

**AFRICAN PHARMACOPOEIA**

## PREFACE

There has been a global upsurge in the use of traditional medicines in the recent time resulting in a huge market worth billions of US dollars. There is need for Africa to reposition herself to benefit prosperously from its stock of biodiversity. This will require scientifically organized information on useful medicinal plants which have been found efficacious in the management of certain aliments in the continent. Thus, African pharmacopoeia will support the development of standard, safe, efficacious and good quality traditional medicines.

The rationale for the production of the second edition of the African Pharmacopoeia arose from the considerable gap left since the production of the first edition in 1985 and the gap and progress made in science and research in the area of medicinal plants since the publication of the first edition. The trend in new knowledge production and discoveries, it is becoming the focus of one of the most intense struggle in the medicinal front in globally. It is against this backdrop, that the African Union organized a comprehensive strategy on the review and production of the second edition by bringing together policy makers, academia, scientists and researchers.

The African Pharmacopoeia series is an authoritative collection of standards for medicines and is an essential reference point for everyone involved in their research, development, manufacture or use. With regulations and legislation constantly changing, the African Pharmacopoeia serves as a comprehensive reference document. It contains user-friendly features which bring wide-ranging benefits to anyone manufacturing or testing pharmaceutical products. It is to be used extensively within the pharmaceutical and chemical industries, quality control, chemical analysis, the government and academia. The contents have been designed as reliable, comprehensive and flexible research and reference tools. In addition to standards checking, it is equally important for method and product testing, and raw material specification.

It is with clear purpose of intent that the development of this second edition has been marked by remarkable dedication, resilience, purposefulness, selfless devotion and a genuine desire to improve traditional medicine practice in the continent. Improved formulation and better presentation of these remedies will result in increased acceptability that will facilitate usage and integration into AU Member States' national health systems.

I commend the efforts of the Scientific Team of the African Union, Scientific, Technical and Research Commission (AU/STRC) for the development of the second edition of the African Pharmacopoeia at this critical juncture that the African Union develeved the Agenda 2063 for shared framework, inclusive growth and sustainable development and source of inspiration for development in the next 50 years. African resources of medicinal plants and its knowledge have played a critical role while publication of African Pharmacopoeia is a step in the right direction. However, the bulge continuous for the experimentation of further plant species, production of pharmaceutical drugs, clinical trials, commercialization in intra-Africa market and up take of the drugs.

Economic integration, coupled with infrastructure development, saw intra-Africa trade mushrooming, from less than 12% in 2013 to almost 50% by 2045. This integration was further

consolidated with the growth of commodity exchanges and continental commercial giants. Starting with the African pharmaceutical company, Pan African companies now not only dominate our domestic market of over two billion people, but they have overtaken multi-nationals from the rest of the world in their own markets.

My special thanks goes to the Member States, Regional Economic Communities (RECs) and other International partners for their invaluable contribution in the production of the African Pharmacopoeia series.

**Dr. Nkosazana Dlamini Zuma,**  
The African Union Commission Chairperson

## **ACKNOWLEDGEMENT**

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AU/STRC would like to offer sincere appreciation for their contribution to the first edition to the following organizations/Agencies; WHO, FAO, RECs, and ANDDI that support this work through participation in meetings and online reviews that culminated in the production of this second edition. The support of the top management of the African Union Commission for the express authorization in the preparation and organization, of meetings, hiring of consultants and working visit to Centers of Excellence in the course of production of the second edition African Pharmacopoeia volume one second edition was a turning point to be reckoned with.

The AU/STRC is grateful for the numerous people that were consulted in the course of production of the second edition and a wide number of references used in the development of the text. We also acknowledged and appreciate the Wikipedia and Wikimedia for using numerous pictures of plant species in their galleries (internet based).

## INTRODUCTION

Africa relies on traditional medicine more than other regions in the world because it has lowest access to essential medicine. According to World Health Organization (WHO) due to weak health systems, poor health service and infrastructure as well as limited resources assigned to health, over 80% of Africans resort to traditional medicine for their basic health care or whenever modern healthcare systems fail to meet their needs. Critical factors that affect access to essential medicines are affordability; sustainable financing; reliable supply and health systems.

About 67% of new medicines introduced worldwide from 1981 to 2002 were derived from natural sources; also out of the 1223 new medicines launched between 1975 to 1997 only 11 of the targeted tropical diseases (Mills, Cooper and Kanfer 2005).

In Africa, there are over 50,000 plant species, some of them; especially in Madagascar and South Africa are endemic. It is generally claimed that less than 10% of medicinal plants worldwide have been scientifically evaluated for their therapeutic potentials. The challenges encountered in undertaking appropriate research and development (R&D) activities that will enable proven, safe, effective and standardized traditional medicines to be registered for public health use in various African countries are multifarious. The most crucial challenge is lack of clearly defined policy on traditional medicine that can only occur when there is a political will. While traditional medicine plays a significant role in the lives of Africans now, more than ever, policies must be put in place to capitalize on the complementarities between traditional and modern or western medicine. Traditional healers who rely on herbal medicines are an important source of health care in Africa. For many rural people, traditional healers are the only source of health care within reach. Therefore, they plan an important role in the socio-economic development of the continent.

The Organization of African Unity, declared the period 2000-2010 as the first decade of traditional medicine in Africa. This was later followed by the 2001 Abuja Declaration **Assembly/AU/Dec.291(XV)** which called on Member States to give priority to research on traditional medicines used for the management of HIV/AIDS, malaria, tuberculosis and other infectious disease. The African Union Summit endorsed in Maputo in 2003 the WHO proposal to institute the African Traditional Medicine Day in Member States on 31st August of every year as part of a strategy to promote traditional medicine in health systems. The decisions were accompanied by a strategy, framework and detailed plan of action for implementation at the country level. Traditional medicine is a cross cutting issue and can provide a platform to strengthen regional integration within the African context. Further, decision was taken by the African Union Heads of State and Government special summit of African Union on HIV/AIDS, Tuberculosis and Malaria “*Abuja plan of actions toward the elimination of HIV and AIDS, Tuberculosis and Malaria in Africa by 2030*”.

The countries in the WHO Africa region have adopted various declaration regarding research and development of traditional medicine and only 23 out of 46 countries in the WHO Africa Regions have adopted national policy on traditional medicine. Many African countries have developed national policies on traditional medicine and have taken measures to ensure that these

policies are part of the overall national health policy. For example, Kenya has published a national policy on traditional medicine and medicinal plants. The goals of the policy are: integrate traditional medicine / medicinal plants and practitioners into the commercial sector, mainstream traditional medicine into national healthcare delivery systems, provide protection of intellectual property rights, and equitable access and benefit sharing arising from the use of traditional knowledge.

Despite this positive trend in traditional medicine policy, not much progress has been documented on the use and safe-guarding of medicinal plants in Africa, which are very diverse and constitute the basic raw materials for traditional medicine production. In addition, these resources are subject to widespread bio-piracy through the deliberate efforts of western pharmaceutical companies eager to tap into this knowledge for drug development.

A pharmacopoeia is a formulary, in particular one having an official status and carrying legal force in all pharmacies of a given country. It is a database containing a description of drugs used in current medical practice, including their formulae, analytical composition, physical constants, chemical properties useful for identification, and mode of preparation of compounds and/or combination of products. Legally binding pharmacopoeia are useful tools for regulating traditional medicine and protecting the use of medicinal plants.

As stated above, the use of the pharmacopoeia is multifold. It contributes to better understanding and rational usage of African traditional medicinal plants, while providing the basis for regulation and means for defensive protection against bio-piracy. It also prepares the foundation for the development of an African pharmaceutical industry.

There is growing number of country and RECs initiatives in the pharmacopoeia field including:

- The creation of the Nigerian, Ghanaian, and Ugandan pharmacopoeia, while 11 other countries are in the process of producing or editing their own
- The ECOWAS-WAHO West African pharmacopoeia

The first edition of the African pharmacopoeia had 95 monographs, covering 105 plants. The first edition of the African Pharmacopoeia was produced on the resolution of the Council of Ministers of the Organization of African Unity, meeting in its Fortieth Ordinary Session in Addis Ababa, Ethiopia in February, 1984 and the book was produced in 1985. The book was appreciated and applauded within the scientific community. Considering the time span and scientific development that took place since publication of the first edition, there is strong need for this second edition of the book in order to cope with the spade of development that took place in the field of science and medicinal plant research.

African pharmacopoeia volume one second edition is revised and adopting measures to control and regulate herbal product quality in terms of identity, purity, safety, efficacy and sustainability. That will aid in the appropriate utilization of African medicinal plants to provide quality herbal drugs to African populations as well as boost international trade in African herbal products. In this edition the monographs are indicated in a consecutive manner for each plant the name of the species and family, the synonyms and common names known in English and French; followed

by the African names in principal local languages namely Arabic, Bambara, Hausa, Peuhl, Swahili and Yoruba; finally, brief botanical description and the geographical distribution which will permit the identification of the plant and the knowledge of its area of cultivation and subsequently exploitation in the different climatic zones of Africa. It also gives the photo gallery that presents different parts of the plant and its seeds for easy identification and understanding.

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## **Abrus precatorius L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Abrus abrus* (L.) W. Wight
- (b) *Glycine abrus* L.
- (c) *Abrus cyaneus* R.Vig.
- (d) *Abrus precatorius* var. *novo-guineensis* Miq.

### **Common names:**

- (a) Abrus seed, Crabs eye, Rosary pea, Love nut, Jequirity (E).
- (b) Pois rouge, Liane réglisse (F).

### **African names:**

- (a) Arabic: العفريت بن
- (b) Bambara: N/A
- (c) Hausa: Idon Zakara, Cikaa-gidaa, Tandara, Kalmunta, Damarzaya, Ta-ga-rana.
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Otaberebe, Olorun yin-ni, Oju-ologbo, Iherenjeje, Iwere-jeje, Olorun yenghen.



### **Brief description of the plant:**

*Abrus precatorius* is a slender, perennial climber that twines around trees, shrubs, and hedges. It has no special organs of attachment. It has slender branches and a cylindrical wrinkled stem with a smooth-textured brown bark. Leaves are glabrous with long internodes and are alternate compound paripinnate with stipules. Each leaf is 50-100 mm long. It bears from 20 to 24 or more leaflets, each of which is about 12-18 mm long, oblong and obtuse. It is blunt at both ends, glabrous on top and slightly hairy below. Flowers are small and pale violet with a short stalk, arranged in clusters. The ovary has a marginal placentation. The fruit, which is a pod, is flat, oblong and truncate-shaped with a sharp, deflexed beak, 30-45 x 12 mm, and silky-textured. The pod curls back when opened to reveal pendulous seeds and contains from 3 to 5 oval-shaped seeds, about 6 mm long. They are usually bright scarlet with a smooth, glossy texture, and a black patch on top.

### **Geographical distribution:**

It grows in tropical and sub-tropical areas.

### **Parts used:**

Roots leaves and stem.

### **Name of drug:**

Abrus root.

### **Definition:**

Abrus root is the dried roots of *Abrus precatorius* L (Family, Fabaceae). It contains not more than 1% of foreign organic matter.

**Description:**

**Macroscopical:** *Abrus precatorius* is a slender, perennial climber that twines around trees, shrubs, and hedges. It has no special organs of attachment. Leaves are glabrous with long internodes. It has a slender branch and a cylindrical wrinkled stem with a smooth-textured brown bark. Leaves alternate compound paripinnate with stipules. Each leaf has a midrib from 5 to 10 cm long. It bears from 20 to 24 or more leaflets, each of which is about 1.2 to 1.8 cm long, oblong and obtuse. It is blunt at both ends, glabrous on top and slightly hairy below. Flowers are small and pale violet in colour with a short stalk, arranged in clusters. The ovary has a marginal placentation.

**Chemical constituents:**

Alkaloids, Glycyrrhizin, Abrin.

**Tests for identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the above descriptions.
- (b) Perform the assay for glycyrrhizin under liquorice root (*Glycyrrhiza glabra*) for *Abrus* root.

**Tests for purity:**

- (a) 99 % clean - Contains no more than 1% of foreign organic matter.
- (b) Test for abrin in the seeds of *Abrus*

**Pharmaceutical preparations:**

N/A

**Uses:**

The root is used as a substitute for liquorice, to sweeten medicines. Leaves and stem for cough.

**Storage:**

In a cool, dry, well ventilated area and in closed containers.

## **Acacia senegal (L.) Willd.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Mimosa senegal* L.
- (b) *Acacia verek* Guill. Et Perr.

### **Common names:**

- a) Gum Arabic tree, Senegal gum (E).
- b) Gommier; Gommier blanc; Verek;  
Acacia du senegal (F).



### **African Names:**

- (a) Arabic: شجرة صمغ عربى
- (b) Bambara: Dibe, Patukill.
- (c) Hausa: Akovia, Akoura, Dakwara, Diishee, K'ayar, Kaimin-makiyaaya, Akkora
- (d) Peuhl: Bulbi, Delbi, Patonki, Patuki.
- (e) Swahili: Kikwata, Mgunga.
- (f) Yoruba: N/A

### **Brief description of the plant:**

Thorny shrub of 6 to 7 m with a grey fissured stem, straight, sometimes with ramifications near its base, it is a somewhat large crowned shrub; thorns assembled into three at the base of the branch of bipinnate leaves, with 2 to 6 pairs of pinules and 6 to 15 pairs of oval folioles; inflorescence in axillary clusters with perfumed white flowers; membranous flat cloves of 11 by 2 cm, with 7 or 8 flat and circular beige seeds.

### **Geographical distribution:**

Sub-desert regions of Sahelian and tropical zone.

### **Part used:**

Dried gummy exudate.

### **Names of drug:**

Gummi Arabicum, Gum Arabic, Gumme arabique.

### **Definition:**

Gum Arabic is the dried gummy exudate from the stem and branches of *Acacia senegal* (L.) Willd. (family, Fabaceae), or of some other African species of *Acacia*.

### **Description:**

Colourless; taste, bland and mucilaginous.

**Macroscopical:** Gum Arabic occurs in rounded or ovoid tears, of variable size, usually about 0.5 to 2 cm, in diameter; whitish or yellowish-white; opaque from the presence of numerous small fissures in the outer part of the tears; in consequence of these, they easily break up into a number of small transparent angular fragments with glistening vitreous surface; almost odourless; taste, bland and mucilaginous.

**Powder:** Powdered Gum Arabic is white to yellowish-white; showing under the microscope angular particles (slight traces), no starch granules, occasional particles of vegetable tissues, and no mucilaginous cell wall (distinction from Gum Tragacanth).

**Chemical constituents:**

Gum Arabic consist of a glycosidal acid of high molecular weight which has been termed Arabic acid combined with potassium, magnesium and calcium. Gum Arabic also contains diastase and oxidase enzyme.

**Tests for identity:**

- (a) An aqueous solution of Gum Arabic (1 in 1) is translucent, viscous, slightly acid to litmus paper and not glairy, and when diluted with water and allowed to stand, no gummy deposit separates.
- (b) An aqueous solution of Gum Arabic (1 in 10) is slightly leavorotatory.
- (c) To an aqueous solution of Gum Arabic (1 in 5), add a few drops of solution of hydrogen peroxide and a few drops of benzidine T.S., shake, and allow to stand; a deep blue or greenish-blue colour is slowly formed (presence of oxidase enzyme).
- (d) To 5 ml of an aqueous solution of Gum Arabic (1 in 50), add 1 ml of solution of leadsubacetate; a flocculent white precipitate is formed.

**Tests for purity:**

- (a) Dissolve 1 g of Gum Arabic in 10 ml of water, add 0.2 ml of lead acetate T.S. no precipitate is formed (distinction from agar and gum tragacanth).
- (b) Dissolve 1 g of Gum Arabic in 10 ml of water, boil, then cool and add 0.1 ml of N/10 Iodine; no blue or brown colour is produced (absence of starch and dextrin).
- (c) Dissolve 1 g of Gum Acacia in 10 ml of water, add 0.1 ml of ferric chloride T.S. no bluish-black colour is produced (absence of tannin-bearing gums).
- (d) Dissolve 5 gm of Gum Arabic in 100 ml of water in a 250 ml conical flask, add 10 ml of dilute hydrochloric acid, and boil gently for 15 minutes, filter by suction, while hot, through a tarred Gooch crucible, wash thoroughly with hot water, dry at 100°C, and weigh. Not more than 0.05 g of residue is left (insoluble residue).
- (e) Gum Arabic loses, when dried at 100°C, not more than 15 per cent of its weight.
- (f) Gum Arabic leaves on ignition, not more than 5 per cent of ash;; acid-insoluble ash, not more than 0.05 per cent.
- (g) 1 g Gum Arabic is almost completely soluble in 2 ml of water. It is insoluble in alcohol (96 per cent).
- (h) It is incompatible in alcohol, acids (unless well diluted), borax, ferric salts, calomel, lead subacetate, and preparations containing guaiacum resin.

**Pharmaceutical preparations:**

N/A

**Uses:**

Suspending and emulsifying agent, emollient, adhesive in tablets and pills manufacture.

**Storage:**

In well-closed containers.

## **Acacia seyal Delile**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Acacia flava* var. *seyal* (Delile) Roberty.
- (b) *Acacia hockii* De Wild.
- (c) *Acacia stenocarpa* Hochst. ex A. Rich.
- (d) *Vachellia seyal* (Delile) P.J.H.Hurter.
- (e) *Acacia fistula* Schweinf.



### **Common names:**

Gum Arabic, Shittim wood, Talh, Whistling thorn, White thorn, White whistling thorn, White-galled acacia (E).

### **African names:**

- (a) Arabic: السنط السيال أو السيال
- (b) Bambara: N/A
- (c) Hausa: Dushe kerifi, Dumshishe, Dumshe, Dundushe, Dussa, Erafu, Irahi, Jan k'aya, jimshi, Jushi, Gishishiya.
- (d) Peuhl: Boulbi.
- (e) Swahili: Mgunga.
- (f) Yoruba: N/A

### **Brief description of the plant:**

*Acacia seyal* Delile is a small to medium-sized tree, growing to 17 m tall and 60 cm in diameter at breast height; crown is umbrella shaped, resembling that of *A. tortilis*. A characteristic feature of the tree is its rust-coloured powdery bark; *A. seyal* var. *fistula* has whitish bark. Large, straight spines occur on the branches, and smaller, curved thorns are present near the tips of the branches. Leaves bipinnate, dark green, 4-12 pairs of pinnae, 10-12 pairs of leaflets each 1-2 x 4-12 mm. Flowers clustered in shining, yellow, globose heads, 1.5 cm diameter, on stems 3 cm long. Pods 10-15 x 1 cm, slightly curved, light brown when mature and indehiscent, containing 6-10 seeds. Seeds are elliptic (5-6 x 2.5-3.5 mm), olive-brown branches. The generic name ‘acacia’ comes from the Greek word ‘akis’, meaning ‘point’ or ‘barb’.

### **Geographical distribution:**

Widespread in the drier parts of tropical Africa.

### **Part used:**

Gum.

### **Name of drugs:**

*Acacia seyal*, gum

### **Definition:**

*Acacia seyal* gum also known as Gum Arabic, is a natural gum harvested from the exterior of *Acacia* trees (Family, Fabaceae) in the form of dry, hard nodules up to 50 mm in diameter, and ranging from almost colourless to brown.

### **Description:**

**Macroscopical:** Tree 3–12 m tall, crown flat-topped; bark powdery, white to greenish-yellow or orange-red; sparsely branched, the branches horizontal or ascending; young branchlets with sparse hairs or almost glabrous, with numerous reddish sessile glands; epidermis of twigs becoming reddish and shed annually; leaves often with a large gland on petiole and between the top 1–2 pairs of pinnae; stipules spinescent, up to 8 cm long, ant-galls present or absent; pinnae usually 3–7 pairs, the leaflets in 11–20 pairs, 3–8 cm long, 0.75–1 mm wide, sparingly ciliolate or glabrous; lateral veins invisible beneath; flowers bright yellow, in axillary, pedunculate heads 10–13 mm across, borne on terminal or short lateral shoots of current season; involucel in lower half of peduncle 2–4 mm long; apex of bracteoles rounded to elliptic, sometimes pointed; calyx 2–2.5 mm long, puberulous in upper part; corolla 3.5–4 mm long, glabrous outside; pods 7–20 cm long, 0.5–0.9 cm in diameter, dehiscent, falcate, constricted between seeds, glabrous except for sessile glands, 6–9-seeded; seeds elliptic, 7–9 mm long, 4.5–5 mm wide, compressed, minutely wrinkled, olive-brown to olive; areole 5–6 mm long, 2.5–3.5 mm wide.

### **Chemical constituents:**

This species has been reported to contain the gum and 18–20% tannin.

### **Tests for identity:**

- (a) Acacia occurs as yellowish-white, yellow or pale amber, sometimes with a pinkish tint, friable, opaque, spheroidal, oval or reniform pieces (tears) of a diameter from about 1 cm to 3 cm, frequently with a cracked surface, easily broken into irregular, whitish or slightly yellowish angular fragments with conchoidal fracture and a glassy and transparent appearance. In the centre of an unbroken tear there is sometimes a small cavity.
- (b) Reduce to a powder (355). The powder is white or yellowish-white. Examine under a microscope using glycerol R (50 per cent V/V). The powder presents angular, irregular, colourless, transparent fragments. Only traces of starch or vegetable tissues are visible. No stratified membrane is apparent.
- (c) Examine the chromatograms obtained in the test for glucose and fructose. The chromatogram obtained with the test solution shows three zones due to galactose, arabinose and rhamnose. No other important zones are visible, particularly in the upper part of the chromatogram.
- (d) Dissolve 1 g of the powdered drug (355) in 2 ml of water R by stirring frequently for 2 h. Add 2 ml of alcohol R. After shaking, a white, gelatinous mucilage is formed which becomes fluid on adding 10 ml of water.

### **Tests for purity:**

- |                     |   |
|---------------------|---|
| Loss on drying:     | Not more than 15% (105°, 5 h) for granular and not more than 10% (105°, 4 h) for spray dried material. Unground samples should be powdered to pass through a No. 40 sieve and mixed well before weighing. |
| Total ash:          | Not more than 4%.   |
| Acid-insoluble ash: | Not more than 0.5%.   |
| Acid-insoluble:     | Not more than 1%.   |

Starch or dextrin:	Boil a 1 in 50 solution of the sample, cool and add a few drops of Iodine T.S. No bluish or reddish colour should be produced.
Tannin-bearing gums:	To 10 ml of a 1 in 50 solution of the sample, add about 0.1 ml of ferric chloride TS. No blackish colouration or blackish precipitate should be formed.
Microbiological criteria:	<i>Salmonella</i> spp.: Negative per test. <i>E. coli</i> : Negative in 1 g
Lead:	Not more than 2 mg/kg

***Pharmaceutical preparations:***

N/A

***Uses:***

Gum Arabic is used as thickener, suspender, emulsifier, stabilizer, flavour carrier, binder and encapsulating material. In addition, it is used in confectionaries, food, beverages, pharmaceuticals and chemical industries.

***Storage:***

Moisture content for storage should be 4.5-9%. In well closed containers.

## **Achyranthes aspera L.**

### **Family name:**

Amaranthaceae.

### **Synonyms:**

- (a) *Achyranthes argentea* Lam.;
- (b) *Achyranthes aspera obtusifolia* (Lam.) Griseb.;
- (c) *Achyranthes aspera* var. *indica* L.
- (d) *Achyranthes indica* (L.) Mill.

### **Common names:**

Devil's horsewhip, Prickly-chaff flower, Burweed (E).

### **African names:**

- (a) Arabic: Na'eem.
- (b) Bambara: Sien doro nani.
- (c) Hausa: Hakoorin-macijiji, Kaimin-kadangaree, Kiban k'adangaruu.
- (d) Peuhl: N/A
- (e) Swahili: Panga za wayuka.
- (f) Yoruba: Aboro.



### **Brief description of the plant:**

A perennial stiff erect herb 0.2-2m high, growing up to 1000m height. Stems are square, leaves elliptic ovate or broadly rhoambate, 5-22m long, 2-5cm broad and adpressed pubescent. The inflorescences are 8-30cm long with many single white or red flowers, 3-7mm wide. Flowering time is in summer.

### **Geographical distribution:**

It is found in the south east of Africa: Kenya, Tanzania and Uganda.

### **Part used:**

The whole plant.

### **Name of drug:**

Achyranthes herb.

### **Definition:**

Achyranthes herb is the dried leaf, stem and roots of *Achyranthes aspera* L. (family, Amaranthaceae).

### **Description:**

**Macroscopical:** *Achyranthes aspera* is an erect or spreading perennial herb which can grow up to 2 m tall. Its stems become woody at the base. Its short-stalked leaves (dark green above and paler below) are opposite, simple and egg-shaped with broad end at base (ovate) up to 10 cm long by 8 cm wide, densely to sparsely hairy (pubescent) tapering to a point at both ends and shortly stalked.

The small greenish-white flowers form narrow, elongated terminal spikes up to 60 cm long. As the flowers age, they bend downwards and become pressed closely against the stem. The bracts surrounding the flowers in the fruiting stage have sharp, pointed tips making the heads spiny to the touch. The sharp-pointed fruits are orange to reddish purple or straw-brown capsules.

***Chemical constituents:***

The plant contains triterpenoid saponins possessing oleanolic acid as aglycone, as major chemical constituents. Other constituents of the plant are ecdysterone, long chain alcohol, penta triacontanol, cyclohexyl heptacosan, 16-hydroxyl 26-methyl heptacosan-2-one, dihydroxy hen-pentacontan-4one. It also contains a water soluble base, betaine.

***Tests for identity:***

- a) Macroscopical examination of the specimen to ensure compliance with the above descriptions.
- b) Shake the powdered herb with water. A foam which does not disappear on heating is produced.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antispasmodic.

***Storage:***

Store in sealed containers in a cool & dry place. Protect from light, moisture and pest infestation.

## **Adansonia digitata L.**

### **Family name:**

Bombacaceae

### **Synonyms:**

*Adansonia sphaerocarpa* A. Chev.

### **Common names:**

Baobab, Cream of Tartar tree, Monkey-bread tree,  
Lemonade tree (E). Baobab (F).

### **African names:**

- (a) Arabic: تبلدي إصبعي
- (b) Bambara: Sira, Siti, Sito, Zira
- (c) Hausa: Kuka, Kuukaa, Kumbali duku, Bambu, Kulambali, Kwame Kubali, , Bakko, Kwame kubali,
- (d) Peuhl: Boki, Boy, Boio, Boki
- (e) Swahili: N/A
- (f) Yoruba: Ose



### **Brief description of the plant:**

A massive, deciduous tree with a trunk that can grow to an immense girth. The bark is smooth.

The African baobab is one of the plant kingdom's strangest trees. It is not particularly tall, growing (up to 25 m tall and usually less) but the trunk is massive: as much as 11 m in diameter and shaped like a bottle. It is a deciduous tree, losing its leaves in the dry season.

### **Geographical distribution:**

*Adansonia digitata* is widespread in the drier parts of tropical and southern Africa, from Mauritania in the northwest to Sudan in the northeast, and south to South Africa. It is also found in the Arabian Peninsula.

### **Parts used:**

Fruit pulp, leaves.

### **Name of drug:**

Baobab fruit pulp.

### **Definition:**

Baobab fruit pulp is the cold-pressed unrefined fruit juice or pulp of the fruit of *Adansonia digitata* L. Family, Bombacaceae collected when it has fallen to the ground. It gives out a mild and nutty aroma and a golden liquid.

### **Description:**

#### **Macroscopical:**

Leaves: Borne at the ends of branches, leaves are usually divided into 5–7 leaflets attached to a central point.

Flowers: Large (up to 20 cm in diameter), white and pendent on long stalks. Each flower has five free petals and many stamens (male parts).

**Fruit:** More or less cylindrical and up to 35 cm long and 13 cm wide. Each fruit is filled with mealy pulp containing many small, dark brown seeds, each about 1 cm long and wide. The seeds have a reddish-black seed coat.

**Microscopical:** Fruit shell composed of numerous lignified stone cells, heavily pitted vessels and lignified sclerenchymatous fibres. Pulp consists almost entirely of large unlignified polygonal or irregular beaked pyrenchmatous cells containing numerous simple or compound , angular or spherical large starch grains with distinct striations and hila. Seed, with the brownish hard testa is composed of numerous stone cells and small vessel members; the white kernel consists of soft parenchymatous cells, numerous oil cells and a few unlignified fibres with pitted walls; crystalloids of numerous aleurone grains are present in some cells.

**Powder:** Xylem vessels with pitted walls, numerous lignified stone cells staining red with phloroglucinol and Hydrochloric acid, lignified sclerenchymatous fibres, plenty of large-sized starch grains staining blue-black with iodine solution; aleurone grains are seen numerous, there are parenchymatous cells in the field.

**Chemical constituents:**

Baobab fruit pulp contains moisture, protein , fat , fiber , sugars , pectin, as galacturonic acid, and ascorbic acid , calcium, phosphorus and iron.

**Tests for identity**

- a) Macroscopic and microscopical examination to confirm compliance with the above descriptions.
- b) Thin-layer chromatography to confirm the presence of reducing sugars, galacturonic acid and ascorbic acid

**Tests for purity:**

Baobab fruit pulp contains moisture 6.7 per cent. and, on a dry basis, protein 2.6; fat 0.2; fiber 5.7; ash 5.3; total soluble solids 79.3; alcohol-insoluble solids 57.3; total sugars 23.2; reducing sugars 18.9; pectin, as galacturonic acid, 56.2 per cent. and, in mg/100 g, ascorbic acid 300, calcium 655, phosphorus 51 and iron 9. The pectin is mainly water-soluble and of poorer quality than commercial pectin.

**Pharmaceutical preparations:**

N/A

**Uses:**

Foodstuff, medicine. Leaves and fruit pulp rich in micronutrients for supplementation.

**Storage:**

Store in a cool, dry, ventilated place protected from light. Refrigeration storage recommended.

## **Agave sisalana** Perrine

### **Family name:**

Agavaceae

### **Synonyms:**

- (a) *Agave amaniensis* Trel. & Nowell
- (b) *Agave rigida* Mill.;
- (c) *Agave rigida* var. *sisalana* (Perrine) Engelm
- (d) *Agave segurae* D.Guillot & P.Van der Meer
- (e) *Agave sisalana* var. *armata* Trel.
- (f) *Agave sisalana* f. *armata* (Trel.) Trel

### **Common name:**

Sisal, Sisal hemp (E). Sisal (F).

### **African names:**

Arabic: غاف

Bambara: Tangbeka, Tangeka

Hausa: Axomyis, Zabuwa

Peuhl: N/A

Swahili: Katani, Mkonge, Mkatani, Mkatani Mkonge

Yoruba: N/A



### **Brief description of the plant:**

Perennial plant with short stem, numerous leaves (in rosette) which are thick, fleshy, thorny and which can reach 2 m in height and 15 cm in width; inflorescence in panicles at the apex of a hardy and long central stem of 3 to 8 m; greenish-yellow flowers which rarely develop into capsular fruits and into seeds, but produce a lot of plantlets that ensure the fast propagation.

### **Geographical distribution:**

Sisal can be cultivated in the whole of tropical zone of Africa.

### **Part used:**

Leaf or leaf waste (sludge), stripped from the leaves during the removal of the fibers.

### **Name of drug:**

Sisal. Sisal waste. Sludge.

### **Definition:**

Sisal is the fresh leaf or the waste (sludge) from the leaf of *Agave sisalana* Perrine. (family Agavaceae). Sludge is the juice of the leaf concentrate, which is allowed to ferment for several days, then steamed at high pressure to complete the hydrolysis and liberation of hecogenin, by filtration and drying. Sludge contains not less than 2 per cent w/w hecogenin.

### **Description:**

**Macroscopic:** Rosettes to 2 m tall, with a short trunk. Leaves 9–130 x 9–12 cm; margins minutely toothed when young, toothless in mature leaves; terminal spine 2–2.5 cm long, dark brown. Inflorescence a 5–7 m tall panicle, producing bulbils after flowering. Flowers 5–6.5 cm long, greenish-yellow; perianth-tube 15–18 mm long; sepals 17–18 mm long, equal, hooded at apex. Filaments 50–60 mm long. It has no odour but slightly bitter mucilagenous taste.

**Microscopical:** Transverse section of the leaves show an epidermis surrounding a ground tissue with scattered fibrovascular bundles in the ground tissue.

**Powder:** Several groups of fibers, long, lignified; spiral, annular and pitted vessels; epidermal tissue.

**Chemical constituents:**

Steroidal saponins e.g.: hecogenin, sisalagenin, tigogenin, neotigogenin, etc., also mucilage, pectins and reducing sugars.

**Tests for identity:**

- a) Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above.
- b) Shake powdered leaf with water, it foams and the foam persists on boiling.
- c) Water extract of the leaf reacts positively to blood haemolysis test for saponins
- d) Boil powdered sisal with dilute hydrochloric acid to hydrolyse the saponin. Extract the saponin from the hydrolysate with chloroform. Concentrate the chloroform extract and use to test for the presence of hecogenin by thin-layer co-chromatography.

**Tests for purity:**

Moisture: Not more than 83 per cent (fresh leaf)

Ash: Not more than 14.3 per cent.

Acid-insoluble ash: Not more than 14.3 per cent.

Water-soluble ash: Not less than 90.1 per cent.

Alcohol-soluble extractive Not less than 13 per cent. (coarse powder)

Water-soluble extractive: Not less than 6.7 per cent. (coarse powder)

**Assay:**

N/A

**Storage:**

In well-closed containers, protected from light.

## **Albizia ferruginea (Guill. & Perr.) Benth.**

### **Family name:**

Fabaceae.

### **Synonym:**

*Albizia angolensis* Welw. ex Oliv.

### **Common names:**

Albizia.

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Tsin, Tsiyar-kurmii
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ayinre-langara, Ayinre-ogo, Ayinre-semise, Semi-solose, Ayinreta.



### **Brief description of the plant:**

A tall tree found scattered in the moist semi-deciduous high forest, less common in secondary forest. Large spreading tree with low, fat buttresses; bark rough and scaly, thick; slash fibrous, yellow-orange contoured with brown gritty streaks, exuding red-gummy exudates; sapwood with ripple marks. Leaflets very hairy with long ginger hairs, especially around the petiole; glands on rachises pinkish. Ripe pods dry, yellow, thin-papery. Look for the crater-like glands on petiole and rachises.

### **Geographical distribution:**

Widespread, occurring from Senegal east to Uganda and south to northern Angola.

### **Part used:**

Stem bark. Root bark.

### **Name of drug:**

Albizia bark.

### **Definition:**

Albizia bark is the dried stem bark or root bark of *Albizia ferruginea* (Guill. & Perr.) Benth. (family, Fabaceae).

### **Description:**

**Macroscopical:** Large deciduous tree up to 45(–50) m tall; bole branchless for up to 22(–30) m, straight and cylindrical, up to 100(–130) cm in diameter, without buttresses or sometimes with small, thick buttresses up to 1.5 m high; bark yellowish brown to dark grey, rough and scaly, inner bark fibrous, yellowish to orange-brown, with darker stripes and clear or honey-coloured gum; crown dome-shaped, heavily branched, with fairly spreading branches; young branches densely rusty hairy. Leaves alternate, bipinnately compound with 3–7 pairs of pinnae; stipules awl-shaped, caduceus; petiole (2–)3–4.5(–6) cm long, at the middle of upper side with a sessile gland, rachis (2–)4–15 cm long, rusty hairy; leaflets in 6–14(–20) pairs per pinna, sessile, elliptical to oblong, slightly oblique, 1–2.5 cm × 0.5–1 cm, rounded at apex, densely pubescent below. Inflorescence an axillary head on (2–)5–10 cm long peduncle. Flowers bisexual, regular, 5-merous, white to yellow, subtended by up to 7 mm long bracteoles; pedicel up to 3 mm long; calyx 3–6

mm long, with long tube and short lobes, densely rusty pubescent outside; corolla 9–13 mm long, with c. 6 mm long tube, rusty pubescent outside; stamens numerous, 3–5.5 cm long, united into a tube in lower half; ovary superior, c. 3 mm long, gradually tapering into an up to 3 cm long style. Fruit an oblong, flat pod 15–24 cm × 3–5 cm, glabrous, transversely veined, yellowish brown when ripe, opening with 2 papery valves, c. 10-seeded. Seeds flattened globose to ellipsoid, 7–10 mm × 4.5–8 mm. Seedling with epigeal germination; hypocotyl 4–6 cm long, epicotyl 1–2.5 cm long; cotyledons c. 1 cm long, thick and fleshy, rounded, early caduceus; first 2 leaves opposite, one pinnately compound and the other bipinnately compound.

**Microscopy:** Wood, Growth rings: (1: growth ring boundaries distinct); (2: growth ring boundaries indistinct or absent). Vessels: 5: wood diffuse-porous; 13: simple perforation plates; 22: intervessel pits alternate; (23: shape of alternate pits polygonal); 26: intervessel pits medium (7–10 µm); 29: vested pits; 30: vessel-ray pits with distinct borders; similar to intervessel pits in size and shape throughout the ray cell; 43: mean tangential diameter of vessel lumina ≥ 200 µm; 46: ≤ 5 vessels per square millimeter; (47: 5–20 vessels per square millimeter); 58: gums and other deposits in heartwood vessels. Tracheids and fibres: 61: fibres with simple to minutely bordered pits; 65: septate fibres present; 69: fibres thin- to thick-walled. Axial parenchyma: 79: axial parenchyma vasicentric; 80: axial parenchyma aliform; 81: axial parenchyma lozenge-aliform; 83: axial parenchyma confluent; 91: two cells per parenchyma strand; 92: four (3–4) cells per parenchyma strand. Rays: (97: ray width 1–3 cells); (98: larger rays commonly 4- to 10-seriate); 104: all ray cells procumbent; 115: 4–12 rays per mm. Mineral inclusions: 136: prismatic crystals present; 142: prismatic crystals in chambered axial parenchyma cells.

#### **Chemical constituents:**

The phytochemical screening of the aqueous methanol leaf extract of *Albizia ferruginea* revealed the presence of alkaloid, anthraquinones, carbohydrates, cardiac glycosides, flavonoid, saponin, tannin and terpenes. The bark from roots and bole contains high amounts of saponins, and the root bark also alkaloids. The content of protein in the leaves was 38%, and that of crude fiber 41%, both of which are comparatively high. In another test the crude protein content was only about 25%, while the leaves had a C/N ratio of 11.4, a lignin/N ratio of 10.3 and a polyphenol/N ratio of 0.82, indicating that the leaf litter is slow to decompose.

#### **Tests for identity**

The heartwood is yellowish brown to reddish brown, with a golden or occasionally purplish shine, and distinctly demarcated from the 3–7 cm wide pale yellow to pinkish brown sapwood.

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the description given above.
- b) Shake the powdered root or stem bark with water and warm. The foam produced increases but does not decrease indicating the presence of saponins
- c) Treat an aqueous acid extract with the alkoidal reagents (Wagner's, Dragendorff's), a positive reaction is obtained in each case.

#### **Tests for purity:**

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Dysentery, bronchial affections and pain caused by fevers, vermifuge, jaundice.***Storage:***  
In a cool dry place.

## **Alchornea cordifolia Müll.Arg.**

### **Family name:**

Euphorbiaceae.

### **Synonyms:**

- (a) *Alchornea cordifolia* (Schumach. & Thonn.) Müll.Arg.
- (b) *Schousboea cordifolia* Schumach. & Thonn.

### **Common names:**

Christmas bush (E) Arbe de djeman (F).

### **African names:**

Arabic: N/A

Bambara: Ko gira.

Hausa: Bambamie, Bambana, Bambani.

Peuhl: Holata, Bulora.

Swahili: N/A

Yoruba: Ewe-ifá, Ipa, Eepa, Esin-yin, Siin,Uhen-en, Essinrin, Omusen-en, Usen-en.



### **Brief description of the plant:**

Very common, sun-loving shrub or small tree of wet situations, common in secondary bush, sometimes climbing. Leaf with distinct glands at the base of the lamina.

### **Geographical distribution:**

Distributed throughout tropical Africa.

### **Part used:**

Leaves.

### **Name of drug:**

Christmas bush leaf.

### **Definition:**

Christmas bush leaf is the fresh or dried leaf of *Alchornea cordifolia* Müll.Arg. (family, Euphorbiaceae).

### **Description:**

**Macroscopical:** *Alchornea* is pantropical and comprises about 60 species of which 6 occur in tropical Africa. Straggling, laxly branched, evergreen dioecious shrub or small tree up to 8 m tall; young shoots erect, later becoming horizontal, hollow, glabrous. Leaves alternate, simple; stipules triangular, c. 1.5 mm long, acute, soon falling; petiole (3–)5–15 cm long; blade ovate to elliptical-ovate, (5–)10–25 cm × (3–)7–15 cm, base cordate, with basal lobes slightly auriculate and overlapping, apex acute to acuminate, margins toothed, shortly hairy when young, later almost glabrous, 3–5-veined at the base with 4 glandular patches in the angles of the veins. Male inflorescence an axillary panicle up to 30(–45) cm long, sparingly hairy, bracts minute; female inflorescence an axillary spike or lax panicle up to 30(–45) cm long, 1–several together, bracts broadly triangular-ovate, c. 1 mm long, acuminate. Flowers unisexual, sessile; male flowers with 2 cup-shaped sepals, petals absent, stamens 8, the united filaments forming a basal plate; female flowers with 2–4-lobed calyx, lobes obtuse, hairy, petals absent, ovary superior, conical, c. 2 mm × 2 mm, smooth, densely silky hairy, styles 2–3, 1–2 cm long, free or fused at

base, dark red. Fruit a 2-lobed capsule c. 1.5 cm × 1.5 cm, lobes somewhat compressed, smooth, shortly hairy, green to red, 2-seeded. Seeds ovoid-ellipsoid, c. 6 mm long, smooth, bright red.

**Microscopical:** Surface view shows stellate trichomes with unicellular arms and unicellular clothing trichomes; warty epidermal cells, anisocytic stomata on lower surface. Transverse section shows a dorsiventral leaf arrangement; palisade layer 2-celled with numerous rosette calcium oxalate crystals; mesophyll cells abound in the collenchymas tissue of the midrib region in both upper and lower surfaces, also spongy mesophyll with rosette crystals; vascular bundle bicolateral, bounded by shield-shaped lignified pericyclic fibres; xylem elements lignified

**Powder:** Colour green; odourless; taste slightly bitter; numerous lignified reticulate xylem vessels and fibres; clothing unicellular and stellate trichomes with lignified bases; anisocytic stomata, prismatic and rosette crystals of calcium oxalate; veins with sheaths, prismatic crystals.

**Chemical constituents:**

The leaves, roots and stem bark contain terpenoids, steroid glycosides, flavonoids (2–3%), tannins (about 10%), saponins, carbohydrates and the imidazopyrimidine alkaloids alchorneine, alchornidine and several guanidine alkaloids. The leaves also contain a range of hydroxybenzoic acids: gallic acid and its ethyl ester, gentisic acid, anthranilic acid (vitamin L1) and protocatechuic acid, and also ellagic acid (alizarine yellow). A C<sub>20</sub>-homologue of vernolic acid, named alchornoic acid, is present in the seed oil.

**Tests for identity:**

- a) Macroscopical and microscopical examination to ensure the specimen complies with the above descriptions.
- b) Microchemical tests to confirm the presence of flavonoids and alkaloids.
- c) Carry out thin-layer chromatographic test to confirm the presence of flavonoids and alchorneine by co-chromatography.

**Tests for purity:**

Moisture: Not more than 4.8 per cent for dry leaf.

Ash: 5.6 per cent.

Water soluble extractives: not less than 22.8 per cent.

Alcohol (70%) soluble extractives: Not less than 22 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

Fever, rheumatism, anti-microbials, diuretic, purgative, toothache, cough, sore, gonorrhea, insomnia.

**Storage:**

Store in a cold dry place.

## Allium sativum L.

### **Family name:**

Alliaceae

### **Synonym:**

- (a) *Porvium sativum*, Rchb.
- (b) *Porrum ophioscorodon* (Link) Rchb.
- (c) *Porrum sativum* (L.) Rchb.,
- (d) *Allium arenarium* Sadler ex Rchb.
- (e) *Allium controversum* Schrad. ex Willd
- (f) *Allium longicuspis* Regel
- (g) *Allium ophioscorodon* Link
- (h) *Allium pekinense* Prokh.

### **Common names:**

- (a) Common garlic, Garlic (E).
- (b) Ail commun, Ail, Thériaque des pauvres (F).



### **African names:**

- (a) Arabic: الثوم
- (b) Bambara: Layi, Tume
- (c) Hausa: Gabaruwa, Tafanuwa, Tafarnuuwaa, Tafaranoa
- (d) Peuhl: N/A
- (e) Swahili: Kitunguu-sumu, Kitungu saumu
- (f) Yoruba: Ayuu

### **Brief description of the plant:**

Herbaceous plant with coated bulb consisting of some ten pods enclosed in a common papery sheath; flat and smooth leaves, whitish or greenish umbellate flowers frequently replaced by bulblets.

### **Geographical distribution:**

Garlic is indigenous to Asia but is cultivated all over Africa.

### **Part used:**

The bulbs.

### **Names of drug:**

Bulbus Allii, Garlic, Ail. Bulbus Allii Sativi.

### **Definition:**

Garlic consists of the fresh or dry bulbs of *Allium sativum* L. (family, Alliaceae).

### **Description:**

**Macroscopical:** The mature garlic bulb consists of several outer layers of thin sheathing protective leaves which surround inner sheath. The latter enclose the swollen storage leaves called "cloves". A typical garlic bulb possesses a dozen of sterile sheathing leaves, within these are 6-8 cloves bearing buds with a total number of 10-20 cloves; also it possesses 20-40 well-developed but short and embedded roots. Cloves of the bulb are quite asymmetric in shape, but those near the centre are symmetric. It has a strong aromatic alliaceous odour and alliaceous acrid taste.

**Microscopical:** The protective leaf contains an epidermis enclosing a mesophyll free from chlorophyll. The outer epidermis consists of lignified sclereid cells of thick pitted

walls, elongated, covered with thin cuticle, long fibres up to 500  $\mu$  long and 30  $\mu$  wide. The cortical cells are thick-walled, non-lignified, tend to collapse on maturity, isodiametric and contain purple pigments. The vascular bundles consist of lignified spiral and annular vessels.

The storage leaves show an outer epidermis of thin, delicate cells of variable shape, somewhat arranged in irregular rows; of 60  $\mu$  long, 30  $\mu$  wide. Stomata are present on the outer epidermis only at the extreme tip near the base of the foliage leaves.

The mesophyll consists of swollen storage parenchyma cell filled with fine granular reserve material. Scattered in the cortex are about 20 laticiferous tubes of 500 to 1000  $\mu$  in length. Two series of vascular bundles are arranged in the mesophyll consisting of narrow lignified spiral and annular vessels.

**Powder:** Powdered garlic is pale buff to greyish or purplish white in colour, with characteristic aromatic alliaceous odour and taste. It is characterized by the presence of sclereids of the epidermis of protective leaves, thin epidermis of storage cells, latex tubes, swollen parenchyma cells with granular contents, lignified narrow spiral and annular vessels.

#### **Chemical constituents:**

Garlic contains diallylbisulphide, diallyltrimisulphide and diallylpolysulphides. Other constituents include vitamins A, B, C (0.9 mg of Ascorbic acid/g) and D, a reserve carbohydrate sistrin and a basic principle Alliin from which the diallylsulphides are derived by enzymatic cleavage.

Garlic also contains a saponin, 10 per cent of a white, water-soluble and sweet tuberoholoside; 0.41 per cent of phosphorus; some hydrocyanic acid as well as some enzymes.

#### **Test for identity:**

- Carry out the carius halogen test for Sulphur compounds
- Also carry out the TLC analysis to determine the presence of Alliin as described in Wagner et al. (1984), Drug Analysis, Berlin, SpringerVerlag, 253-257.

#### **Tests for purity:**

- Moisture:* Not more than 7 per cent.
- Ash:* Not more than 5.0 per cent.
- Acid-insoluble ash:* Not more than 1.0 per cent.
- Water-soluble extractive:* Not less than 5.0 per cent.
- Alcohol-soluble extractive:* Not less than 4.0 per cent.
- Carry out qualitative and quantitative assay for sulfur constituents (alliin, allicin etc.)
  - content by means of high-performance liquid chromatography or gas
  - chromatography-mass spectroscopy methods

#### **Uses:**

Antimicrobial, dietetic, flavouring agent, anthelmintic, antihypertensive, colon cancer chemoprevention.

#### **Storage:**

In well-closed containers, protected from light.

**Aloe ferox** Miller

**Aloe vera** L.

**Family name:**

Xanthorrhoeaceae

**Synonyms:**

(a) *Aloe ferox* Miller

- A. *horrid* Haw.,
- A. *perfoliata* Thunberg.,
- A. *pseudoferox* Salm. Dyck,
- A. *socotrina* Masson.,
- A. *supralaevis* Haw.,
- Pachydendron ferox* Humb. et Bonplc.
- P. supralaeve* Haw.

(b) *Aloe vera* L.

- A. *barbadensis* Mill.
- A. *chinensis* Bak.,
- A. *elongata* Murray,
- A. *indica* Royle
- A. *officinalis* Forsk.,
- A. *perfoliata* L.,
- A. *rubescens* DC,
- A. *vulgaris* Lamk.
- A. *vera* L. var. *littoralis* König ex Bak.,
- A. *vera* L. var. *chinensis* Berger,



**Common names:**

- (a) Aloes foroce (F). Cape Aloe, Bitter Aloe (E) *Aloe ferox* Mill.
- (b) Aloes vulgaire (F). Aloe (E). *Aloe vera* L.

**African names:**

- (a) Arabic: الصبار
- (b) Bambara: Sogobahu, Sogoba Ku = *A. buettneri*
- (c) Hausa: Tinya, Zabuwa, Zaabuwaa
- (d) Peuhl: N/A
- (e) Swahili: Shubiri, Za'bila,
- (f) Yoruba: Eti erin, Eti-erin oyinbo, Alon-erin

**Brief description of the plant:**

*Aloe ferox* is a shrub with a single stem of 10 to 15 cm in diameter and 3 to 4 m in height, crowned by a large rosette of numerous leaves which are sea milkwort green, oval-lanceolate, of 40 to 60 cm by 10 to 12 cm, thorny on the ridge and the edges. Inflorescence in cluster of about 60 cm in height, simple or with ramifications; flowers with perianth of 2,5 cm tinged with yellow and purplish-blue, striped with red and green.

*Aloe vera* is nearly stemless with inflorescence in cluster pressed close to a stem of 50 cm, small yellow flowers of 20 to 25 mm .

**Geographical distribution:**

Subtropical Africa.

**Part used:**

Solidified juice.

**Names of drug:**

Aloe, Aloes (E). Aloes (F).

**Definition:**

Aloe is the solid residue obtained by evaporating the liquid which drains from the cut leaves of *Aloe ferox* Miller (family, Xanthorrhoeaceae) and its hybrids, known in commerce as Cape Aloes, or of *A. vera* L. (family, Xanthorrhoeaceae) known in commerce as Curacao Aloes, or of *A. perryi* Baker (family, Xanthorrhoeaceae), known in commerce as Socotrine Aloes or Zanzibar Aloes. It has a characteristic and disagreeable taste, bitter or faintly sour.

**Description:**

**Macroscopic:** Cape aloes occurs in dark brown or greenish-brown glassy masses, often covered with a yellowish powder; in thin fragments. It is transparent and exhibits a yellowish reddish-brown or greenish tinge; fracture, smooth, even, and glassy; odour, characteristic and disagreeable; taste, somewhat sour, nauseating and very bitter.

Curacao or Barbados aloes occur in dark chocolate-brown usually opaque masses; fracture, dull waxy, uneven and frequently conchoidal; odour, characteristic and disagreeable; taste, nauseating and very bitter.

Socotrine aloes occurs in hard, dark brown or nearly black, opaque masses; fracture, uneven, porous; odour, characteristic and disagreeable; taste, nauseating and very bitter. Zanzibar aloes occurs in livery-brown opaque masses; fracture nearly smooth and slightly porous; odour, slight and not disagreeable; taste, nauseating and very bitter.

**Powder:** Powdered aloes are yellowish-brown to dark reddish-brown. When mounted in lactophenol T.S. and examined with the microscope: Cape aloes appear as transparent brown irregular and angular fragments; Curacao aloes show fragments with numerous minute acicular crystals embedded in an amorphous matrix; Socotrine aloes shows fairly large prisms grouped into masses; Zanzibar Aloes shows irregular lumps with sphaerites. The particles gradually dissolve in the mountant.

**Chemical constituents:**

The principal constituent of all the foregoing varieties of aloes is the pale yellow, crystalline substance, barbaloin. In Curacao aloes, the barbaloin is accompanied by isobarbaloin. Socotrine and Zanzibar aloes contain no isobarbaloin and Cape aloes contains traces only. Other constituents of aloes are resin and aloe emodin.

**Tests for identity:**

Aloes are partially soluble in water; soluble in alcohol (60 per cent) in glycerol; insoluble in chloroform, in ether and in petroleum-benzene. It is soluble in alkalis and in glacial acetic acid. Boil about 1 g of powdered aloes with 100 ml of water for about 2 to 3 minutes, cool, then shake thoroughly with about 1g of kieselguhr and filter. The clear filtrate obtained responds' to the following tests:

- (a) Dissolve, with the aid of heat, about 0.2 g of borax in 5 ml of the filtrate; transfer 5 to 10 drops of the solution to a test-tube nearly filled with water, a green fluorescence is produced.
- (b) Shake 30 ml of the filtrate with 20 ml of benzene and allow to separate. Shake 10 ml of the benzene layer with 10 ml of dilute solution of ammonium hydroxide. A cherry-red colour is produced in the ammoniacal layer with Curacao and Socotrine but not with Zanzibar and Cape aloes.
- (c) To 1 ml of the filtrate, add 1 ml of bromine T.S.; a copious pale yellow precipitate is formed.
- (d) Mix 25 ml of the filtrate with 1 ml of nitric acid; a yellowish-brown colour, passing rapidly to vivid green, is produced with Cape aloes; a deep brownish-red colour with Curacao aloes; and a yellowish-brown colour with Socotrine and Zanzibar aloes.
- (e) Dilute 2 ml of the filtrate to 10 ml with water, add a drop of copper sulfate T.S., warm and add about 0.5 ml of sodium chloride T.S., and then about 1 ml of alcohol (95 per cent); a deep wine-red colour is produced with Curacao aloes and an evanescent pale wine-red colour with Cape aloes (presence of isobarbaloin). This test is not given with Socotrine and Zanzibar aloes.

**Tests for purity:**

- (a) Dissolve, with the aid of gentle heat, 1 g of aloes in 50 ml of alcohol and cool. An almost clear solution is obtained (detection of gums and inorganic impurities).
- (b) Transfer 5 drops of a solution of aloes (1 in 100) to a porcelain dish and add 1 ml of sulfuric acid, followed by a drop of fuming nitric acid; no green colour is produced (Natal aloes).
- (c) Aloes yield not less than 50 per cent of water-soluble extractives, and not more than 10 per cent of alcohol-insoluble residue.
- (d) Aloes lose, when dried at 100° C, not more than 12 per cent of its weight.
- (e) Aloes leave on ignition not more than 5 per cent of ash.

**Pharmaceutical preparations:**

Pilula Aloes.  
 Pilula Aloes et Ferri.  
 Pilula Colocynthidis et Hyoscyami.  
 Pilula Rhei Composita.  
 Tinctura Aloes.  
 Tinctura Benzoini Composita.

**Uses:**

Cathartic.

**Storage:**

In well-closed containers, protected from light.

## **Althaea officinalis L.**

### **Family name:**

Malvaceae

### **Synonyms:**

- a) *Althaea armeniaca* Ten.
- Althaea cannabina* L.
- Althaea taurinensis* L.
- b) *Althaea balearica* Rodrigeuz,
- c) *Althaea kragujevacensis* Pan.,
- d) *Althaea micrantha* Wiesb. ex Borbas,
- e) *Althaea officinalis* var. *obtusifolia*,
- f) *Althaea sublobata* Stokes,
- g) *Althaea taurinensis* DC.,
- h) *Althaea vulgaris* Bubani,
- i) *Malva althaea* E.H.L.Krause,
- j) *Malva althaea* F.W.Schultz,
- k) *Malva maritima* Salisb.
- l) *Malva officinalis* (L.) Schimper & Spenner.



### **Common names:**

- (a) Marshmallow, marsh mallow, marshmellow, common marshmallow, White Mallow, Wymote (E).
- (b) Guimauve, Racine De Guimauve, guimauve officinale, guimauve sauvage, mauve blanche (F).

### **African names:**

- (a) الختمية الطيبة أو الخبيز: Arabic
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

The stems, which die down in the autumn, are erect, 3 to 4 ft (0.91 to 1.22 m), simple, or putting out only a few lateral branches. The leaves, shortly petioled, are roundish, ovate-cordate, 2 to 3 in (51 to 76 mm) long, and about 1½ inch broad, entire or three to five lobed, irregularly toothed at the margin, and thick. They are soft and velvety on both sides, due to a dense covering of stellate hairs. The flowers are shaped like those of the common mallow, but are smaller and of a pale colour, and are either axillary, or in panicles, more often the latter.

The stamens are united into a tube, the anthers, kidney-shaped and one-celled. The flowers are in bloom during August and September, and are followed, as in other species of this order, by the flat, round fruit which are popularly called 'cheeses.'

The common mallow is frequently called by country people 'marsh mallow,' but the true marsh mallow is distinguished from all the other mallows growing in Great Britain, by the numerous divisions of the outer calyx (six to nine cleft), by the hoary down which thickly clothes the stems and foliage, and by the numerous panicles of blush-coloured flowers, paler than the common mallow. The roots are perennial, thick, long and tapering, very tough and pliant, whitish yellow outside, white and fibrous within.

The entire plant, particularly the root, abounds with a mild mucilage, which is emollient to a much greater degree than the common mallow

**Geographical distribution:**

Marshmallow is native to Europe and Africa.

**Part used:**

Root.

**Name of drug:**

*Althaea radix*, *Radix Althaeae*.

**Definition:**

*Radix althaeae* consists of the dried roots of *Althaea officinalis* L. (family, Malvaceae).

Roots are obtained from commercially cultivated plants that are at least 2 years old and harvested in the autumn.

**Description:**

Odour: faint, aromatic; taste: mucilaginous.

**Macroscopical:** Cylindrical or tapering, slightly twisted roots, up to 2 cm thick, with deep longitudinal furrows. Outer surface greyish-brown, bearing numerous rootlet scars. Fracture externally fibrous, internally rugged and granular; section shows a thick, whitish bark with brownish periderm, separated by a well-marked, brownish cambium from the white xylem; stratified structure of the bark and radiate structure of xylem become more distinct when moist. Peeled root has greyish-white finely fibrous outer surface; cork and external cortical parenchyma absent

**Microscopical:** Phloem with numerous long, thin-walled, non-lignified fibres arranged in tangential groups alternating with groups of sieve tissue, with a ground tissue of thin-walled parenchyma; xylem containing reticulate or scalariform thickening and bordered pits accompanied by lignified tracheids, a small amount of lignified parenchyma and occasional small groups of fibres with only the middle lamella lignified; xylem and phloem transversed by numerous non-lignified medullary rays, mostly uniseriate; majority of parenchyma cells of the phloem and medullary rays contain abundant small starch grains which are mostly simple, spherical to ovoid, occasionally 2–3 compound, with a well-marked circular or slit-shaped hilum; some of these parenchyma cells contain cluster crystals of calcium oxalate 20–40mm in diameter, while others exist as idioblasts containing mucilage.

**Powder:** Brownish-grey (unpeeled root) or whitish (peeled root). Fragments of colourless, mainly unlignified, thick-walled fibres with pointed or split ends; fragments of reticulate or scalariform thickening and bordered pits; cluster crystals of calcium oxalate about 20–35mm, mostly 25–30mm, in diameter; parenchyma cells containing mucilage; fragments of cork with thin-walled, tabular cells in the powdered material from the unpeeled root. Numerous starch grains, 3–25mm in diameter, with occasionally a longitudinal hilum; starch grains mostly simple, a few being 2–4 compound.

**Chemical constituents:**

Mucilage, asparagines, pectin, tannins, flavonoids, polyphenolic acids and Scopoletin. Root: Mucilage, 18-35%: consisting of a number of polysaccharides: one is composed of L-rhamnose, D-galactose, D-galacturonic acid and D-glucuronic acid; another a highly branched L-arabifuranan, another a trisaccharide structural unit and one with a high proportion of uronic acid units; about 35% pectin, 1-2% asparagines, tannins; In the leaves: mucilage including a low molecular weight D-glucan; Flavanoids such as kaempferol, quercitin and diosmetin glucosides; Scopoletin, a coumarin; polyphenolic acids, including syringic, caffeic, salicyclic, vanillic, p-courmaric, etc.

**Tests for identity**

Not more than 2 per cent. of brown, deteriorated drug and not more than 2 per cent. of cork in the peeled root.

**Tests for purity:**

*Total ash:* Not more than 6per cent. in the peeled root and not more than 8 per cent in the unpeeled root;

*Acid-insoluble ash:* Not more than 3 per cent. in the peeled root.

*Water-soluble extractive:* Not less than 22 per cent.

*Moisture:* Not more than 12 per cent.

*Swelling index:* Not less than 10

**Pharmaceutical preparations:**

Infusion of Marshmallow

**Uses:**

Asthma, Bronchitis, Common cold/sore throat, Cough

**Storage:**

Stored in a cool and dry well-closed container, keep away from moisture and strong light heat.

## **Ammi visnaga (L.) Lamk.**

### **Family name:**

Apiaceae.

### **Synonym:**

- (a) *Daucus visnaga* L.,
- (b) *Apium visnaga* (L.) Crantz
- (c) *Selinum visnaga* E.H.L. Krause,
- (d) *Sium visnaga* Stokes,
- (e) *Visnaga daucoides* Gaertn.

### **Common name:**

- (a) Bishop's weed, Toothpick weed, Visnaga  
Toothpick plant (E).
- (b) Plante aux cure-dent, Herbe aux cure-dents (F).



### **African names:**

- (a) Arabic: الخلة البلدية
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Herbaceous plant of 20 to 80 cm in height, with dentate leaves in strips which are very narrow and whole; stalked umbellate flowers with highly swollen rays at the base; fruits hardly ever as long as wide.

### **Geographical distribution:**

Mediterranean regions of Africa.

### **Part used:**

Fruits.

### **Names of drug:**

Fructus Ammi visnagae. Ammi visnaga fruit. Fruit d'Ammi visnaga.

### **Definition:**

Ammi visnaga fruit is the dried ripe fruits of *Ammi visnaga* (L.) Lamk. (fam. Apiaceae) containing not more than 3 per cent of the bitter principle, Khellin.

### **Description:**

Odour slightly aromatic; taste, aromatic, bitter and slightly pungent.

**Macroscopical:** Fruit, cremocarp, usually separated into its mericarps, rarely entire with a part of the pedicel attached. Mericarp, small, ovoid, about 2 mm long and 1 mm broad; brownish to greenish-brown, with a violet tinge; externally glabrous, marked with 5 distinct, pale brownish, rather broad primary ridges, 4 inconspicuous dark secondary ridges, and a disc-like styloped at apex; internally, the mericarp shows a pericarp with 6 vittae, 4 in the dorsal and 2 in the commisural side, a large oily orthospermous endosperm and a small apical embryo.

**Microscopical:** Epidermis of pericarp consists of polygonal cells, elongated on the ridges, with occasional crystals of calcium oxalate and finely striated cuticle; no hairs. Mesocarp, normally of parenchyma traversed longitudinally by the schizogenous vittae, each surrounded by large, slightly radiating cells, and in the ridges by vascular bundles each forming a crescent around a comparatively large lacuna (distinction from *A. majus.*) and accompanied by fibres and reticulate, lignified cells; the innermost layer of the mesocarp consists of large, polygonal, brown-walled cells, with thick porous inner walls. Endocarp, composed of narrow tangentially elongated cells, some of these being regularly arranged in groups variously oriented, adhering to the brown seed-coat which is formed of similar but wider and somewhat shorter cells. Endosperm consists of polygonal, thick-walled, cellulosic parenchyma, containing fixed oil and numerous small oval aleurone grains, each enclosing a minute, rounded globoid and a micro-rosette crystal of calcium oxalate.

Carpophore, split passing at the apex into the raphe of each mericarp traversed by a vascular strand of fibres and spiral vessels.

**Powder:** Powdered *Ammi visnaga* fruit is brown; characterised by fragments of pericarp with few brownish pieces of vittae, reticulate cells, vessels and fibres; fragments showing the inner porous cells of the mesocarp crossed by and intimately united with endocarpal cells which are in groups, some of them being differently oriented; fragments showing cells of the brown seed-coat; numerous fragments of endosperm; aleurone grains, 4 to 10 microns in diameter containing micro-rosette crystals of calcium oxalate 2 to 5 microns in diameter.

#### **Chemical constituents:**

Furanochromones (Py-ones): 2-4% comprising khelin (0.3-1.2%), visnagin (0.05-0.3%), khellol and its glucoside khellenin; khellinol, ammiol and its glucoside visammiol; khellinone, visnaginone

Pyranocoumarins (Visnagans): (0.2-0.5%) comprising visnadin, samidin and dihydrosamidin

Furanocoumarins: traces of xanthotoxin and ammoidin

Flavonoids: 0.02-0.03% comprising quercetin and isorhamnetin and their 3-sulphates as well as kaempferol

Volatiles: camphor, carvone, (terpineol, terpine-4-ol, linalool, cis- and trans- linalool oxides)

Fixed oils, 12-18%

Protein: 14%

#### **Test for identity:**

Boil about 0.05 g of *Ammi visnaga* fruit with 5 ml of water for a minute, strain, add 1 to 2 drops of this decoction to 1 ml of solution of sodium hydroxide (1 in 1), and shake; a rose-red colour is produced within 2 minutes.

#### **Test for purity:**

*Ammi visnaga* fruit contains no starch granules (cereals, etc.). Ash, not more than 8 percent.; Acid-insoluble ash, not more than 3.5 per cent.; Moisture, Not more than 10 per cent.

**Assay:**

Introduce about 5 g of powdered Ammi visnaga fruit, module, 26, accurately weighed, into a flask, add 50 ml of alcohol, shake well, set aside, for 10 minutes, and then shake frequently for one hour. Transfer the mixture to a small continuous extraction apparatus plugged with cotton-wool, and when the liquid ceases to flow, pack firmly, and continue the extraction, until complete exhaustion of the bitter principle is effected, or when a drop of the percolate fails to produce a rose-red colour with solution of sodium hydroxide (1 in 1). Evaporate the extract on a water-bath to 18 ml, dilute with water to 50 ml, and add 2 ml of lead acetate T.S. , or a sufficient quantity until no more precipitate is formed. Boil, filter while hot, and wash the precipitate on the filter with boiling water until free from the bitter principle. To the combined filtrate and washings, add 1 g of acid sodium phosphate or sufficient quantity to precipitate the lead; filter, and wash the precipitate with boiling water until free from the bitter principle. Mix the filtrate and washings, and evaporate on a water-bath to about 59 ml. Filter while hot, into a separator, wash the flask and filter with boiling water, cool, and shake the combined liquids successively with 4 portions, each of 20 ml of chloroform or until a drop of the chloroform extract fails to produce a rose-red colour with solution of sodium hydroxide (1 in 1). Dry the combined chloroform extracts with about 1 g of anhydrous sodium sulfate, filter through a dry filter paper into a porcelain dish, wash the sodium sulfate and the filter with a few ml of chloroform adding the washings to the chloroform extract in the dish. Evaporate the chloroform, dry the residue, weigh, and calculate the percentage of the bitter principle, khellin.

**Pharmaceutical preparation:**

Extractum Ammi Visnagae Fluidum.

**Uses:**

Treatment of angina pectoris; vasodilator; expels renal calculi.

**Storage:**

In well-closed containers, in a cool and dry place, protected from light.

## **Anacardium occidentale L.**

*Family name:*

## Anacardiaceae

### **Synonym:**

N/A

#### **Common names:**

- (a) Cashew-nut tree, Caju, Cashew apple (E)
  - (b) Anacardier, Pommier cajou, pomme d'acajou, noix-cajou (F)

## *African names:*

- (a) Arabic: الكاجو أو البلاذر الغربي
  - (b) Bambara: Finza
  - (c) Hausa: Jambe, Kanjuu, Fisa
  - (d) Peuhl: Darkassouyi
  - (e) Swahili: N/A
  - (f) Yoruba: Ekaju, Kaju, Katonoyo



### ***Brief description of the plant:***

A small to medium tree, generally single-trunked and spreading in habit, up to 40' in height but generally 10-20' in cultivation (Figure 9.3). In older trees, spread may be greater than height, with lower limbs bending to touch the ground. Leaves are thick, prominently veined, oval to spatulate in shape, with blunt tips and entire margins. New foliage contains reddish pigment. Flowering is similar to the close relative mango: both male and perfect flowers are borne in the same inflorescence (polygamous). Individual flowers are 1/4" across, with crimson petals, often striped longitudinally and reflexed. They are borne terminally on panicles, generally at the beginning of the dry season. Flowering may occur over several weeks.

### **Geographical distribution:**

Native of tropical America, now widely cultivated throughout the tropics mainly for its edible seeds (cashew nuts).

### *Part used:*

### Nut, leaves, roots.

*Name of drug:*

Cashew nut

### *Definition:*

Cashew nut is the roasted or boiled kernel of *Anacardium occidentale* L. (family, Anacardiaceae).

#### *Description:*

**Macroscopic:** A medium-sized tree, beautiful, and not unlike in appearance the walnut tree, with oval blunt alternate leaves and scented rose-coloured panicles of bloom - the tree produces a fleshy receptacle, commonly called an apple, at the end of which the kidney-shaped nut is borne; the end of it which is attached to the apple, is much bigger than the other. The outer shell is ashy colour, very smooth, the kernel is covered with an inner shell, and between the two shells is found a thick inflammable caustic oil, which will raise blisters on the skin and be dangerously painful if the nuts are cracked with the teeth. The fruit is a so called psuedo fruit "false fruit" since the true fruit is the cashew nut: that is first developed. The receptacle becomes fleshy and plump. It has a

waxy yellow, red or orange skin. It is juicy, acid to subacid. In India, this juice is distilled into liquor (feni). The cashew Apple has a sour taste and is used in preserves and drinks in Brazil and the West Indies.

***Chemical constituents:***

Two peculiar principles have been found: Anacardic acid and a yellow oleaginous liquid Cardol. Also present are Tannins, vitamin A at 2689 SI per 100 grams, 65 grams of vitamin C per 100 grams, calories 73 grams per 100 grams, 4.6 grams of protein per 100 grams, 0.5 grams of fat per 100 grams, 16.3 grams carbohydrate per 100 grams, calcium 33 milligrams per 100 grams, phosphorus 64 milligrams per 100 gram, 8.9 milligrams of iron and water 78 grams per 100 grams.

***Tests for identity:***

Macroscopical examination of the specimen and its source to ensure compliance with the above descriptions.

***Tests for purity:***

The microbial load of the preparation was determined using the standard plate method. Various diagnostic media - Tryptone Soy Agar (TSA), Salmonella-Shigella Agar (SSA), Eosin Methylene Blue Agar (EMBA), MacConkey Agar (MAC), Nutrient Agar (NA), Manitol Salt Agar (MSA), Sabouraud Dextrose Agar (SDA) - were used to culture the test product. Each of the media was prepared according to manufacturers' instruction and sterilized at 121 °C for 15 minutes. Three fold serial dilutions (10-1, 10-2 and 10-3) were made using sterile water and 1ml each of the dilutions seeded in 25 ml each of the sterile culture media. The media were allowed to cool to 45 °C, swirled and left to solidify. The bacterial media were incubated at 37 °C for 3 days while the fungal medium (SDA culture) was incubated at 25 °C for 7 days. They were examined 24 hourly during this period for the colonies and the result.

***Pharmaceutical preparations:***

N/A

***Uses:***

All parts of the plant contain an irritant skin poison. On heating this substance is destroyed. The nut is edible (cashew nut) after heating (boiling or roasting). The swollen stalk of the fruit can be eaten raw. Various parts of the tree are used as medicine. The roots decoction or infusion of leaves used for diabetes and hypertension. Half a glass three times daily.

***Storage:***

Store in a very cool place.

## **Anethum graveolens L.**

### **Family name:**

Apiaceae

### **Synonyms:**

- (a) *Anethum sowa Roxb.*
- (b) *Anethum sowa Roxb. ex J. Fleming,*
- (c) *Ferula marathrophylla Walp*
- (d) *Peucedanum anethum Baill.*
- (e) *Peucedanum graveolens Benth. et Hook.*
- (f) *Peucedanum graveolens (L.) Hiern.,*
- (g) *Peucedanum graveolens (L.) Benth.*
- (h) *Peucedanum sowa (Roxb. ex Fleming) Kurz,*



### **Common names:**

- (a) Fenouil bâtarde, Faux anis, Aneth, Aneth odorant (F).
- (b) Dill, Common dill, Garden dil, East Indian dill (E).

### **African names:**

- (a) Arabic: شبت
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Annual herbaceous plant 60 to 80 cm high; glaucous leaves divided into thread-like stups; umbellate inflorescence ranging from 15 to 30 rays; yellow flowers; deep brown fruits with protruding clear back ribs. Strongly aromatic plant.

### **Geographical distribution:**

Often cultivated in the Mediterranean parts of Africa.

### **Part used:**

Dried ripe fruits.

### **Names of drug:**

Fructus Anethi. Dill Fruit. Fruit d'Anethi.

### **Definition:**

Dill fruit is the dried ripe fruit of *Anethum graveolens* L. (family, Apiaceae), containing not more than 2 percent of foreign organic matter and not less than 2 percent of volatile oil.

### **Description:**

The drug has a characteristic and pleasant odour and taste.

**Macroscopic:** Fruit, cremocarp, usually separated into its mericarps, each mericarp is dorsally compressed, broadly oval and about 3 to 4 mm long, 2 to 3 mm wide and 1mm thick, the ratio of length to breadth being about 1.6 to 1. The mericarp is chocolate-brown with wide yellowish membranous wings, which are the extended lateral ridges; and three brown, inconspicuous dorsal ridges. The transversely cut surface shows six vittae four being dorsal and two on the commissural side and five vascular strands in the ridges, those in the wings being somewhat wider than the others.

**Microscopic:** Each mericarp has four vittae on the dorsal surface and two on the commissural. The outer epidermis has a striated cuticle and the mesocarp contains lignified, reticulate parenchyma; the inner epidermis, composed of tabular cells frequently with wavy walls; the thick-walled parenchyma of the endosperm, containing fixed oil, aleurone grains and micro-rosettes crystals of calcium oxalate.

**Powder:** Powdered dill fruit is greyish brown in colour, characterised by fragments of pericarp with few brownish pieces of vittae. Outer epidermis has striated cuticle, fragments of the mesocarp showing lignified reticulate parenchyma, inner epidermis, tabular cells frequently with wavy walls, numerous fragments of endosperm; aleurone grains, fixed oil and micro-rosettes crystals of calcium oxalate.

**Chemical constituents:**

Dill fruit contains 2-4 percent of volatile oil containing about 53-63 percent of carvone, limonene and some phellandrene. Other constituents are fixed oil, protein and mucilage.

**Test for identity:**

Carry out thin-layer chromatographic test to confirm the presence of anethole and fenchone.

Also carry out gas chromatographic examination to confirm the presence of anethole, fenchone and oestragole

**Test for purity:**

Ash: not more than 11 percent., Moisture, Not more than 8 per cent.

**Assay:**

Determination of the volatile oil content as described in vol. 2.

**Pharmaceutical preparations:**

Aqua Anethi Concentrata.

Aqua Anethi Distillata.

**Uses:**

The action of dill depends on the essential oil which it contains. It is used in mixtures in the form of Aqua Anethi which is a common domestic remedy for the flatulence of infants and is a useful vehicle for children's medicine generally.

**Storage:**

In well-closed containers, in a cool place protected from light and moisture.

## **Annona muricata L.**

### **Family name:**

Annonaceae

### **Synonyms:**

- (a) *A bonplandiana* Kunth
- (b) *A cearensis* Barb. Rodr.
- (c) *Guanabanus muricatus* (L.) M. GÃ³mez
- (d) *Annona portoricensis* M. GÃ³mez
- (e) *Annona muricata* f. *mirabilis* L.
- (f) *Annona muricata* var. *borinquensis* L.



### **Common names:**

- (a) Prickly custard apple, soursop, Graviola, Brazilian paw paw, Guanábana (E)
- (b) Cachiman épineux, Caichemantier, Coeur de boeuf, Corossol, Corossolier, Epineux (F).

### **African names:**

- (a) Arabic: قشدة شائكة الثمر
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Graviola is a small, upright evergreen tree, 5–6 m high, with large, glossy, dark green leaves. It produces a large, heart-shaped, edible fruit that is 15–20 cm in diameter, is yellow-green in color, and has white flesh inside.

### **Geographical distribution:**

An introduced W. Indian species.

### **Part used:**

Leaves, fruit, seeds, bark, roots.

### **Name of drug:**

Soursop. Graviola.

### **Definition:**

Soursop or Graviola is the dried leaf of *Annona muricata* L. (family, Annonaceae).

### **Description:**

**Macroscopical:** Soursop trees are bushy and low, only about 7.5-9 m tall. Young branchlets are rusty-hairy. The smooth, glossy, dark green leaves are oblong to elliptical and pointed at both ends, 6.25-20 x 2.5-6.25 cm wide. The underside of the leaves is somewhat lighter than the top. Solitary flowers emerge anywhere on the trunk, branches or twigs. They are 4-5 cm long, and cone shaped, the 3 fleshy outer petals are yellow-green, the 3 inner petals are pale-yellow. The fruit looks like something out of a Dr. Seuss book. It is more or less oval or heart-shaped, though it tends to be lopsided or

curved. The fruit is fairly variable in size, ranging from 10-30 cm long and up to 15 cm in width. They can weigh as much as 6.8 kg. The fruit is covered with a leathery-appearing, inedible, bitter skin which is covered with many flexible spikes. The skin is dark-green in the immature fruit, becoming slightly yellowish-green before the mature fruit is soft to the touch. The inside of the skin is cream-colored and granular. The white flesh, which is the edible part of the flesh is fibrous and juicy, and separates easily from the rind. The pulp smells a little like a pineapple, but the sweet, acrid flavor is unique and somewhat indescribable. The fruit is segmented, with some segments containing a single oval, smooth, hard, black seed, 1.25-2 cm long. A large fruit may contain from a few dozen to 200 or more seeds.

The plant is grown as a commercial crop for its 20–30 cm (7.9–12 in) long, prickly, green fruit, which can have a mass of up to 15 lb (6.8 kg), making it probably the second biggest annona after the junglesop. The flesh of the fruit consists of an edible, white pulp, some fiber, and a core of indigestible, black seeds. The species is the only member of its genus suitable for processing and preservation. The sweet pulp is used to make juice, as well as candies, sorbets, and ice cream flavorings. The seeds are normally left in the preparation, and removed while consuming.

***Chemical constituents:***

Total ethyl-acetate extract of soursop nectar showed the presence of acetogenins. The volatile oil constituents were  $\alpha$ -pinene (9.4%),  $\beta$ -pinene (20.6%),  $\rho$ -mentha-2,4(8)-diene (9.8%),  $\beta$ -elemene (9.1%) and germacrene D (18.1%). The flavonol triglycoside, quercetin 3-O- $\alpha$ -rhamnosyl-(1"'' → 6")- $\beta$ -sophoroside, together with twelve known phenolics were reported in the leaf. A new aporphine alkaloid named annonamine was isolated from the leaves together with four known benzylisoquinoline alkaloids. Three new megastigmanes, named annoionols A and B and annoionoside, were isolated from the leaves together with 14 known compounds including annoionol C isolated from a natural source for the first time. A methylene chloride extract of the pulp yielded the previously known C-35 and C-37 mono-epoxy unsaturated compounds, epomuricenins-A and -B (1+2) and epomusenins-A and -B. Two new mono-epoxy saturated C-35 representatives, epomurinins-A and -B were also isolated.

***Tests for identity:***

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions above.
- b) Gas chromatographic examination of steam distilled oil from it to ensure the presence of  $\beta$ -pinene and  $\alpha$ -pinene.
- c) Macrochemical tests on the acidulated water extract of the leaf gives a positive reaction with the common alkaloidal reagents (Wagner's, Dragendorff's, Mayer's)
- d) Thin-layer chromatographic examination of the leaf extract shows the presence of annonamine (aporphine) or benzylisoquinoline alkaloids by cochromatography.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

**Uses:**

Antioxidant, antidiabetic, antihypertensive, antimicrobial.

**Storage:**

In a cool dry place.

## **Annona senegalensis Pers.**

### **Family name:**

Annonaceae.

### **Synonym:**

*Annona africana* L.

### **Common names:**

- (a) African custard apple, Wild Custard-apple (E)
- (b) Pomme Cannelle du Senegal (F).

### **African names:**

- (a) Arabic: قشدة شبكية
- (b) Bambara: N/A
- (c) Hausa: Gwandar-daajii, Gwangwalaa, Tallafa maraayu, Jan baroodo.
- (d) Peuhl: Dukumi.
- (e) Swahili: Mchekwa, Mkonokono, Mtomoko, Mtomoko-mwitu, Mutopetope, Mwitu.
- (f) Yoruba: Abo, Epo, Ibobo.



### **Brief description of the plant:**

*Annona senegalensis* is a shrub or small tree 2-6 m tall but may reach 11 m under favourable conditions; bark smooth to roughish, silvery grey or grey-brown, with leaf scars and roughly circular flakes exposing paler patches of under bark. Young branches with dense, brown, yellow or grey hairs that are lost later. Leaves alternate, simple, oblong, ovate or elliptic, 6-18.5 x 2.5-11.5 cm, green to bluish-green, almost without hairs on top, but often with brownish hairs on underside, net veining green to reddish on both surfaces; apex rounded or slightly notched; base square to slightly lobed; margin entire; petiole short, 0.5-2.5 cm, thickset. Flowers up to 3 cm in diameter, on stalks 2 cm long, solitary or in groups of 2-4, arising above the leaf axils; 6 fleshy cream to yellow petals in 2 whorls, greenish outside, creamy or crimson, 0.8-1.5 x 0.9-1.1 cm, glabrous or minutely papillose within; inner whorl of the petals curving over the stamens and ovary; sepals ovate, 3 in number, free, smaller than the petals, 3-4 x 4-5 mm; stamens 1.7-2.5 mm long. Fruit formed from many fused carpels, fleshy, lumpy, egg shaped, 2.5-5 x 2.5-4 cm, ovoid or globose; unripe fruit green, turning yellow to orange on ripening; stalk 1.5-5 cm long; seeds numerous, cylindrical, oblong, orange-brown.

### **Geographical distribution:**

African custard apple is a native to Western and Southern Africa ranging from Senegal to South Africa. Wild trees are mostly found in semi-arid to sub humid regions occurring along riverbanks, fallow land, swamp forests and at the coast. Besides Africa, this fruit is also found in South India.

### **Part used:**

Root, bark, leaves, seeds.

### **Name of drug:**

African custard apple.

**Definition:**

African custard apple is the dried leaf or stem bark of *Annona senegalensis* Pers. (family, Annonaceae).

**Description:**

**Macroscopical:** *Annona senegalensis* is a shrub or small tree 2-6 m tall but may reach 11 m under favourable conditions; bark smooth to roughish, silvery grey or grey-brown, with leaf scars and roughly circular flakes exposing paler patches of under bark. Young branches with dense, brown, yellow or grey hairs that are lost later.

Leaves alternate, simple, oblong, ovate or elliptic, 6-18.5 x 2.5-11.5 cm, green to bluish-green, almost without hairs on top, but often with brownish hairs on underside, net veining green to reddish on both surfaces; apex rounded or slightly notched; base square to slightly lobed; margin entire; petiole short, 0.5-2.5 cm, thickset.

Flowers up to 3 cm in diameter, on stalks 2 cm long, solitary or in groups of 2-4, arising above the leaf axils; 6 fleshy cream to yellow petals in 2 whorls, greenish outside, creamy or crimson, 0.8-1.5 x 0.9-1.1 cm, glabrous or minutely papillose within; inner whorl of the petals curving over the stamens and ovary; sepals ovate, 3 in number, free, smaller than the petals, 3-4 x 4-5 mm; stamens 1.7-2.5 mm long.

Fruit formed from many fused carpels, fleshy, lumpy, egg shaped, 2.5-5 x 2.5-4 cm, ovoid or globose; unripe fruit green, turning yellow to orange on ripening; stalk 1.5-5 cm long; seeds numerous, cylindrical, oblong, orange-brown.

**Chemical constituents:**

Methanolic extract of seeds yielded two new cytotoxic mono-tetrahydrofuran acetogenins, annosenegalin and annogalene. Stem bark gave four bioactive ent-kaurenoids (diterpenoids). A known aporphine alkaloid, (-)-roemerine isolated from the leaves has citotoxic activity.

**Tests for identity:**

- a) Macrochemical and microchemical examination of the specimen to ensure compliance with the descriptions given above.
- b) Macrochemical tests on the acidulated water extract of the leaf extract gives a positive reaction with common alkaloid reagents (Dragendorff's, Mayer's, Wagner's)
- c) Thin-layer chromatographic examination of an alkaloidal extract of the leaf shows the presence of (-)-roemerine (aporphine alkaloid) by cochromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Cancer, dysentery, cough, venereal diseases, toothache, astringent, anthelmintic, , antisickling, cytotoxicity.

**Storage:**

Store in a cool dry place

## ***Anthocleista procera* Lepr. ex Bureau**

### **Family name:**

Gentianaceae

### **Synonyms:**

- (a) *Anthocleista frezoulsii* A.Chev.
- (b) *Anthocleista procera* var. *umbellata* A.Chev.

### **Common names:**

- (a) Cabbage tree, Candelabrum tree (E)
- (b) Arbre chou (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Kwari
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

A tree 6–20 m tall, trunk cylindric, 15–50 cm diameter, without buttresses, and without spines, leaf attaining 145 cm long by 45 cm wide, flower pale green; of swampy places in open bush country at low elevations

### **Geographical distribution:**

It occurs in tropical Africa, including Comoros and Madagascar.

### **Part used:**

Leaves.

### **Definition:**

Candelabrum is the dried leaf of *Anthocleista procera* Lepr. ex Bureau (family, Gentianaceae)

### **Description:**

**Macroscopical:** Small to medium-sized tree up to 20 m tall; bole up to 50 cm in diameter; twigs without spines. Leaves opposite, simple, sessile; blade oblong-obovate to oblanceolate, 40–45 cm × c. 20 cm, in young plants up to 145 cm × 45 cm, base cuneate, auricled, apex rounded, margin entire or minutely crenate, brittle, leathery or papery. Inflorescence an erect terminal dichasial cyme 30–60 cm long, many-flowered; peduncle and branches pale green, thickened at the nodes. Flowers bisexual, regular; sepals 4, free, orbicular or broadly ovate, 9–10 mm × 7–8 mm; corolla with cylindrical tube 35–55 mm long, lobes c. 9, oblong, 10–15 mm long, obtuse, white; stamens as many as corolla lobes and alternating with them, exserted, filaments fused; ovary superior, ovoid to cylindrical, c. 7 mm × 3.5 mm, 4-celled, stigma ovoid-cylindrical, apically slightly notched. Fruit an ellipsoid berry c. 3 cm × 2 cm, pale green, shining, rounded at the apex, thick-walled, many-seeded. Seeds obliquely ovoid-globular, 1.5–2 mm × 1–1.5 mm, dark brown.

### **Chemical constituents:**

Alkaloids

***Tests for identity***

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions.
- b) Macrochemical tests on the alkaloid extract gives a positive reaction with the common alkaloid reagents (Wagner's, Drgendorff's, Mayer's)

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Bark: abortifacients, ecbolics; antidote for venomous stings, bites, etc. dropsy, swellings, oedema, gout; leprosy; menstrual cycle, laxatives, etc.

Leaf: febrifuges; liver, etc.

***Storage:***

In a cool dry place.

## **Antiaris Africana Engl.**

### **Family name:**

Moraceae.

### **Synonyms:**

- (a) *Antiaris toxicaria* var. *africana* Scott Elliott ex A. Chev.
- (b) *Antiaris toxicaria* subsp. *africana* (Engl.) C.C. Berg

### **Common names:**

Antiaris (E)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Farin-loko.
- (d) Peuhl: N/A
- (e) Swahili: mkunde.
- (f) Yoruba: Ooro, Akiro, Oriro, Aya.



### **Brief description of the plant:**

*Antiaris africana* is a magnificent deciduous tree of the forest canopy, often 20- 40 m tall with a dome-shaped crown, drooping branchlets and hairy twigs. This tree yields a useful timber (known as antiaria) for general constructional purposes, and is exported to Europe in small quantities. Whilst it shares to some extent the toxic properties of *Antiaris toxicaria*, it is by no means so aggressively irritant.

### **Geographical distribution:**

In the drier types of forest.

### **Part used:**

Stem-bark, root- bark,sap

### **Name of drug:**

Antiaris

### **Definition:**

Antiaris is the dried stem bark and root bark of *Antiaris Africana* Engl. (family, Moraceae)

### **Description:**

**Macroscopical:** *Antiaris africana* is a magnificent deciduous tree of the forest canopy, often 20- 40 m tall with a dome-shaped crown, drooping branchlets and hairy twigs. Large trees have clear boles and are buttressed at the base. Bark smooth, pale gray, marked with lenticel dots and ring marks. When cut thin creamy latex drips out, becoming darker on exposure to air. Leaves variable, usually oval 5-16 cm x 4-11 cm, the upper half often widest to a blunt or pointed tip, the base unequal and rounded. Saplings and coppice shoots have long narrow leaves, the edge toothed- but rare in mature leaves. Mature leaves prominently veined. Leaves are rough, papery with stiff hairs above but softer below. Male flowers short-stalked, discoid head with many flowers, each flower with 2-7 sepals and 2-4 stamens, growing just below leaves. Female flowers in disc or

kidney-shaped heads to 3 cm across. Ovary adnate to the perianth, 1-locular with a single ovule and 2 styles. Fruit bright red, ellipsoid, dull and furry, 1.5 cm long, the swollen receptacle contains just one seed.

**Chemical constituents:**

From the methanol extract of the stem bark, the  $\alpha$ -amyrin derivative 1 $\beta$ ,11 $\alpha$ -dihydroxy-3 $\beta$ -cinnamoyl- $\alpha$ -amyrin (antiarol cinnamate, 1) and a cardiac glycoside, 3 $\beta$ -O-( $\alpha$ -L-rhamnopyranosyl)-14 $\beta$ -hydroperoxy-5 $\beta$ -hydroxy-19-oxo-17 $\beta$ -card-20-enolide (africanoside), together with  $\beta$ -amyrin and its acetate,  $\beta$ -sitosterol and its 3-O- $\beta$ -D-glucopyranoside, friedelin, ursolic and oleanolic acid, 19-norperiplogenin, strophantidol, strophantidinic acid, periplogenin, 3-epiperiplogenin, strophantidin and 3,3'-dimethoxy-4'-O- $\beta$ -D-xylopyranosyl-ellagic acid. Sterols, triterpene alcohols, and hydrocarbons were present in the unsaponifiable fraction of the seed oils.. Delta(5)-sterols (1-5) occurred at the highest concentration. alpha-amyrin (urs-12-enol) was the dominant triterpene alcohol. A mixture of C(18)-C(34) n-alkanes, squalene, and some monoterpenes was detected in the hydrocarbon fraction.

**Tests for identity**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions.
- b) Thinlayer chromatographic examination of the extract to show the presence of . alpha-amyrin (urs-12-enol) by cochromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Epilepsy, lumbago, skin irritant, purgative and nervous disorders

**Storage:**

In a cool dry place.

## **Arachis hypogaea L.**

### **Family name:**

Fabaceae

### **Synonym:**

- (a) *Arachis africana* Lour.,
- (b) *Arachis americana* Ten.,
- (c) *Arachis asiatica* Lour.
- (d) *Arachis nambyquarae* Hoehne,

### **Common names:**

Ground-nut. Peanut. Monkey-nut (E).  
Arachide. Cacahuète. Pistache de terre (F).



### **African names:**

- (a) Arabic: فول سوداني
- (b) Bambara: Tiga
- (c) Hausa: Ga-bariya, Gama gari, Gèda,
- (d) Guiya, Gyada, Gujiya, Càzbín kùréégBariya
- (e) Peuhl : Gerte
- (f) Swahili: Njugu- Nyasa, Karanga
- (g) Yoruba: Ẹpa; Ẹpa-gidi, Gege

### **Brief description of the plant:**

Annual herbaceous plant around 30 cm high with downy stalks; pinnate alternate leaves with two pairs of leaflets, developed stipules more or less sessile to leaf-stalks; axillary yellow flowers, solitary and stalked; after fertilization the fruit is pressed into the soil by a gynophore where it reaches maturity; the pod contains two to three ovoid seeds.

### **Geographical distribution:**

Grown in all the parts of Africa lying in the tropical zone.

### **Part used:**

The carefully dried roasted or unroasted seeds known as Peanuts. Arachis oil is also used as will be demonstrated later under the drug name Oleum Arachidis, Arachis oil, Huile d'arachide.

### **Names of drug:**

Semen Arachidis, Peanut, Graine d'arachide.

### **Definition:**

Peanut is the carefully dried roasted or unroasted seeds of *Arachis hypogaea* L. (family, Fabaceae); containing not more than 3 percent of foreign organic matter and yielding not less than 44 percent of fixed oil.

### **Description:**

Seeds are copper-coloured, brown or purple; odour, slight; taste, agreeable and bland.

**Macroscopical:** Whole fruits: Peanuts have one to several seeded pods, commonly two-seeded, less often three-seeded, and only in certain unusual varieties, are four- or five-seeded; more or less cylindrical, with swellings over the seeds and constriction in between; having a single locule. Externally, the fruits are pale yellow, buff or orange coloured, with a number of longitudinal ridges, connected here and there by branches to

form reticulation on the surface; Framework of shell (Pericarp), thin, 'brittle and papery, with a silvery luster on the inner surface.

**Seeds:** The seeds are nearly ovate, the adjoining ends of the seeds are flattened usually diagonally. The small hilum of each seed is in the end nearest to the stalk of the fruit; enveloping each seed is a thin skin, copper coloured, brown or purple on the outer, yellow or white on the inner side. The skin consists chiefly of the testa with an inner layer believed to be the endosperm; in this skin, the raphe and its branches (about five) radiating from the chalaza are evident as veins. Each of the two cotyledons has a longitudinal groove through the middle of the inner side; radicle, short and not recurved.

**Microscopical:** Pericarp; formed of five layers; epicarp of exceeding thin-walled cells, many with characteristic hairs; hypodermis, of more or less rectangular cells, thin-walled and non-porous, or thick-walled and porous arranged in cork-like radial rows; Mesocarp, of two layers, an outer parenchymatous layer interrupted by ridges of fibres and an inner fibrous layer; fibres are transverse and longitudinal, elongated, simple or branched in the form of T-shape, multiple branched or saw-like these fibres form the ridges through which the vascular bundles run; Endocarp, comprise pithlike, thin-walled parenchymatous rounded cells with wide intercellular spaces and collapsed on maturity of the fruit. Vessels of xylem are of various types.

**Seeds:** Spermoderm, a modified leguminous type from 4 layers; outer epidermis, corresponding to the palisade cells of the other legumes, but not so high, being up to 25  $\mu$  in length and up to 50  $\mu$  in width, with thick, porous walls in the outer part. They appear polygonal, with straight beaded walls in surface view; Subepiderm, of thin-walled polygonal-celled parenchyma (not spool or basket-shaped cf. other leguminous seeds); spongy parenchyma of the nutritive layer with wide outer cells and narrow inner ones; Inner epidermis of polygonal straight-walled parenchyma cells; Endosperm, a single layer of moderately thick-walled cells which are slightly wavy; Embryo, epidermis of the cotyledons consists of tangentially elongated, straight-walled cells with minute aleurone grains and stomata of the anomocytic or paracytic type. The mesophyll has thick-walled porous cells, but no palisade cells. Starch grains up to 15  $\mu$ , of globular form with central hilum; aleurone grains also up to 15  $\mu$ , with several globoids and are evident contents.

**Powder:** Powdered seeds occur as yellowish-white, coarse greasy powder with faint odour and bland taste. .

**Microscopically:** Fragments of the skin showing epidermis of spermoderm with porous cells, thin-walled subepidermal parenchyma, wavy cells from endosperm, epidermis of the cotyledons with straight walls and anomocytic or paracytic stomata; polyhedral thin-walled parenchyma with oil globules, aleurone grains and starch granules; both of the latter being up to 15  $\mu$  in diameter.

#### **Chemical constituents:**

Peanuts contain 46-51 percent of fixed oil and 26-31 percent of proteins, while the roasted nuts contain 48-55 percent of oil and 27-34 percent protein formed of arachin and conarachin both being globulins.

#### **Uses:**

Unroasted seeds are expressed to produce archis oil which is used in forming emulsions and the cake rich in protein is used as cattle food.

Peanuts are largely consumed salted, also in confectionary cakes and biscuits. Peanut ground to a paste, known as peanut butter, furnish a spread for bread.

**Storage:**

In cold dry places, protected from light.

### **Arachis oil**

**Part used:**

The fixed oil.

**Names of drug:**

Oleum Arachidis. Arachis oil. Huile d'arachide.

**Definition:**

Arachis oil is the fixed oil obtained by cold expression from the seeds of *Arachis hypogaea* L. (family, Fabaceae).

**Description:**

Arachis oil is a pale yellow, or practically colourless oil; odour, faint, and nut-like; taste, bland and nutty.

Arachis oil becomes opalescent at 3°C and partially solidifies below -10°C. On exposure to air, Arachis oil thickens very slowly and becomes rancid.

**Tests for identity and purity:**

Sp. gr. at 20°C, 0.911 to 0.926; refractive index at 40°C, 1.4625 to 1.4545; acid value, not more than 4; saponification value, 186 to 197; iodine value, 83 to 100; unsaponifiable matter, not more than 1.5 percent.

(a) Arachis oil is very slightly soluble in alcohol (90 percent). It is miscible with ether, with chloroform, with carbon disulfide, and with petroleum-benzene.

(b) Saponify about 1 ml of Arachis oil in small flask, by boiling gently under a reflux condenser for 5 minutes, with 5 ml of 1.5 N alcoholic potassium hydroxide, then add 1.5 ml of acetic acid and 50 ml of alcohol (70 percent), warm until the solution is clear, and cool slowly with a thermometer dipped in the liquid; the temperature at which the solution becomes turbid is not lower than 39°C (other vegetable fixed oils).

(c) Arachis oil does not respond to the tests for rancid oils, for cottonseed oil, for sesame oil, and for mineral oils.

The presence of cottonseed or sesame oil is indicated by the following test:

1. Mix 2.5 ml with 2.5 ml each of amyl alcohol and a 1 per cent solution of precipitated sulphur in carbon disulphide and heat the mixture in a closed tube by immersing to one-third its depth in boiling water; the development of a pink or red colour within 30 minutes indicates the presence of cottonseed oil. Shake 2 ml with 1 ml of a 1 percent solution of sucrose in hydrochloric acid; the development of a pink colour in the acid layer on allowing to stand for 5 minutes indicates the presence of 'sesame oil, if the colour produced is deeper than that produced by repeating the test without the sucrose.
2. On exposure to air it thickens very slowly and may become rancid.

**Uses:**

Arachis oil has properties similar to those of olive oil and is used for the same purposes.

Emulsions containing 10 percent of Arachis oil and 40 percent dextrose have been used by intragastric drip as a nitrogen-free diet.

***Storage:***

It should be stored in well-filled airtight containers. It becomes cloudy at about 3°C and partly solidifies at lower temperatures. If it has solidified it should be completely remelted and mixed before use. It is sterilised by dry heat.

## **Argemone mexicana L.**

### **Family name:**

Papaveraceae

### **Synonyms:**

- (a) *Argemone leiocarpa* Greene
- (b) *Argemone ochroleuca* Sweet

### **Common names:**

- (a) Mexican Prickly Poppy, Prickly poppy,  
Yellow Mexican Poppy (E).
- (b) Pivot epineux, Pavot  
du mexique, Tache de l'oeil, Chardon du pays  
(F)

### **African names:**

- (a) Arabic: أرجمون مكسيكي أو خشخاش شائك مكسيكي
- (b) Bambara: Bozobo
- (c) Hausa: Boginahi, Hakoorin-kadaa, Kaaki rowan-  
Allah, K'amuk'amu, Karanko, Kuurar-fataakee
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Orisa-ode, Ahon-ekun, Eekan-ekun, Egun-arugbo, Ma-fowokan-omo-mi



### **Brief description of the plant:**

Leaves glaucous, oblong-ob lanceolate, pinnately lobed, 1/2-3/4 to midrib, both surfaces sparsely covered with prickles along veins, margins somewhat sinuate-dentate, the teeth tipped with a prickle, sessile, upper ones usually somewhat clasping the stem. Buds subglobose, 1.2-1.6 cm long, sparsely prickly; sepal horns terete, 5-10 mm long; petals bright yellow, 1.7-3 cm long; stamens 30-50; ovary 4-6-carpellate. Capsules oblong to broadly ellipsoid, 3-4.2 cm long, each valve with 9-15 prickles, the longest one 7-10 mm long. Seeds numerous, 1.2-1.5 mm in diameter"

### **Geographical distribution:**

India and all Africa

### **Part used:**

Aerial parts without seeds. Leaf.

### **Name of drug:**

Prickly poppy

### **Definition:**

Prickly poppy consists of the fresh or dried leaves of *Argemone mexicana* L. (family, Papaveraceae)

### **Description:**

**Macroscopic:** The height of this plant varies between 0.3 to 0.12 meters, Leaves are thistle like. Stem clasping, Oblong, sinuately pinnatifid, spinous and viens are white. Flowers are terminal, yellow and of 2.5–5.0 cm diameter. Fruits are capsule. Prickly and oblong ovoid. Seeds numerous, globose, netted and brownish black.

Coarse erect herbs with milk sap and prickly stems and leaves; leaves somewhat irregularly pinnatilobed and serrate, glaucous, the edges crisped-undulate, each tooth spinose; flowers sessile, yellow, showy, up to 6 cm broad.; stems 2.5-10 dm long, branched, sparsely to moderately covered with prickles.

**Microscopical:** Groups of fibres with calcium oxalate crystals, spiral vessels, numerous crystals of calcium oxalate, fragments of a few skins.

**Powder:** Powder is green, tasteless, rough to touch with characteristic tobacco smell. Shows parenchyma cells of the leaf epidermis, fibres carrying calcium oxalate crystals as identified under the general macroscopical characters above; fragments of epidermal cells, xylem fibres, spiral vessels and numerous free crystals of calcium oxalate.

**Chemical constituents:**

Mexicana Prickly poppy seeds contain 22–36% of a pale yellow non-edible oil, called argemone oil or katkar oil, which contains the toxic alkaloids sanguinarine and dihydrosanguinarine. Four quaternary isoquinoline alkaloids, dehydrocorydalmine, jatrorrhizine, columbamine, and oxyberberine, have been isolated from the whole plant of *Argemone mexicana*. The seed pods secrete a pale yellow latex when cut open. This argemone resin contains berberine and protopine.

Tannins, benzoquinones, coumarins, mucilage, sterols, triterpenes fat, organic acids, combined and free amino acids, monosaccharides, Vitamin C, flavonoids (rutin and quercetin) have also been reported present in the plant.

**Tests for identity:**

- a) Macroscopical and microscopical examination to ascertain compliance with the descriptions given above.
- b) Microchemical tests to confirm the presence of alkaloids.
- c) Thin-layer chromatographical examination to show the presence of sanguinarine, jatrorrhizine and/or berberine by co-chromatography.

**Tests for purity:**

Moisture: 6.53 per cent.

Ash: Not more than 17.33 per cent

Water soluble extractive: Not less than 20 per cent.

Alcohol (70 per cent) soluble extractives: Not less than 19.4 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

Hypotensive, narcotic, diaphoretic, diuretic antibacterial.

**Storage:**

In closed containers kept dry and away from light.

## **Areca catechu L.**

### **Family name:**

Arecaceae.

### **Synonyms:**

- (a) *Areca cathechu* Burm.f.
- (b) *Areca faufel* Gaertn.
- (c) *Areca hortensis* Lour.
- (d) *Areca himalayana* Griff. ex H.Wendl.
- (e) *Areca nigra* Giseke ex H.Wendl.
- (f) *Areca cathechu* Burm.f.
- (g) *Sublimia areca* Comm. ex Mart.

### **Common names:**

Areca nut, Areca Palm , Betel nut palm,  
Betelpalm, Catechu (E) Arec, Aréquier(F).

### **African names:**

Arabic: فوفل

Bambara: N/A

Hausa: N/A

Peuhl: N/A

Swahili: N/A

Yoruba: N/A



### **Brief description of the plant:**

It is a palm exhibiting a slender single trunk, up to 30 m tall and about 20 cm wide, green at first, subsequently greyish and ringed by the remains of leaf scars. Its leaves, borne at stem apex, are pinnate, with a rigid but recurved rachis and several rigid, closely packed segments. Flowers, yellow and fragrant, are unisexual, clustered in inflorescences basally arising from the leaves, and enveloped by two spathes; male flowers are more numerous and located at inflorescence apex, whilst female flowers, less numerous, are to be found near the base. Fruits are hard, ovoid, red-orange coloured; they possess a fibrous mesocarp and a thin woody endocarp enveloping one seed.

### **Geographical distribution:**

: Zanzibar and coast of German East Africa, cultivated.

### **Part used:**

The seed.

### **Name of drug:**

Areca nut

### **Definition:**

Areca nut is the dried nut of *Areca catechu* L. (family, Arecaceae)

### **Description:**

**Macroscopical:** It is the most widely cultivated species in the genus *Areca* and has been distributed by humans throughout the tropics. As a result of its long history of domestication, the geographic origin of this palm is not known with certainty (similar uncertainty surrounds the origin of Coconut (*Cocos nucifera*), Peach Palm (*Bactris gasipaes*), and Sugar Palm (*Arenga pinnata*)). The fruit of *A. catechu* turns a yellow to

scarlet color as it ripens and then consists of a thick fibrous pericarp, the so-called husk, that encloses the seed. Like other *Areca* palms, this species is an understory palm and thrives in humid tropical forests at low to medium elevations. Unlike some other members of its genus, *A. catechu* readily self-seeds and is tolerant of open conditions. Although this species is most often encountered in village gardens, it is also grown on large-scale plantations in some areas, notably in India. Because this palm is planted mainly for betel quid production, fruits and seeds have been the main target for selection by growers, although cultivation for ornamental purposes has increased in recent years. In cultivation, variation is seen in the overall growth habit and the size, shape, color, and even taste of the fruits and seeds.

**Chemical constituents:**

Areca nut contains a large quantity of tannin, also gallic acid, a fixed oil gum, a little volatile oil, lignin, and various saline substances. Four alkaloids have been found in Areca nut - Arecoline, Arecain, Guracine, and a fourth existing in very small quantity. Arecoline resembles Pilocarpine in its effects on the system. Arecaine is the active principle of the Areca nut.

**Tests for identity**

- a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Make an aqueous extract of the plant material. Filter and add a few drops of ferric chloride. A dark colouration is produced.
- c) Make an extract of the alkaloid portion with ammoniacal chloroform. Concentrate the chloroform layer and confirm the presence of arecoline in it by thin-layer co-chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Tapeworm, contraction of the pupil, colic.

**Storage:**

In a cool dry place.

## **Artemisia absinthium L.**

### **Family name:**

Asteraceae

### **Synonyms:**

- (a) *Absinthium officinale* Brot.
- (b) *Absinthium majus* Geoffr.,
- (c) *Absinthium vulgare* Lam.
- (d) *Artemisia absinthia* St.-Lag.
- (e) *Artemisia arborescens* var. *cupaniana* Chiov.
- (f) *Artemisia arborescens* f. *rehan* (Chiov.) Chiov.
- (g) *Artemisia rhaetica* Brügger

### **Common names:**

- (a) Worm Wood; Old woman absinthe,  
Common wormwood,  
Green ginger or Grand wormwood (E).
- (b) Absinthe (F).



### **African names:**

- (a) Arabic: الأفنتين أو شيخ ابن سينا أو شجرة مريم أو الشوبلاء أو الشيج الرومي أو الدمسيسة
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Herbaceous plant 40 cm to 1m high; leaves in rounded stups, spotted with small acorus; inflorescence, large flower heads of 4 mm. Very bitter plant, and very sweet smelling.

### **Geographical distribution:**

Mediterranean region of Africa.

### **Part used:**

Dried herb.

### **Names of drug:**

Herba Artemisia absinthium. Absinthium herb. L'herbe d'absinthe.

### **Definition:**

The drug is the dried leaves and flowering tops of *Artemisia absinthium* L. (family, Asteraceae) It contains not more than 5 percent of foreign organic matter and yields not less than 0.3 percent of volatile oil.

### **Description:**

Odour, characteristic and aromatic; taste, bitter.

**Macroscopical:** Stem is solid, nearly cylindrical, greyish-green in colour and longitudinally striated. Leaves, alternate, exstipulate petiolate. Lower leaves have pinnatisected lamina and very long petiole, the upper leaves are nearly simple and sessile. Leaf is greyish green 4-12 cm long and 0.3-9 cm wide, having 5-9 broadly obstrangular lobes which are repeatedly subdivided into 3-5 smaller ovoid lobes. Lobes have acute

apex, entire margins, lamina has pinnate reticulate venation, upper surface dark green in colour, both surfaces densely covered with smooth hairs. Lamina of the simple leaves is oval lanceolate, margin entire, apex acute, base symmetric. Petiole, is nearly triangular with deep groove on the upper side, densely hairy, greyish green and its base broadly flattened. Flower heads; hemispherical, greenish-yellow, arranged in panicles, peduncle cylindrical erect, receptacle with central convexity, densely covered with hairs, and surrounded by involucre of 2 rows, outer bracts oval, thick, distinctly keeled. Greyish green in colour, outer surface hairy, inner smooth, shiny 0.2-0.3 cm long, 0.05-0.1 cm wide; inner bracts more lanceolate, longer, thinner, florets of the outer whorls pistillate, other hermaphrodite, corolla, epigynous; formed of 5 pale yellow petals forming a tube. Stamens 5 epipetalous syngenious, filaments short, anther yellow oblong, ovary syncarpus of two united carpels, unilocular with one ovule, inferior, elongated cylindrical, 5-ribbed covered with shinning oil glands. Style filiform brown; stigma bifid.

**Microscopical:** Leaf isobilateral, epidermal cells polygonal with wavy anticlinal walls, more wavy in the lower epidermis, cuticle smooth stomata on both surfaces, more numerous on the lower epidermis surrounded by 4 to 6 cells, ranunculaceous type.

Trichomes are numerous nonglandular hairs 1-3 cells uniseriate stalk and a horizontal twisted end cell (the beam). Another type 1-4 short cells and a dagger-shaped apical end cell.

Glandular hairs; short stalked bicellular biseriate and a multicellular biseriate head of 4-8 cells, another type of glandular hairs of rare occurrence of short one-celled stalk and unicellular sac like head. Mesophyll with palisade of 2 rows abutting on each epidermis, spongy mesophyll of several layers traversed by schizogenous glands. Midrib with peripheral collenchyma in cortex and shows an arc of vascular bundles. Stem shows epidermis with numerous hairs similar to those of the leaf; cortex with peripheral collenchyma in the ridges and endodermis; pericycle with groups of fibres; phloem, without fibres; xylem, as a continuous cylinder with, pitted, reticulate and spiral vessel; pith with numerous schizogenous glands; bract, outer epidermal cells similar to those of the leaf, covered with striated cuticle, the inner epidermis polygonal with lignified anticlinal walls.

Stomata present only on the outer, trichomes similar to those of the leaf; corolla, outer epidermal cells elongated having wavy anticlinal walls, striated cuticle, inner with straight walls and smooth cuticle, stomata present only on both surfaces; stamen, epidermal cells rectangular with rosette crystals of calcium oxalate; anther, epidermal cells tabular somewhat collapsed; pollen grains, spherical with 3 pores and 3 germinal furrows and smooth somewhat collapsed; furrows and a smooth exine; ovary; epidermal cells. polygonal with straight anticlinal walls, hairs numerous on the outer surface only of the glandular types; style, epidermal cells tubular covered with smooth cuticle; stigma, papillose receptacle, walls pitted, lignified, covered with non-glandular unicellular twisted hairs.

**Powder:** Greyish green, taste, bitter, odour, aromatic shows fragment of epidermal cells of leaves, stems, and flowers, ranunculaceous stomata, glandular and non-glandular hairs, schizogenous glands, pericyclic fibres with tapering pointed ends, annual, spiral, pitted vessels.

**Chemical constituents:**

Absinthin, volatile oil contains mainly cineole and thujone.

**Tests for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above
- b) Gas chromatographic examination of the volatile oil to confirm the presence of cineole and thujone

**Test for purity:**

Worm wood contains not more than 1 percent of acid insoluble ash.

**Assay:**

Extract 10g of the powdered plant with 95 percent alcohol in a continuous extraction apparatus till complete extraction, concentrated alcoholic extract transferred to 100 ml volumetric flask containing 25 ml lead acetate 12.5 percent, volume completed with distilled water. Filter, 50 ml of the filtrate transferred to 100 ml volumetric flask containing 40 ml sodium phosphate 4.7 percent, volume completed to 100 ml, filter, 1 ml of the purified extract transferred to test tube, evaporate in water bath; residue dissolved in 5 ml alcohol 95 percent mixed with 5 ml of the colour reagent (50 percent sulphuric acid containing 0.5 percent ferric chloride T.S.); warm for one minute on a boiling water bath, the developed reddish-brown colour measured after 4 hours (400 nm); the percentage of absinthin deduced from a preconstituted standard curve by adopting the same procedures (0.1-0.5 mg of pure absinthin was found to obey Beer's law).

**Pharmaceutical preparation:**

Tincture Absinthii.

**Uses:**

Tonic, stimulant, anthelmintic, has a powerful cytotoxic effect. Dose 4-16 ml of oil.

**Storage:**

In tightly closed, dark glass containers.

In a cool place, protected from light.

## Astragalus gummifer Lab.

### Family name:

Fabaceae.

### Synonyms:

- (a) *Astragalus strobiliferus* Royle
- (b) *Astragalus erianthus* Willd.
- (c) *A adpressus* Ehrenb. ex Walp
- (d) *A noemiae* Eig. var. *Brantii* Eig.

### Common name:

- (a) Tragacanth tree, Tragacanth gum  
Goat's thorn, Milkvetch (E)
- (b) Adragante, Astragale Adragant,  
Astragale de Marseille,  
Adragante (F)

Gomme



### African names:

- (a) Arabic: كثيراء او قناد
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### Brief description of the plant:

Umbellate shrub reaching 30 cm in height; leaves composed of thorny rachis with 4 to 7 pairs of mucronated and smooth leaflets and smooth or white downed stipules. Flowers in clusters of two or three at the axils of leaves, calyx of 5 to 7 mm covered with white down at the base, vexillum ranging from 10 to 12 mm.

### Geographical distribution:

Forests, steppe pastoral land, hillsides up to an altitude of 1300-1800 m of Sahel Region of Africa.

### Part used:

Dried gummy exudate.

### Names of drug:

Gummi Tragacanthe. Gum Tragacanth. Gomme Adragante.

### Definition:

Gum Tragacanth is the dried gummy exudation, obtained by incision from *Astragalus gummifer* Lab., and some other African species of *Astragalus* (family, Fabaceae). Gum Tragacanth contains not more than 1 per cent of foreign organic matter.

### Description:

Gum Tragacanth occurs in thin, frequently curved, ribbon-shaped flakes; about 2.5 cm to 1 cm wide and 0.5 to 3 mm thick, or occasionally in straight or spirally twisted linear pieces; white to pale yellowish-white, with, numerous concentric ridges or lamellae, translucent; tough and horny; fracture, short; odourless; taste, mucilaginous. Gum Tragacanth is rendered easily pulverisable when heated to 50°C.

**Powder:** Powdered Gum Tragacanth is white to light yellowish-white; showing under the microscope angular particles of striated mucilaginous cell-walls, few simple, rounded to

elliptical starch granules, 3 to 25  $\mu$  in diameter, and occasional compound granules of 2 to 4 components; and very few or no fragments of lignified vegetable tissue (distinction from Indian Gum).

**Chemical constituent:**

Tragacanth can be separated into two parts on the basis of its behavior when added to water. The portion soluble in water is termed tragacanthin and the insoluble portion is named bassorin.

Tragacanth contains also 15 per cent water, traces of starch, cellulose and nitrogenous substances. No oxydase enzyme is present.

**Tests for identity and purity:**

- (a) Gum Tragacanth is sparingly soluble in water, but swells into a homogeneous, adhesive opalescent gelatinous mass. It is insoluble in alcohol.
- (b) Mix a small quantity of powdered Gum Tragacanth with a few drops of ruthenium red T.S.; the particles do not acquire a pink colour (Sterculia Gum and Agar).
- (c) To 4 ml of an aqueous solution of Gum Tragacanth (1 in 200), add 0.5 ml of hydrochloric acid and heat for 30 minutes in a water-bath. Divide the liquid into two portions:
  - (d) To one portion, add 1.5 ml of sodium hydroxide T.S. and 3 ml of potassium-cupric tartrate T.S., and warm in a water-bath; a precipitate is formed.  
To the other portion, add barium chloride T.S.; no precipitate is formed (cf. Agar).
  - (e) To 20 ml of an aqueous solution of Gum Tragacanth (1 in 100), add 5 drops of solution of hydrogen peroxide and 5 drops of benzidine T.S., shake, and allow to stand; neither blue coloured particles (Indian Tragacanth) nor a blue coloured solution is obtained (Gum Arabic).
- (f) Boil 1 g of Gum Tragacanth with 20 ml of water, until a mucilage is obtained, then add 5 ml of hydrochloric acid, and again boil the mixture for 5 minutes; no red or pink colour is produced (Indian Gum or Karaya Gum). .
- (g) Mix a small quantity of powdered Gum Tragacanth with a few drops of water, followed by a few drops of N/50 iodine; the particles are coloured yellow and may show minute scattered blue points. Examine microscopically; only a few groups of small rounded starch granules are visible (Starch).
- (h) Gum Tragacanth loses, when dried at 100°C, not more than 10 per cent of its weight.
- (i) Gum Tragacanth leaves on ignition not more than 5 per cent of ash; acid-insoluble ash, not more than 0.5 per cent.
- (j) Boil 0.5 g of Gum Tragacanth with 20 ml of water, until a mucilage is obtained, add 10 ml of lead acetate T.S.; a flocculent precipitate is formed, filter, and to the filtrate add 10 ml of solution of lead subacetate; no precipitate is formed, or at most a slight turbidity is produced (Gum Arabic).

**Pharmaceutical preparations:**

Mucilago Gummi Tragacanthae.

Pulvis Gummi Tragacanthae Compositus.

**Uses:**

Emulsifying and suspending agent.

**Storage:**

In well-closed containers.

## **Atropa belladonna L.**

### **Family name:**

Solanaceae

### **Synonym:**

*Belladonna baccifera Lamk.*

### **Common names:**

Belladona. Deadly night-shade leaves (E).  
Belladone (F).

### **African names:**

- (a) Arabic: سُتْ الْحَسْنَ
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Shrub of 0.5 m to 2 m high, covered with a short down slightly fetid; undivided leaves of 15 cm over 8, gathering in two, one large and one small, purplish-blue flowers; fruits black berries.

### **Geographical distribution:**

Mediterranean parts of Africa.

### **Part used:**

Leaves with or without the flowering tops.

### **Names of drug:**

Folium Belladonnae. Belladonna Leaf. Feuille de belladone.

### **Definition:**

Belladonna Leaf is the dried leaves, with or without the flowering tops, of *Atropa Belladonna* L. (family, Solanaceae), collected from plant in flower. Belladonna Leaf contains not more than 20 per cent of belladonna stem, not exceeding 5 mm in diameter, and not more than 2 per cent of foreign organic matter, and yields not less than 0.3 per cent of total alkaloids of belladonna, calculated as hyoscyamine."

### **Description:**

Belladonna Leaf usually occurs as partly matted masses together, crumpled and twisted, or broken leaves, or together with some smaller stems and a number of flowers and fruits; odour, slight; taste, somewhat bitter and acrid.

**Macroscopic:** Leaf, simple, alternate, but the upper, in pairs, each of a large and a small leaf; shortly petiolate; petiole, 0.5 to 4 cm long; lamina, oval lanceolate to broadly ovate, narrowed at the base and slightly decurrent; apex, acute to acuminate, margin, entire; 5 to 25 cm long, 2.5 to 12 cm broad; light green to brownish-green; thin, papery and brittle; almost glabrous; showing, especially when examined by a lens, numerous, whitish, slightly raised dots, indicating the crystal cells in the mesophyll; veins, prominent on the lower surface and run parallel to the entire margin.

Flower, solitary, usually associating the pairs of leaves, pendulous, pedicellate, pedicel, 1.5 to 2 cm long; calyx, deeply 5-10 bed, 1 cm long; corolla, regular, campanulate, dull

purplish or yellowish-brown, with 5 small reflexed lobes, about 2.5 cm long and 1.2 cm wide; stamens, 5 short epipetalous; ovary, superior, bicarpillary, with numerous ovules. Fruit, berry, absent or very few, immature, usually attached to the persistent calyx, subglobular green to dull purplish-black, pulpy, up to about 12 mm in width, bilocular, containing numerous small seeds attached to an axial placenta. Seed, about 2 mm long, somewhat reniform, flattened, campylotropous, with brown reticulate seed-coat and curved embryo embedded in an oily endosperm. Stem, more or less hollow, cylindrical, flattened, longitudinally furrowed and hairy.

**Microscopical:** Leaf, dorsiventral; epidermal cells, with distinctly striated cuticle and more or less sinuous anticlinal walls, more distinctly sinuous in the lower epidermis; stomata, present on both surfaces (distinction from *Scopolia*), but more on the lower; each surrounded by 3 to 5, mostly 3 subsidiary cells, one of which is distinctly smaller than the others, cruciferous type; hairs, few, usually present, especially near the veins, on the lower surface, more numerous on young leaves; glandular hairs, either short with 1- to 3-celled stalk and rounded or club-shaped multicellular head, or long with 4- to 6-celled stalk, and 1-celled ovoid head; non-glandular hairs, uniseriate, 2- to 6-celled, smooth, thin-walled. Mesophyll shows a single layer of palisade and occasional idioblasts filled with microsphaenoidal crystals, of calcium oxalate in the spongy parenchyma; such idioblasts are also present in the tissues of the veins.

Midrib, as well as the big veins, show an array of collateral vascular bundles and numerous groups of peri medullary phloem. Stem possesses elongated epidermal cells with longitudinally striated cuticle, few hairs, endodermal starch sheath, small strands of long thin-walled lignified pericyclic fibres, a ring of vascular bundles having large reticulate vessels with ellipsoidal bordered pits, perimedullary phloem of supernumerary strands in the pith, and occasional idioblasts of microsphaenoidal crystals in cortex and pith. Calyx with numerous glandular hairs, having uniseriate stalks and 1- to 3-celled heads. Corolla, with inner epidermis papillose and outer epidermis with glandular hairs. Pollen grains, in chloral hydrate T.S., subspherical, about 40 microns in diameter tricolporate, having three broad germinal furrows and rows of pits between the ridges on the exine. Fruit, with epicarp exhibiting polygonal epidermal cells having straight walls, striated cuticle and stomata; mesocarp, with large pulp cells containing occasional cluster crystals of calcium oxalate.

Seed exhibits a white to brown seed-coat, with convoluted thick-walled cells, having prominent ridges over the anticlinal walls.

**Powder:** Powdered Belladonna Leaf is green to brownish-green; characterised by fragments showing epidermis with stomata of cruciferous type and striated cuticle; numerous green fragments of mesophyll with idioblasts of microcrystals of calcium oxalate; occasional non-glandular and glandular hairs; very few fragments of thin-walled lignified fibres and reticulate vessels with ellipsoidal pits of stem. Pollen grains and fragments from flower and fruit may be present.

#### **Chemical constituents:**

Alkaloids, mainly hyoscyamine and small amounts of hyoscine, volatile bases- pyridine, N-methyl pyrrolidine, N-methyl pyrrolidine and diamine. A fluorescent substance  $\beta$ -methyl aesculetin.

**Tests for identity:**

(a) Shake 1 g, in powder, for 2 minutes with 10 ml of 0.1N sulphuric acid, filter, and to the filtrate add 2 ml of dilute ammonia solution and 5 ml of water; extract with 15 ml of solvent ether, cautiously, to avoid emulsion formation, separate, dry the ether layer over anhydrous sodium sulphate, and filter; evaporate off the ether in a porcelain dish, add 10 drops of fuming nitric acid and evaporate to dryness over a small flame, add 10 ml of acetone and, dropwise, a 3 per cent of potassium hydroxide in alcohol (95 per cent); a deep violet colour develops.

(b) Carry out the method for thin-layer chromatography, in vol. 2, using silica gel G as the coating substance and a mixture of acetone, water and 13.5M ammonia (ratio 90: 7: 3) as the mobile phase and allowing the solvent front to ascend 10 cm above the line of application. Apply separately to the chromatoplate, at 2 cm intervals, 5 µl, 10 µl and 20 µl of each of A and B solutions. Prepare solution (A) by adding 10 ml of 0.05M sulphuric acid to 1 g, stir for two minutes, filter, add 1 ml of 13.5M ammonia to the filtrate, dilute to 10 ml with water, extract with 10 ml of ether, separate the ether layer, dry over anhydrous sodium sulphate, filter, evaporate to dryness on a water-bath, and dissolve the residue in 0.25 ml of methanol; for solution (B) dissolve 24 mg of atropine sulphate in 9 ml of methanol and add to this 1 ml of a solution containing 7.5 mg of hyoscine hydrobromide in 10 ml of methanol. After removal of the chromatoplate, dry it at 100 to 105°C for 15 minutes, allow to cool and spray with 10 ml of sodium iodobismuthate solution followed by 0.05M sulphuric acid until the spots become visible as orange-red to red on a yellow to grey background. The spots in the chromatograms obtained with solution (A) are similar to those in the chromatograms obtained with solution (B) with regard to their  $R_f$  (hyoscyamine-atropine,  $R_f$  0.30 to 0.35; hyoscine,  $R_f$  0.8 to 0.9), their approximate size and colour . . Other spots do not appear, particularly at  $R_f$  0.45 to 0.50 (apo-atropine) in the chromatogram obtained with 20 µl of solution (A), or at  $R_f$  0.05 to 0.10 (tropan-3-ol) in the chromatogram obtained with 10 µl of solution (A).

**Tests for purity:**

(a) Belladonna Leaf shows no papillosed and stomata-free epidermis (*Scopolia* Leaf); no raphides (*Phytolacca*); no cluster crystal in rows and no thick-walled stiff hairs (*Ailanthus*).

(b) Shake vigorously about 0.2 g of powdered Belladonna Leaf with 2 ml of dilute hydrochloric acid, filter, and add to the filtrate a drop of potassiummercuric iodide T.S.; a precipitate is immediately formed (exhausted Belladonna Leaf).

(c) Belladonna Leaf has no ammoniacal odour (bad storage).

(d) Ash, not more than 16 per cent; acid-insoluble ash, not more than 5 per cent.

**Assay:**

Introduce about 10 g of powdered Belladonna Leaf, module No. 22 accurately weighed, into a stoppered flask, and add 10 ml of alcohol and 40 ml of ether. Mix well, set aside for 10 minutes, add 5 ml of dilute solution of ammonium hydroxide, and shake frequently for one hour.

Transfer the mixture to a small continuous extraction apparatus plugged with cotton-wool, and when the liquid ceases to flow, pack firmly, and continue the extraction until complete exhaustion of drug is effected.

Evaporate the ethereal extract to about 20 ml, and filter through a small dry filter paper into a separator. Wash the receiver and filter, previously used, with three successive portions; each of 5 ml of ether, transferring each to the separator. Add to the mixed ethereal extract and washings 20 ml of N/I sulfuric acid, shake well, allow to separate, and run off the lower layer into another separator. Continue the extraction with several portions; each of 10 ml of N/I0 sulfuric acid, until complete extraction of the alkaloid is effected. Mix the acid liquids, wash with about 10 ml of chloroform, run off the latter into a separator containing 10 ml of water, shake, allow to separate, and reject the chloroform. Repeat the extraction of the acid liquid with two further portions; each of 10 ml of chloroform, transferring each to the separator containing the same water, and wash as before. Transfer the water from this separator to that containing the acid liquid, add 20 ml of chloroform, followed by dilute solution of ammonium hydroxide, until distinctly alkaline, and shake at once. Separate the chloroform layer, and repeat the extraction with successive portions, each of 20 ml of chloroform, until complete extraction of the alkaloids is effected, carrying out the extraction as rapidly as possible. Wash the combined chloroform extracts with about 10 ml of water, reject the water, and dehydrate the chloroform extract with about 2 g of anhydrous sodium sulfate. Filter the chloroform extract through a dry filter paper into a porcelain dish and wash the sodium sulfate and the filter with a few ml of chloroform. Remove the chloroform, add to the residue 2 ml of dehydrated alcohol R., evaporate to dryness, dry for half an hour at 100° C, and then cool. Dissolve the residue in 20 ml of N/50 sulfuric acid, and titrate with N/50 sodium hydroxide, using methyl red T.S. as indicator.

Transfer the titrated liquid to a separator, add a few drops of dilute solution of ammonium hydroxide, and shake with successive portions of chloroform.

Evaporate the chloroform, add to the residue a few drops of fuming nitric acid R., evaporate on a water-bath, cool, and add to the residue a few drops of alcoholic potassium hydroxide T.S., a violet colour is produced.

**Pharmaceutical preparations:**

Extractum Belladonnae Fluidum.

Extractum Belladonnae Siccum.

Pulvis Belladonnae Standardizata.

Tinctura Belladonnae.

Aluminium Hydroxide and Belladonna Mixture.

**Uses:**

Parasympatholytic, anticholinergic.

**Storage:**

In well-closed containers, in a cool dry place protected from light.

## **Azadirachta indica A. Juss.**

### **Family name:**

Meliaceae.

### **Synonyms:**

- (a) *Antelaea azadirachta* (L.) Adelb.
- (b) *Antelaea javanica* Gaertn
- (c) *Melia azadirachta* L.
- (d) *Melia indica* (A. Juss.) Brandis
- (e) *Melia indica* Brand.

### **Common names:**

Indian lilac. Nim. Neem. Margose (E). Lilas des Indes, Margousier, Nim (F).

### **African names:**

- (a) Arabic: ازادخت
- (b) Bambara: Sa furani, Mali yirini,
- (c) Hausa: Dogo'n yaro
- (d) Peuhl: N/A
- (e) Swahili: Mwarobaini, Mwarubaini kamili
- (f) Yoruba: Dongo yaro, Igi-Oba



### **Brief description of the plant:**

A tree that can reach 25 m in height, straight-boled, with striped and fissured bark; alternate paripinnate leaves with about 5-8 pairs of asymmetrical leaflets at the base, long acuminate tip; inflorescence in axillary panicles; flowers white numerous and pedicellate, fruit ovoid, yellow when ripe containing only one seed.

### **Geographical distribution:**

Originates from India, but it is naturalized all over intertropical Africa especially in the coastal plains.

### **Parts used:**

Leaves.

### **Name of drug:**

Neem leaves. Folium Azadirachti.

### **Definition:**

Neem is the fresh or dried leaf of *Azadirachta indica* A. Juss., (family, Meliaceae).

### **Description:**

Odour, strong and characteristic; taste, bitter.

**Macroscopical:** The leaves are pinnate or alternate in arrangement. On each leaf there may be up to 5-8 pairs of leaflets attached to the main strand through a small petiole. The leaflets are ovate-lanceolate to lanceolate falcate, asymmetrical at base, long acuminate and coarsely serrated at the edges with acuminate apex and glossy appearance.

**Microscopical:** A transverse section of *A. Indica* leaf (midrib) shows a collateral structure and characteristic sub-epidermal masses of collenchyma on both surfaces. The xylem takes the form of a strongly curved arc while both surfaces have smooth cuticle, epidermal cells with almost straight walls, particularly those of the upper epidermis. The

stomata of anomocytic type are present in the lower epidermis while they are absent on the upper epidermis.

Palisade ratio is 4.5 to 6.20 to 7.80 (upper epidermis only).

Stomata index is 5.0 to 12.8 for upper epidermis, there is no stomata on lower epidermis.

Stomatal number is 200 to 333 to 500.

Veinlet number is 2.5 to 3.0.

Vein let termination number is 26.0 to 28.0.

**Powder:** Colour , greenish-brown; taste, slightly bitter; odour, alliaceous. Straight walls epidermal cells; lamina pieces showing anomocytic stomata, collenchymatous cells, xylem vessels, epidermal cell walls straight; lignified vascular elements in veins and veinlets; rosette crystals present; starch granules absent;

**Chemical constituents:**

Contains azadirachtin, salannin, meliantriol, azadirone, azadiradione, gedunin and other meliacins.

**Tests for identity:**

- (a) Macroscopical and microscopical examination to comply with the descriptions given above.
- (b) Make a methanol extract of the leaf of *Azadirachta indica* A. Juss. It gives positive tests for triterpenes, fatty acids and glycosides. It gives negative tests for alkaloids, carboxylic acids and phenols.

**Test for purity:**

- (a) *Azadirachta indica* leaf contains no starch granules.
- (b) Total ash should not be more than 11.6 per cent. Acid-insoluble ash should not be more than 1.2 per cent.
- (c) Water-soluble ash should not be less than 1.8 per cent.
- (d) Foreign organic matter, Not more than 2 per cent.
- (e) Water soluble extractive: Not less than 16 per cent.
- (f) Moisture: Not more than 30 per cent (fresh leaf)
- (g) Alcohol-(70 per cent.)-soluble: Not less than 22 per cent.

**Uses:**

Used as an anti-inflammatory agent, antimalarial and as an insecticide.

**Storage:**

Store in a cool dry place.

## **Balanites aegyptiaca (L.) Del.**

### **Family name:**

Balanitaceae.

### **Synonyms:**

- (a) *Ximenia aegyptiaca* L.
- (b) *Agialida senegalensis* Van Tiegh.
- (c) *Balanites zizyphoides* Mildbr. & Schlechter

### **Common names:**

Myrobalan. Soapberry tree. Thorn tree. Desert date (E). Myrobalan d'Egypte. Dattier du desert (F).

### **African names:**

- (a) Arabic: الْجَلِيجُ الْمَصْرِيُّ أَوْ زَقْوَمٌ
- (b) Bambara: Serene, Segene, Segere, Zekene
- (c) Hausa: Aduwa, Adua
- (d) Peuhl: Goleteki, Tani, Mutoki, Mourotauki, Muceteeki
- (e) Swahili: Mnyara, Njienjia
- (f) Yoruba: Adowa



### **Brief description of the plant:**

Small straight boled tree of 8 to 9 m high, dark coloured bark with deep stripes; branches with strong thorns reaching 8cm in length; petiolated leaves with two subsessile leaflets of 3 over 2.5 cm; inflorescence in bunches or axillary racemes; flowers greenish-yellow; the fruit ovoid drupe of 3 to 4 cm in length and turns yellow when ripe.

### **Geographical distribution:**

Sudanese-Sahelian regions of Africa.

### **Part used:**

Seed.

### **Name of drug:**

Desert date. Balanites seed.

### **Definition:**

Balanites seed is the dried ripe seeds of *Balanites aegyptiaca* Del. (Family, Balanitaceae). It contains not less than 0.5 per cent of total sapogenins.

### **Description of the drug:**

**Macroscopical:** Stem bark flat or channeled pieces; outer bark with vertical cracks, lenticulate; colour yellowish grey; inner bark with fine vertical striations; colour buff; fracture short; odour characteristic; taste bitter

**Microscopical:** Transverse and longitudinal sections show thin-walled lignified cork cells; outer cells show exfoliations; thin three-layered cambial cells separate the cork layer from the cortex; cortex consists of isolated groups of numerous sclereids with thickened lignified walls and small lumen; two types of sclereids- isodiametric and elongated cells; large rosette crystals occur in some cortical parenchyma; phloem tissue consists of parenchyma and broad medullary rays with prismatic calcium oxalate crystals, lignified phloem fibres occur in isolated groups among the phloem parenchyma.

**Powder:** Buff-coloured; odour sternutatory; taste bitter; numerous sclereids, isodiametric and elongated, lignified; long fibres both lignified and non-lignified; few cork cells, rosette and prismatic calcium oxalate crystals; starch grains present.

**Chemical constituents:**

0.5 per cent Diosgenin/Yamogenin; 50 per cent fixed oil, protein, carbohydrates, saponins, balanitoside, pregnane glycosides.

**Test for identity:**

- (a) Examine macroscopically and microscopically to ensure compliance with the descriptions given above.
- (b) Perform the tests for steroidal saponins described in vol. 2.

**Tests for purity:**

Moisture: Not more than 8.5 per cent.

Ash: Not more than 12.21 per cent.

Water-soluble extractives: Not more than 16.3 per cent.

Alcohol (70 per cent.)-soluble extractives: Not less than 14.8 per cent.

**Assay:**

Perform the assay for estimation of saponins in plants. See the assay for total steroidal saponins as described by Bacou *et al* in *The Analyst* (1977) 102:458-65. It contains not less than 0.5 per cent total saponin in the seed.

**Uses:**

The diosgenin obtainable from the seeds is used in the partial synthesis of sex hormones, oral contraceptives and corticosteroids. Antidiabetic, antihelminthic, antipyretic, anticancer, molluscicidal.

**Storage:**

Store in a cool dry place away from moisture.

## Bauhinia reticulata DC.

### **Family name:**

Fabaceae.

### **Synonyms:**

*Piliostigma reticulatum* (DC.) Hochst.

### **Common names:**

Camel's foot (E). Pied de chameau,  
Semellier (F).

### **African names**

- (a) Arabic: N/A
- (b) Bambara: Niama, Niama tiene
- (c) Hausa: Kargoo, Kalgo
- (d) Peuhl: Barkey, Boredjji, Barkewi
- (e) Swahili: N/A
- (f) Yoruba: Abafe, Abafin, Ubons



### **Brief description of the plant:**

Evergreen shrub or small tree with a twisted bole to 9 m high, with a bushy spherical canopy. Bark dark grey to brown, fibrous and corky, slash dark red. Leaves large, thick, leathery, grey-green, 6-12 cm long x 4-8 cm wide; split in half in cattle-hoof shape, apex bilobate, obtuse; 9 palmate conspicuous central nerves. Flowers dioecious, clustered in short, hairy, axillary racemes measuring 4-5 cm. Petals white with pink stripes. Fruit large, long, straight, undulate or twisted and hard, either glabrous or sparsely pubescent, brown, indehiscent, up to 25 cm long x 5 cm wide.

### **Geographical distribution:**

*Piliostigma reticulatum* occurs in the Sahelo-Sudanian region from Senegal and Mauritania eastward to Sudan. It has been introduced into Mozambique.

### **Part used:**

Leaves, barks.

### **Name of drug:**

Camel's foot.

### **Definition:**

Camel's foot is the dried leaves of *Piliostigma reticulatum* (DC.) Hochst. (family, Fabaceae).

### **Description :**

**Macroscopical:** Dioecious shrub or small tree up to 10(-15) m tall; bole short, rarely straight, up to 30 cm in diameter; outer bark deeply fissured to cracked, grey to brown, inner bark pink to red; crown rounded and dense; branches grey, waxy and glabrous. Leaves alternate, conspicuously bi-lobed; petiole 1-3.5 cm long, swollen at both ends; blade 5-12 cm x 4-18 cm, cordate or rounded at base, lobes rounded or more or less cuneate, coriaceous, glabrous, greyish-green, palmately veined with 8-11 basal veins. Inflorescence an axillary or terminal panicle, 5-15 cm long, shortly pubescent. Flowers unisexual, c. 2.5 cm in diameter; calyx 5-toothed, 15-20 mm long; petals 5, obovate, white with pink stripes; male flowers with 10 stamens, anthers brown. Fruit an oblong pod 15-30 cm x 2.5-5 cm, straight, undulate or twisted, woody, hard, glabrous or

sparsely pubescent, brown, flat, pruinose, sometimes twisted and cracked, indehiscent and persisting, many-seeded. Seedling with epigeal germination.

***Chemical constituents:***

Tannins.

***Test for identity:***

- a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Extract the specimen with water. Add a few drops of ferric chloride solution. A dark colouration appears

***Test for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Tooth ache, antidiarrhoeal, anticonvulsant, sedative, vibriocide.

***Storage***

In a cool dry place.

## **Bobgunnia madagascariensis (Desv.) J. H. Kirkbr. & Wiersema**

### **Family name:**

Fabaceae.

### **Synonyms:**

*Swartzia madagascariensis* Desv.

### **Common names:**

Snake bean tree (E). Petit dim (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Samakara, firin gama, kōngo dugura ni, sama kara, sama kata, samagara, samāñ kara
- (c) Hausa: Bayama, Bogozage, Gama fada, Gwazkiya
- (d) Peuhl: Gugirki, Gugiriki
- (e) Swahili: msekeseko
- (f) Yoruba: N/A



### **Brief description of the plant :**

It is widely distributed across wooded habitats in Africa. It is usually small, with thick, rough grey bark with longitudinal cracks and a light, rounded crown. For several months each year the tree is bare, although the cylindrical chocolate-brown seed pods remain and make it quite distinctive. When damaged the tree exudes a dark-colour gum and a pea-like scent. The leaves have an odd number (imparipinnate) of greyish coloured leaflets with yellow hairs on the underside. The tree bears fragrant pale, pea-like flowers followed by the pods that release 10-15 seeds when the sticky yellow flesh around them rots on the ground.

### **Geographical distribution:**

Widespread in tropical Africa and the Mascarene Islands.

### **Part used:**

Whole plant, leaves, root and bark.

### **Name of drug:**

Snake bean fruit.

### **Definition**

Snake bean fruit is the dried ripe fruits of *Swartzia madagascariensis* Desv. (family, Fabaceae).

### **Description:**

**Macroscopical:** Small or medium deciduous tree up to 18 m or occasionally a shrub; bark grey or brown, deeply fissured or reticulate. Young branches, leaf rachides and inflorescence axes and pedicels rather conspicuously covered with a rusty-brown or greyish dense pubescence or tomentum, but fairly quickly somewhat glabrescent, the indumentum inconspicuous at time of fruiting. Leaves: petiole and rachis together (3)6–15(18) cm long; leaflets (3)5–9(13), alternate or occasionally opposite, each (1)2–6(10) × (0.8)1.2–3(5.7) cm, usually elliptic or broadly elliptic, occasionally ovate- or obovate- or oblong-elliptic, rounded to emarginate at the apex, rounded at the base, usually markedly darker above than beneath (particularly when young), the lower surface densely

appressed-pubescent and the upper surface sparsely so when young, tending to be glabrescent with age; petiolules 1–3(4) mm; stipels absent or present at the base of the terminal leaflet only. Racemes up to 5(8) cm long, sometimes appearing branched, with up to 10 flowers but sometimes much reduced so that the flowers appear to be in sessile fascicles of 2 or 3 or solitary in the leaf axil; bracts subtending pedicels triangular, up to 3 mm long, rapidly falling and often leaving two short stipules; pedicels 1–3(4) cm long. Calyx globose and 6–7 mm in diameter before anthesis, then splitting for about half its length into 2–5 lobes and reflexing. Petal 1, 2–3.6 × (1.8)2.2–3 cm including the short claw, white with a yellow patch at the base inside, crinkled, densely covered with appressed brown or greyish hairs outside, glabrous inside. Stamens probably 50–60, exceeded by the petal, somewhat unequal, yellow or orange. Gynophore 7–12 mm long, bearing the ovary usually largely clear of the stamens. Pods (6)8–18(30) × 1–1.7(2.3) cm, roughly cylindrical, usually somewhat bumpy and twisted, hard, dark brown to black, pendent, indehiscent, with several to many seeds. Seeds 7–8 × 5–7 × 3 mm, oblong-reniform, compressed, with a small hilum below the radicular lobe, pale brown or greyish, shiny.

***Chemical constituents:***

Fruit: Saponin, flavonoid, glycoside.

***Tests for identity:***

- (a) Macroscopical examination of the specimen to ensure compliance with the above descriptions.
- (b) Shake the powdered fruit with water. It foams and the foam does not disappear on heating

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Molluscicidal, Antifungal, insecticidal (flower)

***Storage:***

In a cool dry place.

## **Bridelia ferruginea Benth.**

### **Family name:**

Phyllanthaceae

### **Synonym:**

*Gentilia chevalieri* Beille

### **Common names:**

Bridelia (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Saguan, Sabua, Sagba, Sagua, Saguin, Dafi sagwan, Sagwan baboni
- (c) Hausa: Kumi, Kirni, Kisni, Kurni
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba:Ira, Ira odan, Eepo ira, Ura, Asaragba



### **Brief description of the plant:**

A shrub or small tree up to c. 6 m high with spiny branches. Bark cracked, grey. Twigs dark brown. Young shoots and petioles densely ferruginous-tomentose.

### **Geographical distribution:**

Guinée and Mali eastwards to the Central African Republic and from Gabon south and east to Angola and extreme NW Zambia.

### **Part used:**

Leaf and stem bark

### **Name of drug:**

Bridellia

### **Definition:**

Bridellia consists of the leaf or stem bark of *Bridellia ferrigeia* Benth. (family, Phyllanthaceae)

### **Description:**

**Macroscopical:** A shrub or small tree up to c. 6 m high with spiny branches. Bark cracked, grey. Twigs dark brown. Young shoots and petioles densely ferruginous-tomentose. Petioles 5–7 mm long. Stipules 5–6 × 1.5–2 mm, lanceolate, acuminate, tomentose, readily caducous. Leaf blades 4–10 × 3–5.5 cm, elliptic to elliptic-ovate, subacute to shortly obtusely acuminate, rounded, truncate or sometimes cordulate at the base, thinly coriaceous, evenly pubescent along the midrib and main nerves above and beneath, otherwise sparingly so, glossy green above and paler beneath when fresh, drying dark brown or greyish-brown above, dark reddish-brown beneath; lateral nerves in 7–10 pairs, cheilodromous, scarcely prominent above, prominent beneath, tertiary nerves parallel, fairly prominent beneath, quaternary nerves reticulate. Male flowers: pedicels 1–1.5 mm long, puberulous; sepals 2 × 1 mm, triangular-ovate-lanceolate, acute, puberulous without, glabrous within, yellowish-green; petals 1 × 0.75 mm, obdeltoid-spathulate, incised or tridentate at the apex, cornute, glabrous; disk 1.5–2 mm in diameter, annular, ± smooth; staminal column 1 mm high; anthers 0.7 × 0.5 mm; pistillode 0.5 mm high,

conical, notched at apex. Female flowers subsessile; sepals  $1.5 \times 1.5$  mm, triangular, thick, otherwise as in male; petals elliptic-obovate, puberulous without, otherwise as in male; outer disk ± as in male; inner lacinate at the apex, ciliate within, pubescent or subglabrous; ovary  $1.5 \times 1$  mm, ellipsoid, 2-celled; styles 2, c. 1 mm long, ± free, bifid, stigmas ± smooth. Fruit c.  $7 \times 4-5$  mm when dried, ellipsoid to ovoid-ellipsoid, 1-locular by abortion, green at first, then reddening and becoming purplish-black at maturity. Seeds  $5 \times 3$  mm, smooth, brownish.

**Microscopy:** Leaf dorsiventral with abundant fragments of lamina cells in sectional view, showing the upper epidermis with no stomata, presence of thin cuticle; palisade layer is single and cells are closely packed; lower epidermis is covered with fairly thick smooth cuticle and consists of cells similar to the upper epidermis; trichomes are multicellular; covering hairs, non-glandular, stomata, few, paracytic, surrounded by 2-3 subsidiary cells; mesophyll parenchymatous; vascular bundles with phloem consisting of soft, thin walled elements; the xylem vessels occur with groups of parenchyma cells in between; idioblasts of microspaeroidal crystals of calcium oxalate, abundant in the mesophyll and a few ones scattered in the parenchyma and the phloem; midrib at the upper epidermis consists of polygonal, straight-walled cells with thick cuticle. Transverse section of the stem bark shows coastal and intercoastal regions filled with sclerenchymatous cells and interspersed with various crystals of calcium oxalate. The bark surrounds the parenchymatous cells which also contain crystals of calcium oxalate. Anticlinal walls of parenchymatous cells are mostly straight, occasionally undulate and contain large quantities of tannins. The radial tangential section shows diffuse ray tissues which are heterogeneous and multiseriate. Medullary rays contain calcium oxalate  $0.15 \pm 0.07$  mm by  $0.085-0.02$  mm.

**Powder:** Leaf powder greenish, odourless; taste bland; fragments of lamina show trichome on veins and veinlets; numerous simple starch grains; lignified fibres; vessels, veins and veinlet fragments. Abundant fragments of the lamina cells in surface view; cells with thin sinuous anticlinal walls of the upper epidermis slightly thick-walled lower epidermal cells with fragments of hairs, few paracytic stomata; scattered polygonal, straight-walled cells of the upper epidermis; midrib with thick cuticle. Stem-bark with pitted vessels that are alternate and large, few  $9.8 \mu - 33.6 \mu$ . fibres of different sizes varying from  $21 \mu$  to  $50 \mu$ , some containing prismatic crystals of calcium oxalate.

#### **Chemical constituents:**

Flavonoids (Bridelilactone and Bridelilactoside, apigenin and kaempferol etc.) , triterpenes, glycosides, saponins, steroids; tannins, astringents, lignans and phenols.

#### **Tests for identity**

- Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- Macrochemical tests for the presence of flavonoids, glycosides, steroids and tannins
- Thin-layer chromatographical examination to confirm the presence of Bridelilactone, Bridelilactoside etc by co-chromatography as described in volume 2.

#### **Tests for purity:**

Moisture: Not more than 25 per cent.

Ash: Not more than 14.6 per cent.

Acid-insoluble ash: Not more than 1.8 per cent.

Water-soluble ash: Not less than 1.3 per cent.

Water-soluble extractive: Not less than 31.4 per cent.

Alcohol (70 per cent.)- soluble extractive: Not less than 31.4 per cent.

***Pharmaceutical preparations:***

N/A

***Uses:***

Antidiabetic, antihypertensive, anti-viral, antimicrobial, diuretic, antipyretic.

***Storage:***

Store in a cool dry place.

## **Caesalpinia bonduc L. (Roxb.)**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Guilandina bonduc* L.
- (b) *Guilandina bonducella* L.
- (c) *Caesalpina bonducella* (L.) Fleming
- (d) *Caesalpina crista* of Small and other authors
- (e) *Guilandina crista* (L.) Small
- (f) *Caesalpinia crista* Thunb.
- (g) *Guilandina crista* auct. non (L.) Small



### **Common names:**

Gray nicker, Nicker seed, Bonduc nut, Nicker nut, Nicker bean, Yellow nicker, Benga nut, Physic-nut (E).

### **African names:**

- (a) Arabic: Akit-makit, Banduc
- (b) Bambara: N/A
- (c) Hausa: Yayandara, Yaayan-daraa
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ayoo

### **Brief description of the plant:**

Gray nicker is a twisted, woody shrub than can grow quite big in the Amazon Rainforest; up to 20' high. It behaves more like a liana (woody vine) and can use the other trees as support. Leaves are bipinnate, large prickly pods and spiny stems. The hard and shiny seeds are green turning gray. They are used for jewelry. Gray nicker is a twisted, woody shrub than can grow quite big in the Amazon Rainforest; up to 20' high. It behaves more like a liana (woody vine) and can use the other trees as support. Leaves are bipinnate, large prickly pods and spiny stems. The hard and shiny seeds are green turning gray. They are used for jewelry.

### **Geographical distribution:**

Widespread in the tropics of the Old and New Worlds.

### **Part used:**

Root, Bark, Leaves, Nuts, Seeds.

### **Name of drug:**

Gray nicker.

### **Definition:**

Gray nicker is the dried nuts of *Caesalpinia bonduc* L. (Roxb.) (family, Fabaceae).

### **Description:**

**Macroscopical:** Perennial, Shrubs, Herbs, Vines, twining, climbing, Woody throughout, Stems erect or ascending, Stems or branches arching, spreading or decumbent, Stems 1-2 m tall, Stems greater than 2 m tall, Trunk or stems armed with thorns, spines or prickles,

Stems solid, Stems or young twigs glabrous or sparsely glabrate, Leaves alternate, Leaves petiolate, Stipules conspicuous, Stipules green, triangulate to lanceolate or foliaceous, Stipules persistent, Stipules free, Leaves compound, Leaves even pinnate, Leaves bipinnate, Leaf or leaflet margins entire, Leaflets opposite, Leaflets alternate or subopposite, Leaflets 10-many, Leaves glabrous or nearly so, Inflorescences racemes, Inflorescence terminal, Bracts conspicuously present, Flowers actinomorphic or somewhat irregular, Calyx 5-lobed, Calyx hairy, Petals separate, Petals clawed, Petals orange or yellow, Banner petal narrow or oblanceolate, Banner petal ovoid or obovate, Wing petals narrow, oblanceolate to oblong, Wing tips obtuse or rounded, Keel tips obtuse or rounded, not beaked, Stamens 9-10, Stamens completely free, separate, Stamens long exserted, Filaments glabrous, Style terete, Fruit a legume, Fruit unilocular, Fruit freely dehiscent, Fruit tardily or weakly dehiscent, Fruit orbicular to subglobose, Fruit exserted from calyx, Fruit spiny, bur-like, with hooked bristles or prickles, Fruit 1-seeded, Fruit 2-seeded, Fruit 3-10 seeded, Seeds ovoid to rounded in outline, Seed surface smooth, Seeds olive, brown, or black.

***Chemical constituents:***

Alkaloids, Glycosides and Terpenoids.

***Tests for identity***

- a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Make an extract with ammoniated chloroform. Shake with dilute hydrochloric acid. Test the acidic extract with the common alkaloid reagents (Wagner's, Dragendorff's, Mayer's reagents). A positive reaction (precipitate) is obtained.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Amenorrhea, dysmenorrhea, fever, cough, worms, flatulence, dyspepsia, jaundice, arthritis, splenomegaly and diabetes.

***Storage:***

In a cool dry place.

## ***Cajanus cajan* Millsp.**

### **Family names:**

Fabaceae

### **Synonyms:**

- (a) *Cytisus cajan* L.
- (b) *Cajanus indicus* Spreng.

### **Common names:**

Field-pea, Pigeon pea (E). Pois d'Angol, Pois de pigeon (F).

### **African names:**

- (a) Arabic: بسلة هندية او بسلة الحمام
- (b) Bambara:
- (c) Hausa: Waken-masar, Waken-turawa, Achi-shiru, Waken gizo, Waaken-danfamii, Aduwaa
- (d) Peuhl:
- (e) Swahili: Mbaazi
- (f) Yoruba: Otili, Otinli, Feregede



### **Brief description of the plant:**

Annual or biennial shrub of 2 m high with stalks and leaves covered with white down; trifoliolate leaves; short leaf stalks, oblong lanceolate folioles, inflorescence corymbiform racemes; flowers brownish yellow; oblong linear pods obliquely constricted between the seeds that vary from 3 to 6.

### **Geographical distribution:**

Originates from India and cultivated in the tropical regions of Africa.

### **Part used:**

The dried ripe seeds known as pigeon pea.

### **Names of drug:**

Semen Cajani Indici, Cajanus seed, Pigeon pea. Seme de Cajani.

### **Definition:**

Pigeon pea is the dried ripe seeds of *Cajanus cajan* Millsp. (family, Fabaceae),, containing not more than 3 per cent foreign organic matter.

### **Description:**

Odourless when dry, characteristic when soaked in water; taste, slight, characteristic.

**Macroscopical:** Seeds are more or less spherical or sub-spherical, with smooth, glassy, light to dark brown surface, 5 mm to 7.5 mm in length, 5 mm to 6 mm in width and 3.5 mm to 5 mm in thickness. It has a strongly convex dorsal side and more or less straight ventral side. The hilum and micropyle are neighbouring each other and a short raphe is present in the lower part of the ventral side; the hilum, covered by whitish remains of the funicle in the form of two prominent ridges mounted on the hilum and occupies most of the ventral side in the form of white long line; the seed being anatropous. The micropyle, opposite to the radicle in the upper most part of the ventral side, the seed hard to break, but becomes soft when soaked in water for about 24 hours. The seed is formed of thin hard testa enclosing a large embryo filling its cavity, being exaluminous. The embryo is

found of two large cotyledons enclosing the plumule and a small radicle slightly projecting on the upper most part of the dorsal and ventral sides.

**Microscopical:** The seed shows a thin leathery testa with very thin cuticle, enclosing a slightly accumbent embryo. The testa, formed of three layers, the epidermis, the hypodermis and the parenchymatous nutritive layer. The epidermis consists of one layer of cells in the different regions and two layers in the hilum region, palisade-like, being radially elongated very closely packed, nearly equal in length in the different regions except the hilum regions where they are slightly shorter having unequally thick, highly refractive cellulosic, non-lignified walls with bar-like thickening, lumen narrow at the outer extremity and wide, rounded or irregular at the base. These cells show a shining line near its outer extremity. The cells appear from both upper and lower sides polygonal 5-6 sides, isodiametric with thick walls with narrow or wide lumen. The epidermal cells measure 13 to 21 microns in length, 9 to 17 microns in width and 82 to 107 microns in height. The hypodermis consists of a continuous single layer of radially elongated cells, each resembling the tibial bone, basket or watch glass, consisting of narrow, shaft-like middle part and two swollen extremities, having cellulosic, non-lignified, highly refractive, unevenly thickened walls, with narrow lumen in the middle part and wide at both extremities, the intercellular spaces between the constricted middle parts of each of two contiguous bearer cells are wide and appear hexagonal or oval in shape. The cells measure 9 to 17 microns in length, 13 to 21 microns in width and 43 to 64 microns in height. In surface view, the cells appear polygonal in outline and show two concentric rings, the outer ring corresponding to the wide lumen, and the inner ring to the narrow lumen. The parenchymatous nutritive layer consists of 8 layers or more of large tangentially elongated cells in the inner part and smaller cells in the outer, having thin walls and containing large masses of protein filling the entire cell cavity. The embryo is formed of small thin-walled parenchymatous cells, the cotyledons consist of an epidermis of tabular mostly quadrangular cells and a mesophyll of radially elongated cells, filled with starch granules. Aleurone grains are extended in the epidermal cells forming aleurone layer, and also they are present in subepidermis and in few cells of mesophyll, very small, polygonal or rounded and each containing one globoid.

**Powder:** Yellowish-brown, odourless, with slight characteristic taste. It is characterized by the presence of fragments of the seed coat showing more or less polygonal isodiametric cells with thick walls and narrow lumen when seen in top view and relatively wide lumen when seen in base view, fragments of hypodermis with polygonal cells with two concentric rings fragments of parenchymatous nutritive layer of the seed showing elongated cells containing deposits of proteins, occasional parenchymatous cells from embryo containing starch granules and aleurone grains, starch grain polyhedral with round angles, oval or rarely rounded, simple or compound, showing faint concentric striation and centric fissured, 2-3 branched hilum.

#### **Chemical constituents:**

Pigeon pea seeds contain protein (10-11 per cent), fat (1.7-2 per cent); carbohydrates (68-70 per cent); calcium (154-180 mg/100 g); phosphorous (255-284 mg/100 g) and iron (8.8-92 mg/100 g), in addition to saponins and flavonoids. Phenylalanine, p-hydroxy benzoic acid, tryptophan and cajaminose are present in the aqueous ethanolic and water extracts and are responsible for its antisickling (reversal and inhibitory) activity..

**Tests for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Phytochemical tests to confirm the presence of glycosides and for flavonoids

**Tests for purity:**

Ash 10.55-11.20 per cent; acid insoluble ash, 0.14-0.15 per cent and water-soluble ash 3.79-4.23 per cent, crude fiber 4.66-9.59 per cent.

**Uses:**

Seeds are used as a food in the cooked form. Also useful as antisickling (reversal and inhibitory) agent.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Calotropis procera (Aiton) W. T. Aiton**

### **Family name:**

Asclepiadaceae.

### **Synonyms:**

*Asclepias procera* Aiton.

### **Common names:**

- (a) Giant Swallow wort, Milkweed, Apple of Sodom, Giant milkweed, Roostertree (E)
- (b) Arbre à soie du Sénégal; Pomme de Sodome (F)

### **African names:**

- (a) العشار الباسق أو العشر Arabic: (a) Arabic
- (b) Bambara: Pompogolo, Mpopopogolo, Ngeyi, , Fogofoko, Tomo ndeke
- (c) Hausa: Tumfaafia, Bambambele,
- (d) Peuhl: Bwami, Bamanbi, Baawan bawan
- (e) Swahili: Mpamba mwitu, Ol dule, Olmasiigi
- (f) Yoruba: Bomubomu, Bomibomu



### **Brief description of the plant:**

*Calotropis procera* is a shrub or small tree up to 2.5 m (max. 6) high, stem usually simple, rarely branched, woody at base and covered with a fissured, corky bark; branches somewhat succulent and densely white tomentose; early glabrescent. All parts of the plant exude a white latex when cut or broken. Leaves opposite, simple, subsessile, stipule absent; blade oblong-obovate to broadly obovate, 5-30 x 2.5-15.5 cm, apex abruptly and shortly acuminate to apiculate, base cordate, margins entire, succulent, white tomentose when young, later glabrescent and glaucous. Inflorescence a dense, multiflowered, umbellate cyme arising from the nodes and appearing axillary or terminal; flowers hermaphroditic, pentamerous; pedicle 1-3 cm long; calyx 5-lobed, shortly united at the base, lobes ovate, 4-7 x 3-4 mm, glabrescent. Fruit, a simple, fleshy, inflated, subglobose to obliquely ovoid follicle up to 10 cm or more in diameter; seeds numerous, flat obovate, 6 x 5 mm, with silky white pappus 3 cm or more long. The specific name, procera is Latin for tall or high.

### **Geographical distribution:**

An introduced plant originally from Africa and Asia now naturalized across northern Australia and also in South Australia.

### **Part used:**

Leaves, Flowers, root bark

### **Name of the drug:**

Caloptropis. Mudar

### **Definition:**

Caloptropis or Mudar is the dried root of *Calotropis procera* (Aiton) W. T. Aiton (family, Asclepiadaceae) freed from its outer cork layer. **Description:**

It occurs in commerce in short quilled pieces about 1/5 to 1/10 of an inch thick and not over 1 1/2 inch wide. Deeply furrowed and reticulated

**Macroscopical:** Shrub or small tree to 4 m high. Stems with soft thick corky bark. Leaves grey-green, 5–20 cm long, 4–15 cm wide, lower leaf surface densely covered in short white hairs; base of leaf heartshaped and stem-clasping; on leaf stalk to 0.4 cm long. Fruit a grey-green pod, splitting to release seeds. Seeds numerous, ovate, flattened, brown, ending in a tuft of white silky hairs.

Deeply furrowed and reticulated, colour greyish buff, easily separated from periderm. Fracture short and mealy, taste bitter, nauseous, acrid; it has a peculiar smell and is mucilaginous; official in India and the Colonial addendum for the preparation of a tincture.

**Chemical constituents:**

A yellow bitter resin; a black acid resin; Madaralbum, a crystalline colourless substance; Madarfluavil, an ambercoloured viscid substance; and caoutchouc, and a peculiar principle which gelatinizes on being heated, called Mudarine. Also, a neutral principle, Calatropin, a very active poison of the digitalis type has been reported present in it.

**Tests for identity**

- a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions.
- b) Marcochemical test to confirm the presence of cardiac glycosides
- c) Choromatographical examination to confirm the presence of calotropin by co-chromatography

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Febrifuge, anthelmintic, depurative, expectorant, asthma

**Storage:**

In a cool dry place

## **Canavalia ensiformis L. (DC.)**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Dolichos ensiformis* L.
- (b) *Malocchia ensiformis* (L.) Savi
- (c) *Dolichos acinaciformis* Jacq.
- (d) *Dolichos ensiformis* L.
- (e) *Dolichos pugioniformis* Rauschert



### **Common names:**

- (a) Garde Place, Giant Stock-bean, Horse Bean, Jack Bean (E)
- (b) Pois De Sabre (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Ladiko, Wakenankwai, Baran-chaki, Waaken-bisa
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ponondo, Sese nla

### **Brief description of the plant:**

Perennial climber, or stems trailing, 3–15 m long. Stems appressed ferruginous pubescent, glabrescent. Leaflets 6–17(23) × 4–12(15) cm, ovate, acuminate to a short blunt tip or elsewhere rarely rounded, sparsely to densely pubescent on both surfaces; petiole 4–13(16) cm long; stipules c. 2 mm long, rather thick. Inflorescences 18–50 cm long, long-pedunculate; pedicels 2 mm long; bracteoles just over 1 mm long, obtuse. Calyx pubescent; tube 6–9 mm long; upper lip 4–5 mm long, rounded or emarginate. Standard mauve with white veins and green towards the base, 2.7–3 × 1.7 cm, oblong; wings and keel mauve, white towards the base. Pods 10–17 × 2.5–3 cm, linear-oblong, each valve with a sutural rib and an extra rib just below this, densely ferruginous pubescent at first, later somewhat glabrescent. Seeds brown or reddish-brown, sometimes marbled with black, 16–20 × 11–20 × 7–11 mm; hilum 11–15 mm long.

### **Geographical distribution:**

Tropical Africa

### **Part used:**

Seed

### **Name of drug:**

Giant stock-bean

### **Definition:**

Giant stockbean is the dried seed of *Canavalia ensiformis* L. (DC.) (family, Fabaceae)

### **Description:**

**Macroscopical:** Hardy, drought-resistant annual, immune to most pests; cultivated extensively for forage and green manuring. Young pods and immature seeds used as a vegetable for human consumption; mature seeds ground for livestock feeding. Usually an

erect bushy annual crop plant 1–2 m tall, but can become a perennial climber to 10 m. Stems glabrous to appressed pubescent. Leaflets 6–20 × 3–12 cm, elliptic or ovate-elliptic, subacute to shortly acuminate, glabrescent to sparsely pubescent on both surfaces; petiole 2–11 cm long; stipules soon deciduous. Inflorescences 6–40 cm long, long-pedunculate; pedicels 2–5 mm long; bracteoles c. 2 mm long, obtuse. Calyx sparsely pubescent; tube 6–7 mm long; upper lip 4–5 mm long, truncate. Standard rose to purple, 2.7–3 cm long. Pods 15–35 × 3–3.5 cm, linear-oblong, each valve with a sutural rib and an extra rib just below this, pubescent, glabrescent. Seeds white with a brownish mark round the hilum, 14–21 × 10–15 × 7–11 mm; hilum 5.5–9 mm long.

**Chemical constituents:**

An insulin-binding protein was isolated from *Canavalia ensiformis* seed coat, by using an insulin-Sepharose 4B affinity chromatography, and the protein was identified as canavalin (Canavalia 7S globulin). The entomotoxic effect is due to the release of a 10-kDa peptide by cathepsin-like enzymes in the insect's midgut. *Canavalia ensiformis*, *C. gladiata* and *C. virosa* seeds contain high levels of trypsin inhibitor, lectins and canavanine. The proteins urease and canatoxin (a toxic protein), a variant form of the jackbean urease. Researchers have cloned a cDNA encoding another isoform of urease, called JBURE-II. *C. ensiformis* seeds exhibited a relatively high level (69.0%) of in vitro protein digestibility.

**Tests for identity**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) By using an insulin-Sepharose 4B affinity chromatography, confirm the presence of canavalin (see under chemical constituents above)

**Tests for purity:**

Determine the *in vitro* protein digestibility. It should not be less than 60 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

Insecticide, Renal perfusion pressure.

**Storage:**

In a cool dry place.

## **Capsicum annuum L.**

### **Family name:**

Solanaceae.

### **Synonyms:**

- (a) *Capsicum cerasiforme* Lank.
- (b) *Capsicum chamaecerasus* Nees.
- (c) *Capsicum hispidum* Dunal
- (d) *Capsicum longum* DC.
- (e) *Capsicum indicum* Lobel.,
- (f) *Capsicum indicum* Dierb.,



### **Common names:**

Red pepper (E). Piment doux. Piment des jardins. Gros piment. Poivron (F).

### **African names:**

- (a) Arabic: فلفل رومي او فلفل احمر
- (b) Bambara: Forotu, Kilikili
- (c) Hausa: Barkono, Barkhannu, Tasshii, Tsiiiduhuu, Tonkaa
- (d) Peuhl: N/A
- (e) Swahili: Pilipili, Pilipili-hoho
- (f) Yoruba: Ata sisebe, Ata jije, Ata-gbasejo, koruko

### **Brief description of the plant:**

*Capsicum annuum* L.: Annual or biennial suffrutescent plant that can reach over 1 m in height; ovate lanceolate leaves of 6 x 3.5 cm, inflorescence axillary bunches, greenish white flowers, fruits polymorphic berries 18 cm long, red when ripe.

### **Geographical distribution:**

Grown in Africa within the tropics.

### **Part used:**

The dried entire fruit.

### **Names of drug:**

Fructus Capsici Annum. Bombay Capsicum. Red Pepper.

### **Definition:**

Red pepper is the dried ripe fruits of *C. annuum* L. (family, Solanaceae) containing not more than 3 per cent of calyx and pedicel, and not more than 1 per cent of foreign organic matter.

### **Description:**

Colour, red, yellowish-red or brownish-red; odour, characteristic but not powerful; taste, slightly pungent, the pungency not destroyed by solutions of caustic alkalies (1 in 50), but is destroyed by potassium permanganate T.S. (distinction from gingerol and paradol).

**Macroscopical:** Fruit, berry, nearly globular, ovoid or oblong, bilocular about 5 to 12 cm long and 2 to 4 cm wide in greatest width; red, yellowish-red or brownish-red; superior and attached to a 5-toothed calyx and a cylindrical, curved or hooked pedicel about 2-5 mm thick. Pericarp glabrous, shining, somewhat shrivelled, thin and leathery. Seeds numerous, brownish yellow, flat, subreniform, albuminous with curved embryo about 3-5

mm long, loose or attached to a reddish membranous dissepiment, not extending throughout the entire length of the fruit.

**Microscopical:** Outer epidermis of the pericarp consists of polygonal thick straight, pitted-walled cells, covered by a thick cuticle which is not uniformly striated; the outer tangential and most of radial walls are much thickened; the hypodermis consists of several layers of cuticularised collenchymatous cells; Mesocarp of several layers of thin-walled cellulosic parenchyma, containing numerous, reddish oil globules, occasional idioblasts containing microsphenoidal or prismatic crystals of calcium oxalate and traversed by small vascular bundles; inner most layer of thin-walled giant cells; Endocarp, composed of islets of isodiametric sclereids with thick, pitted, lignified, sinuous walls; one islet over the cavity of each giant cell and separated by small thin-walled parenchyma cells. Dissepiment shows an epidermis, formed of polygonal cells; the cuticle of which being raised by secretion of reddish oily droplets, containing, sometimes crystals of capsaicin; the remainder parenchyma contain occasional idioblasts of microsphenoidal crystals of calcium oxalate, and traversed by vascular bundles. Seed-coat consists of an epidermis composed of yellowish, very large, sinuous-walled cells with characteristic thickening on the inner tangential and radial walls, and a nutritive layer of collapsed parenchyma cells. Endosperm, of polygonal parenchymatous cells with highly refractive colourless walls and containing fixed oil and aleurone grains. Calyx with outer epidermis having anomocytic stomata; inner epidermis, with numerous glandular hairs having unicellular stalk and multicellular head, few non-glandular hairs of one or more cells, but no stomata; mesophyll containing many idioblasts of microsphenoidal crystals of calcium oxalate and a few small vascular bundles. Pedicel with epidermis consisting of axially elongated subrectangular cells, numerous stomata and scattered glandular hairs; pericycle with well-developed fibres, isolated or in groups of 2 or 3; xylem with radiating medullary rays; perimedullary phloem with fibres on the inner border.

**Powder:** Yellowish-brown to brownish-red; characterised by fragments of the outer epidermis of the seed-coat, consisting of lignified cells, with thick yellowish sinuous walls; fragments of the endosperm with polyhedral cells containing oil globules and aleurone grains, scattered reddish oily droplets; fragments of the outer epidermis of the pericarp; scattered idioblasts of microsphenoidal crystals of calcium oxalate, fragments of sclerenchymatous islets from the inner epidermis of the pericarp; few fragments from the calyx and pedicel; only few small vessels and fibres but no starch granules.

**Chemical constituents:**

Capsicum contains the pungent principle capsaicin, a minute amount of a liquid alkaloid, fixed oil, carotin, a red colouring matter capsanthin and a lot of vitamin C.

**Test for identity:**

- a) Macroscopical examination of the specimen to ensure compliance with the above given Descriptions
- b) Choromatographical examination to confirm the presence of capsaicin by co-chromatography

**Test for purity:**

N/A

***Pharmaceutical preparations:***

Tinctura capsici.  
Unguentum capsici.  
Capsicum plaster.

***Uses:***

It is applied externally as a stimulant and counter irritant; internally, as a pungent stomachic, carminative and stimulant, to dispel flatulence and rouse the appetite.

***Storage:***

In well-closed containers, protected from light.

## **Capsicum frutescens L.**

### **Family name:**

Solanaceae

### **Synonyms:**

- (a) *Capsicum baccatum* L.
- (b) *Capsicum fastigiatum* Bl.

### **Common names:**

Capsicum fruit. Japanese chillies (E).  
Piment de cayenne, Piment enrage,  
Petit piment, Pilipili (F).

### **African names:**

- (a) Arabic: شطة
- (b) Bambara: Foratu, Forotu, Gamaho, Gamako, Ebaba kani
- (c) Hausa: Barkono, Barkhannu, Tasshii, Tonkaa, Tsiiiduhuuu
- (d) Peuhl:
- (e) Swahili: Pilipili
- (f) Yoruba: Ata weere,

### **Brief description of the plant:**

*Capsicum frutescens* L.: Perennial branched sub-shrub sometimes exceeding 1 m in height; yellowish white flowers, smaller fruits do not exceed 4 cm.

Other characteristics similar to those of *C. annuum* L.

### **Geographical distribution:**

Grown in the Mediterranean region and Africa within the tropics.

### **Part used:**

Fruits.

### **Names of drug:**

Fructus Capsici Frutescens. Capsicum.

### **Definition:**

Japanese chillies are the dried ripe fruits of *Capsicum frutescens* L. (family, Solanaceae). Capsicum is free from pedicels and calices, and not more than 1 per cent of foreign organic matter.

### **Description:**

Odour, characteristic but not powerful; taste, less pungent than *C. minimum*; the pungency is not destroyed by solutions of caustic alkalis (1 in 50), but is destroyed by potassium permanganate T.S. (distinction from gingerol and paradol).

**Macroscopical:** Fruit, berry, oblong conical, obtuse, somewhat flattened, bilocular about 15 to 26 mm long and 5 to 9 mm wide; bright crimson-red colour; superior and sometimes remains attached to a small, inconspicuous, 5-toothed calyx, and a slender straight pedicel, about 1 mm thick, which is as long as or rather longer than the fruit itself. Pericarp, glabrous, shining somewhat shrivelled, thin, leathery and more or less translucent. Seeds, 10 to 20 in each fruit, brownish-yellow, 'flat, subreniform, albuminous, with curved embryo, about 3 to 4 mm long, either loose or attached to a thin reddish, membranous dissepiment.



**Microscopical:** Outer epidermis of the pericarp consists of strongly thick walls, radiate lumen, smooth cuticle, rectangular cells, 25 to 60 microns wide. Mesocarp, including the hypodermis; have thick, pitted, cuticularised walls, cellulosic parenchyma containing numerous reddish oil globules, occasional idioblasts containing microsphenoidal or prismatic crystals of calcium oxalate and traversed by small vascular bundles; innermost layer, of thin-walled giant cells. Endocarp, composed of islets of isodiametric sclereids with thick, pitted, lignified, sinuous walls, one islet over the cavity of each giant cell, and separated by thin-walled small parenchymatous cells. Dissepiment shows an epidermis, formed of thinwalled polygonal cells, the cuticle of which being raised by secretion of reddish oily drops, containing, sometimes, crystals of capsaicin; the remainder parenchyma, containing occasional idioblasts of microsphenoidal crystals of calcium oxalate, and traversed by vascular bundles. Seed coat consists of an epidermis composed of yellowish, very large, sinuous walled cells, with characteristic thickening on the inner tangential and radial walls, and a nutritive layer of collapsed parenchymatous cells. Endosperm, formed of polygonal cellulosic parenchymatous cells with highly refractive colourless walls and containing fixed oil and aleurone grains, 3 to 6 microns in diameter. Calyx, with outer epidermis having stomata of cruciferous type; inner epidermis, with numerous glandular hairs having uniseriate stalks and multicellular yellowish heads, few non-glandular hairs of one or more cells, but no stomata, mesophyll contains many idioblasts of microsphenoidal crystals of calcium oxalate and a few small vascular bundles. Pedicel, with epidermis consisting of axially elongated subrectangular cells, numerous stomata and scattered glandular hairs; pericycle, with well-developed fibres, isolated or in groups of 2 or 3; xylem with radiating medullary rays; perimedullary phloem, with fibres on the inner border.

**Powder:** Powdered Capsicum is yellowish-brown to brownish-red; characterized by fragments of the outer epidermis of the seed-coat, consisting of lignified cells, with yellowish thick and sinuous walls; fragments of the endosperm with polyhedral cells containing globules of fixed oil and aleurone grains, 3 to 6 microns in diameter; scattered reddish oily droplets; fragments of the outer epidermis of the pericarp; scattered idioblasts of microsphenoidal crystals of calcium oxalate; fragments of sclerenchymatous islets from the inner epidermis of the pericarp; few fragments from calyx and pedicel; only few small vessels, and fibres, but no starch granules.

**Chemical constituents:**

Pungent principle, capsaicin (0.05 to 0.14 per cent), minute quantity of a liquid alkaloid which is not pungent, fixed oil, carotin, red colouring matter, capsanthin.

**Tests for purity:**

- (a) Alcohol (60 per cent) extractive, not less than 20 per cent; non-volatile ether extractive, not less than 12 per cent, when dried at 110°C.
- (b) Ash not more than 8 per cent; acid-insoluble ash, not more than 1.5 per cent.

**Pharmaceutical preparations:**

Tinctura Capsici.

Unguentum Capsici.

**Uses:**

Externally as a stimulant and counter-irritant, internally as a pungent stomachic carminative and stimulant to dispel flatulence and arouse the appetite.

***Storage:***

In well-closed containers, protected from light in a cold place.

## **Carica Papaya L.**

### **Family name:**

Caricaceae

### **Synonyms:**

- (a) *Carica hermaphrodita* Blanco
- (b) *Carica mamaya* Vellon

### **Common names:**

Pawpaw (E). Papayer (F).

### **African names:**

- (a) البَيْازُ أو الْبَيَايَا أو دِبَاءُ الْهَنْدَ Arabic: *bayaz* or *baiyaa* or *dibaa al-hend*
- (b) Bambara: Papayi, Papiu, Papia, Mandje
- (c) Hausa: Gwandau, Gwandda, Gwandar rabeji, Gwandar daafijii, Gwandar masar
- (d) Peuhl: Papayi, Papayo
- (e) Swahili: Papai, Papayu
- (f) Yoruba: Igi-ibepe, Ibepe, Sayinbo

### **Brief description of the plant:**

Shrub of 4 to 5 m high, swollen trunk, straight, branches out without explicit design, remarkable foliar scars, leaf for the most part petiolated with extremely divided lamina; dioecious with female feet with flowers sessile on the trunk and male stock with flowers borne by large loose panicles, fruits vary in size and colour, pulp yellow or red when ripe. The plant contains a copious white latex.



### **Geographical distribution:**

Originates from central America and widely grown in tropical Africa.

### **Part used:**

Fresh ripe fruits.

### **Names of drug:**

Fructus carica papaya. Carica papaya fruit. Fruit de carica papaya.

### **Definition:**

*Carica papaya* fruit is the fresh ripe fruits of *Carica papaya* L., family Caricaceae, containing not more than 2 per cent foreign organic matter.

### **Description:**

Odour of ripe fruit is faintly aromatic and has a sweet taste.

**Macroscopical:** Fruit, berry, oblong to oblong ovate in shape, dark green becoming yellowish orange on ripening with numerous seed on parietal placenta, epicarp is leathery, mesocarp is fleshy, orange-coloured. The endocarp is unidentified. The fruit is about 15-22 cm long and 7-11 cm broad.

**Microscopical:** The epidermis of the pericarp consists of polygonal isodiametric cells with straight anticlinal walls, stomata, rare, of the ranunculaceous type; no hairs. Mesocarp, formed of several layers of thin-walled parenchymatous cells, the outermost layer more or less tangentially elongated and with smaller cells. The inner layer is formed of large rounded or oval parenchymatous cells. The vascular strands, formed of narrow, non-lignified spiral vessels and a patch of phloem. The mesocarp shows numerous

anastomosing laticiferous vessels, containing substance staining yellow colour with iodine and few starch granules. Calcium oxalate being absent.

**Chemical constituents:**

The drug contains an alkaloid, amino acids, fat, resin, sugars ( $\alpha$ -D-glucose, B~D-glucose, fructose, galactose and arabinose) pectin in the unripe and ripe fruits, also proteolytic enzyme "Papain" in the latex of the unripe fruit.

**Tests for identity:**

- a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions
- b) Macrochemical examination to confirm the presence of alkaloid

**Assay:**

20 g of the drug is moistened with dilute ammonium hydroxide, dried and exhaustively extracted by percolation with chloroform containing 20 per cent ethanol. The chloroform-alcohol extract is evaporated on a water bath. The residue is dissolved in 50 ml of N/10 hydrochloric acid portionwise, then filtered through a small piece of cotton wool into a separating funnel. The dish and filter are washed twice; each with 5 ml portions of N/10 hydrochloric acid, and then with successive portions; each of 5 ml of distilled water till free from alkaloids. The acidic solution and washings are combined, rendered alkaline with ammonium hydroxide and extracted

with chloroform several times till exhaustion. The combined chloroform extracts are washed with 5 ml distilled water, transferred to an extraction flask and the chloroform distilled off, 5 ml neutral absolute alcohol added, evaporated to dryness on a water bath and residue further heated for 15 minutes. Residue is dissolved in 2 ml chloroform, 25 ml N/50 hydrochloric

acid added, warmed to drive off the chloroform, cooled and titrated with N/50 sodium hydroxide using methyl red as indicator. Each ml N/50 hydrochloric acid is equivalent to 0.00478 g of alkaloids calculated as carpaine.

**Uses:**

As amoebicide. The milky juice of the unripe fruits used as cosmetic, anthelmintic, also has oxytocic properties. Ripe fresh fruits are stomachic, carminative, digestive and diuretic.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Carthamus tinctorius L.**

### **Family name:**

Asteraceae

### **Synonyms:**

- (a) *Centaurea carthamus* E.H.L.Krause
- (b) *Carthamus glaber* Burm.f.
- (c) *Carduus tinctorius* (L.) Falk
- (d) *Carduus tinctorius* Ehrh.

### **Common names:**

- (a) Safflower, False saffron, (E)
- (b) Carthame, Safran bâtarde (F)



### **African names:**

- (a) Arabic: العصفر أو قرطم عصفوري
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

An annual herb, 0.4–1.3 m high, much branched, glabrous, spiny. Branches stiff, cylindrical, whitish in colour. Leaves simple, spirally arranged, without petiole; oblong, ovate, lanceolate or elliptic; dark green, glossy, 3–15 cm long, 1.5 cm wide, spinous along the margin and at the tip. Flowers solitary, terminal, 2.5–4.0 cm in diameter with spreading outer leafy spiny bracts and inner triangular bracts, spine tipped, forming a conical involucre, with small opening at the tip. Florets, 30–90, tubular, hermaphrodite, usually orange-yellow in colour; corolla tubes 4 cm long, with five pointed segments. Fruits white or grey, tetragonal achenes, about 8 mm long, without pappus

### **Geographical distribution:**

Middle-east, Afghanistan, Ethiopia and India. Widely cultivated around the world.

### **Part used:**

Flowers

### **Name of drug:**

Flos Carthami. Safflower

### **Definition:**

Safflower is the dried flowers of *Carthamus tinctorius* L. (family, Asteraceae)

### **Description:**

Odour: characteristic aromatic; taste: slightly bitter. Red to red-brown corollas, yellow styles and stamens, rarely mixed with immature ovaries; corollas tubular, 1–2 cm long, with five segments; long pistils surrounded by five stamens; pollen grains yellow and spherical, approximately 50.0 µm in diameter, with fine protrusions on the surface.

**Macroscopical:** Safflower (*Carthamus tinctorius* L.) is an annual herbaceous, highly branched plant that can reach 0.3-1.5 m in height. It has an extensive root system with a strong fleshy taproot reaching 2-3 m in depth and thin lateral roots exploring the first 30

cm of the soil (Ecoport, 2010; Oyen et al., 2007). The stems are glabrous, greenish white, cylindrical and woody near the base. The leaves are sessile, arranged in a rosette from the base, 4–20 cm long × 1–5 cm broad, glossy dark green; the upper leaves bear many sharp spines. Each stem bears a terminal inflorescence. It is a globular capitulum, 1.3-3.5 cm in diameter, containing 20-80 tubular orange-red flowers becoming dark red during flowering. Each flower produces one fruit. Safflower fruits are achenes, usually called "seeds", surrounded by a thick fibrous hull. They are smooth, shiny and angular, about 6-9 mm long, white or brownish and white with grey, brown or black stripes. They generally contain 33-60% hull and 40-67% kernel.

*Carthamus* comprises about 15 species. Section *Carthamus* comprises *Carthamus tinctorius* and its 5 closest relatives, all annual species from western Asia with  $n = 12$ . Because *Carthamus tinctorius* has been cultivated over a wide area since ancient times, and because cross-pollination is fairly common, variability in safflower is large. The morphological differences are most obvious in branching (height, density), leaves (presence or absence of rosette leaves, more or less spiny leaves), involucral bracts (form, pubescence, spiny or not), inflorescences (number and size of heads), flower colour (reddish, orange, yellow, white), and achenes (size, presence or absence of pappus).

**Powder:** Orange-yellow with fragments of corolla, filament and stigma. Long tubular secretory cells, up to 66 µm in diameter, usually accompanied by vessels containing yellowish-brown to reddish-brown secretion. Outer walls of terminal epidermal cells of corolla lobes projecting to be tomentellate.

Upper epidermal cells of stigma and style differentiated into conical unicellular hairs, acuminate or slightly obtuse at the apex. Pollen grains subrounded, elliptical or olivary, with three germinal pores, exine dentate spinose. Parenchymatous cells containing crystals of calcium oxalate, 2–6 µm in diameter

#### **Chemical constituents:**

The major constituent is the chalcone C-glucoside carthamin (up to 8.5%). Other significant constituents include fatty acids, the chalcone hydroxysaffl or yellow A; the nitrogenous chalcone tinctoramine; the quinoid C-glycosides saffl or yellow A and safflor yellow B; the flavonoids neocarthamin, quercetin, rutin, kaempferol and related hydroxy derivatives and glycosides; dotriaccontane-6,8-diol, erythrohentriacontane-6,8-diol, heptacosane-8,10-diol, triacontane-6,8-diol and related alkanes.

#### **Tests for identity:**

- Macroscopical and microscopical examination of the plant material to comply with the descriptions above.
- Carry out thin layer chromatography tests to confirm the presence of carthamin using this compound as a reference by co-chromatography.
- Confirm the presence of carthamin by spectrophotometry.

#### **Tests for purity:**

Foreign organic matter: Not more than 2 per cent. .

Total ash: Not more than 18 per cent.

Moisture: Not more than 13 per cent.

#### **Pharmaceutical preparations:**

N/A

**Uses:**

Treatment of amenorrhoea, dysmenorrhoea and wounds or sores with pain and swelling, and prevention of atherosclerosis.

**Storage:**

To be stored in closed glass containers protected from moisture.

## **Cassia fistula L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia fistulosa* L. ex R.W. Long & Lakela
- (b) *Cassia fistuloides* Collad.
- (c) *Cassia rhombifolia* Roxb.
- (d) *Bactyriobium fistula* Willd.
- (e) *Cassia bonplandiana* DC.
- (f) *Cassia excelsa* Kunth
- (g) *Cathartocarpus excelsus* G. Don
- (h) *Cathartocarpus fistuloides* (Collad.) G. Don
- (i) *Cathartocarpus rhombifolius* G. Don



### **Common names:**

Canafistula, Golden shower, Indian laburnum, Purging fistula, Purging cassia (E)

### **African names:**

- (a) Arabic: خيار شنبر أو كاسيا فستيلا أو الخروب الهندي
- (b) Bambara: N/A
- (c) Hausa: Filasko
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Aidan tooro

### **Brief description of the plant:**

The golden shower tree is a medium-sized tree, growing to 10–20 metres (33–66 ft) tall with fast growth. The leaves are deciduous, 15–60 centimetres (5.9–24 in) long, pinnate with 3 to 8 pairs of leaflets, each leaflet 7–21 centimetres (2.8–8.3 in) long and 4–9 centimetres (1.6–3.5 in) broad. The flowers are produced in pendulous racemes 20–40 centimetres (7.9–16 in) long, each flower 4–7 centimetres (1.6–2.8 in) diameter with five yellow petals of equal size and shape. The fruit is a legume, 30–60 centimetres (12–24 in) long and 1.5–2.5 centimetres (0.59–0.98 in) broad, with a pungent odor and containing several seeds. The seeds are poisonous.

### **Geographical distribution:**

Native to South Asia, including India, Sri Lanka and Myanmar, this tree is now widely grown throughout the tropics.

### **Part used:**

Fruit.

### **Name of drug:**

Purgating cassia

### **Definition:**

Purgating cassia is the dried ripe fruits of *Cassia fistula* L. (family, Fabaceae)

### **Description:**

**Macroscopic:** Pods are pendulous, 40-70cm by 20-27mm. They smooth, straight or slightly curved, cylindrical, shortly stalked, suddenly contracted into a blunt point and dark chocolate brown in colour. The round distal end bears a small point marking the position of the style and the base or proximal end is extended as a short stalk widening below towards the remains of the thalamus. Pods are indehiscent and have dorsal and ventral sutures distinctly marked by horizontal smooth lines running along the whole length. Internally, the pod is divided by thin-buff coloured, transverse, dissepiments at intervals of about 0.5cm. Seeds are about 25-100 in number per pod and each is immersed in a dark-cloured pulp. Seed is small, ovoid, somewhat compressed. Testa is very hard, smooth and shiny, pale orange brown in colour, marked down with one flattened surface by a raised line.

**Microscopic:** Epidermis of fruit consists of rectangular to circular-shaped cells with thick cell walls. Occasional stomata of the paracytic type are present. Fibres and calcium oxalate crystals are present. The transverse section of the entire fruit shows 2-3 layers of rectangular-shaped lignified cells usually 15-70 $\mu$  long, a layer of sclerenchymatous tissue containing stone cells and layers of parenchyma. Transverse section of the seed consists of a mucilage stratum followed by long, vertical palisade cells and hourglass cells. The embryo is mainly made up of parenchyma.

**Powder:** Light yellow to brown in colour with slight odour. Diagnostic structures include the presence of rectangular to circular-shaped epidermal cells showing paracytic stomata. Fragments of lignified fibres, vessels of the vascular bundles and hourglass cells.

### **Chemical constituents:**

Purgings fistula's laxative actions come from a group of well documented compounds called anthraquinones that are found in all Cassia and Senna plants in varying degrees. The seeds contain approximately 2% anthraquinones, 24% crude protein, 4.5% crude fat, 6.5% crude fiber, and 50% carbohydrates. The leaves have been documented with 15.88% crude protein, 6.65% crude fat, 20% crude fiber, and 39.86% carbohydrates. In addition to the anthraquinone glycosides, other compounds documented in the plant include fistulic acid, rhein, rheinglucoside, galactomannan, sennosides A and B, tannin, phlobaphenes, oxyanthraquinone substances, emodin, chrysophanic acid, fistuacacidin, barbaloin, lupeol, beta-sitosterol, and hexacosanol.

### **Tests for identity:**

- a) Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above.
- b) Macrochemical test (Borntrager's) to confirm the presence of anthraquinone glycosides
- c) Thin-layer chromatographic tests to confirm the presence of Emodin by co-chromatography.

### **Tests for purity:**

Moisture: Not more than 10 per cent.

Ash: Not more than 5 per cent.

Acid-insoluble ash: Not more than 0.3 per cent.

Water-soluble ash: Not less than 1.5 per cent.

Alcohol-soluble extractives: Not less than 20 per cent. (Coarse powder)

Water-soluble extractives: Not less than 2.3 per cent.

***Pharmaceutical preparations:***

See under Alexandrian senna.

***Uses:***

Laxative and purgative. 2g of the powdered pod to be taken at bedtime as laxative.

***Storage:***

In well-closed containers protected from light and moisture.

## **Cassia sieberiana DC.**

### **Family name:**

Fabaceae.

### **Synonyms:**

*Cassia kotschyana* Oliv.

### **Common names:**

African laburnum, Drumstick Tree (E)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Sindian
- (c) Hausa: Arahe, Gammafada, Malga, Marga
- (d) Peuhl: Samassindiangui, Sindia
- (e) Swahili: N/A
- (f) Yoruba: Aridan-tooro



### **Brief description of the plant:**

Shrub or small tree to 15 m, savanna region or the northern edge of the forest, often planted in villages. Rough, blackish bark; slash ochre-yellowish; wood reddish, very hard. Fruit up to 80 cm long and 1.5 cm thick with the seeds in one series

### **Geographical distribution:**

*Cassia sieberiana* is distributed from Senegal and Gambia east to DR Congo and Uganda.

### **Part used:**

Roots.

### **Name of drug:**

African laburnum.

### **Definition:**

African laburnum leaf is the dried leaf of *Cassia sieberiana* DC. (family, Fabaceae).

### **Description:**

**Macroscopical:** Shrub or small tree up to 15(–20) m tall; bole short, twisted; bark fissured, grey to brown, with blackish stripes; young branches densely shortly hairy. Leaves arranged spirally, paripinnately compound with 5–14 pairs of leaflets; stipules narrowly triangular, c. 2 mm long, caducous; leaflets elliptical to ovate, 3.5–10 cm × 2–5 cm, apex rounded to acute, shortly hairy. Inflorescence an axillary pendulous raceme up to 35(–45) cm long; bracts soon falling. Flowers bisexual, slightly zygomorphic, 5-merous; sepals elliptical, 5–8 mm long, slightly hairy; petals oblong to almost circular, 2–3.5 cm long, bright yellow; stamens 10, free, 3 lower ones fertile, hooked at base, much longer than the petals, 4 middle ones fertile, short, 3 upper ones rudimentary; ovary superior, sessile, style slender, much longer than the petals. Fruit a, cylindrical pod 40–60(–90) cm × c. 1.5 cm, transversely partitioned, dehiscent by 2 valves, black, many-seeded with seeds embedded in yellow pulp. Seeds ellipsoid, 8–9 mm long, rusty to dark brown, glabrous. Seedling with epigeal germination.

**Chemical constituents:**

*Cassia sieberiana* contains calcium oxalate in abundance. The leaves contain flavones (quercitrin, isoquercitrin), an anthraquinone (rhein) and tannins (11%). The roots contain tannins (up to 17%), anthraquinones and sterols. The purgative action can be ascribed to the anthraquinones. The flavones cause diuresis and have antibacterial and anti-inflammatory activity.

**Tests for identity:**

- (a) The termite-resistant wood changes from white or yellowish-pinkish to dark red upon exposure. It is finely textured, heavy, hard and difficult to work.
- (b) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (c) Carry out the macrochemical tests for anthraquinones described under the monograph of Alexandrian senna. It should give a positive reaction.
- (d) Confirm the presence of rhein by co-chromatography on thin-layer chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

See under the monograph for Alexandrian senna .

**Uses:**

Purgative. Root used as tonic, diuretic, aphrodisiac.

**Storage:**

In a cool dry place.

## **Cassia tora L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Senna tora* (L.) Roxb.
- (b) *Cassia borneensis* Miq.
- (c) *Cassia gallinaria* Collad.
- (d) *Cassia numilis* Collad.
- (e) *Cassia boreensis* Miq.
- (f) *Emelista tora* Britton & Rose

### **Common names:**

Coffee pod, Foetid Cassia, Tora, Sickle Senna,  
Wild Senna, Sickle Pod, Coffee Pod, Ringworm Plant (E)  
Casse Puante Petite Espece (F)



### **African names:**

Arabic: N/A

Bambara: N/A

Hausa: Tafasaa, Zark'amo

Peuhl: Oulo

Swahili: N/A

Yoruba: Eru asunundegbe, Ako rere, Epa ikun, Jelenbeun, Epajagbo,

### **Brief description of the plant:**

An annual foetid herb, with a height of 30 to 90 cm, *Cassia tora* is mainly found in the states of Uttar Pradesh and Madhya Pradesh, in India. It has pinnate leaves, which are about 10 cm long. Each leaf has three pairs of leaflets that are opposite, ovate, oblong and oblique at the base. The yellow-colored flowers are bearded in the axel of the leaves. The flowers comprises of five petals, each about half inch in diameter.

The seeds are rhombohedral and brown in color, about 30 to 50 in number. The plant bears flowers in the rainy season and fruits in the winter.

### **Geographical distribution:**

Widely diffused in Tropical Africa, as indeed through the Tropics generally.

### **Parts used:**

Leaves, seeds, roots

### **Name of drug:**

Sickle senna leaves.

### **Definition:**

Sickle senna leaves are the fresh or dried leaves of *Cassia tora* L. also known as *Senna tora* (L.) Roxb. (family, Fabaceae).

### **Description:**

Shrub or small tree to 15 m, savanna region or the northern edge of the forest, often planted in villages. Rough, blackish bark; slash ochre-yellowish; wood reddish, very hard. Fruit up to 80 cm long and 1.5 cm thick with the seeds in one series.

**Macroscopical:** Stem annual, erect or ascending, terete or nearly so, glabrous or thinly pilose or pubescent, attaining 2–3 ft. Leaflets in 2 or 3 pairs, obovate or obovate-oblong, obtuse, mucronate, thinly subappressed-pilose or glabrous, varying from 3/4–1 1/2 or 2 in. in length; petiolules very short. Common petiole pubescent or nearly glabrous, with conspicuous narrow-cylindrical glands between at least the lower pinnæ. Stipules subulate, or narrow-linear. Flowers usually in pairs or solitary, axillary, with or without a short common peduncle; pedicels 3/4–1 in. long, in fruit stout ascending. Sepals unequal, obtuse. Petals obovate, shortly clawed. Anterior anthers enlarged and usually distinctly obtusely produced at the apex. Legumes elongate, curved, narrow-linear, 4–8 in. long, 1/6– 1/4 in. broad, oblong-quadratae in section; valves separating, marked internally with the oblique transverse partial septa. Seeds arranged lengthwise, their larger diameter parallel with the valves, rhomboidal or obliquely oblong; cotyledons plicate in transverse section.

**Chemical constituents:**

(+)-rhein, aloe-emodin, chrysophanol, 7% resins, cathartine, calcium, iron, phosphorus, 1,3,5-trihydroxy-6-7-dimethoxy-2-methylanthroquinone, beta-sitosterol, naptho-alpha-pyrone-toralactone, chrysophanol, physcion, emodin, rubrofusarin, cchrysophonic acid-9-anthrone, tricontan-1-Ol, stigmasterol, b-sitosteral-b-D-glucoside, freundien, palmitic, stearic, succinic and d-tartaric acids uridine, quercitrin, isoquercitrin.

**Tests for identity:**

- Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- Carry out the macrochemical tests for anthraquinones described under the monograph of Alexandrian senna. It should give a positive reaction.
- Confirm the presence of rhein by co-chromatography on thin-layer chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

See under the monograph for Alexandrian senna .

**Uses:**

Fresh leaves for insomnia. Laxative.

**Storage:**

In a cool dry place.

## **Catharanthus roseus (L.) G. Don**

### **Family name:**

Apocynaceae.

### **Synonyms:**

- (a) *Ammocallis rosea* (L.) Small
- (b) *Lochnera rosea* (L.) Rchb. ex Endl.
- (c) *Vinca rosea* L.

### **Common names:**

Madagascar Periwinkle, Periwinkle, Rose periwinkle, Chatas, Chula, Vinca (E).  
Pervenche de Madagascar (F).



### **African names:**

Arabic: عناقية وردية  
Bambara: N/A  
Hausa: Fure biyu, Hure biyu  
Peuhl: N/A  
Swahili: N/A  
Yoruba: Apabida,

### **Brief description of the plant:**

Perennial sub-shrub reaching 80 cm in height; oblong elliptic leaves of 2 to 7 cm long and 1.5 to 3 cm wide, flowers solitary or twin, axillary, white or pink; fruits follicular with two subulate mericarps, numerous black small seeds.

### **Geographical distribution:**

Spontaneous or grown over tropical and subtropical Africa.

### **Part used:**

Leaves.

### **Names of drug:**

Pervenche de Madagascar, Periwinkle.

### **Definition:**

Periwinkle consists of fresh or dried leaves of *Catharanthus roseus* (L.) G.Don (family, Apocynaceae).

### **Description:**

Green greyish after desiccation, taste feebly bitter.

**Macroscopical:** Suffrutose 30–100(–200) cm. high, erect or decumbent, usually with white latex. Stems ± terete, green or yellowish-green, sometimes slightly to heavily suffused with red or purple, laxly pubescent or glabrous. Leaves decussate, petiolate; petiole (0.1)0.3–1 cm. long, laxly puberulous or glabrous, with a fringe of colleters in the axil, the outer ones longer than the inner and with some strigose hairs; lamina rather variable in shape, elliptic, obovate or narrowly obovate, 1.9–3 times as long as wide, (3)4–9 x (0.8)1.5–3.5 cm., obtuse or acute, with a mucronate apex and sometimes slightly emarginate, cuneate or obliquely cuneate at the base, laxly pubescent to glabrous on both sides; veins paler; secondary veins more or less conspicuous, 7–11 on each side; tertiary venation inconspicuous. Inflorescence ebracteate. Pedicel 0.1–0.2 mm. long, laxly puberulous to glabrous. Flowers (3)4–5(5.6) cm. long. Sepals green, slightly

connate at the base, sometimes slightly unequal, 2.7–4.7 times as long as wide, (2)3–5 x 1–1.5 mm., outside laxly puberulous or glabrous, glabrous inside, sometimes towards the apex with some minute white hairs, entire erect. Corolla white or pink, with a purple, red, pink, pale yellow or — if white sometimes — white centre; tube often slightly greenish, with a long narrow cylindrical basal and a short wider upper portion (4.2)5–8(12.5) times as long as the calyx, 2.2–3 cm. long (in the narrow portion 1–2 mm. wide, up to 3 mm. in the widened portion), outside laxly puberulous or glabrescent, within the throat at the level of the anthers with a c. 0.5 mm. broad densely strigose ring, and then in the widened portion velutinous for 1–1.5 mm. on the veins from the base of the filaments, and below it with a 1.5–2 mm. broad sericeous ring, situated just below the level of the clavuncula; throat 1.5–2 mm. in diam.; lobes usually paler outside, (0.8)1.2–2(2.8) x (0.6)0.9–2 cm. broadly obovate, spreading, entire, sometimes ciliate, in bud overlapping to the left. Stamens included, inserted 0.4–0.6 cm. below the corolla-mouth; filaments very short, glabrous; anthers with the apex acute, cordate at the base, 2.3–3 x 1–1.3 mm., introrse, completely fertile. Pistil 17–26 mm. long; carpels 1.5–2(2.8) x 0.8–1 x 0.5–1 mm., connate at the base, rounded at the apex, puberulous at the apex and glabrous towards the base; style 16–24 x 0.3 mm., sometimes slightly split at the base, glabrous; clavuncula 1.3–2.3 mm. long, at the apex with a woolly ring, (0.1)0.3 x 0.8–1.3 mm., at the base also with a woolly ring, 0.3–0.5 x (0.8)1–1.5 mm., and in between with a glabrous or puberulous 0.4–0.8 x 0.5–1 mm. wide zone, and at the base with a reflexed hyaline frill, 0.5–1 x 0.8–1.5 mm. Fruit green, also when mature, composed of two follicles (sometimes one aborted or reduced) erect or slightly spreading. Follicle cylindrical, striate, 5.2–13.5 times as long as wide, 1.2–3.8 x 0.2–0.3 cm., dehiscent at the adaxial side. Seeds numerous grooved at one side, 1.2 x 0.5–0.8 mm.

**Microscopical:** The epidermis of the leaf is glabrous with some fibres; Peripheral part is ligneous with islands of riddled perimedullary tissue. Trichomes are covering type, uniseriate, 1-3 cells long, 35.5–280 $\mu$ m on the upper surface and 105.0–295.5 $\mu$ m on the lower surface. Epidermal cells measure 10.5–63 $\mu$ m with anticlinal walls more sinuous on the lower surface than on the upper surface. Stomatal index is 0.21.4 on the upper surface and 5.0–31.1 on the lower surface while palisade ratio is 2.5–7.5. calcium oxalate crystals are absent. Midrib is abaxially prominent, containing an arc of xylem with a narrow phloem. Perimedullary phloem is present. The zone of collenchymas underlies both epidermises in the midrib region and the single layer of palisade cells, present on the upper surface only, is interrupted in the midrib.

**Powder:** Fragments of epidermis, covering, uniseriate trichomes, stomata of cruciferous type; cell fragments of palisade, collenchymas, parenchyma and also xylem and phloem vessels fragments. Calcium oxalate crystals are absent.

#### **Chemical constituents:**

Leaves contain 5 to 10 per cent of water and about 8 per cent of mineral matter. *C. roseus* contains 63 alkaloids. Among them are vincristine, vinblastine, vinleurosine and vinrozidine-vincerine, ajmalicine serpentine, etc.

Several organic acids have been characterised such as protocatechuic, caffeic, p-hydroxybenzoic, ursolic acids. The latter constitutes 3.7 per cent of the dried drug.

Also found: a volatile monoterpane, heterosidic pigments, aglucons of which are hirsutidin, petunidin, malvidin, kampferol and quercitin. A phenolic heteroside, vincoside has been characterised as  $\beta$  glucoside 2,3-dihydroxy benzoic acid.

They also contain tannoids, flavonic pigments and cholin. Active principles of the drug are dimeric indolic alkaloids representing 0.40 to 0.90 per cent (depending on the geographical origin) of dried leaves. The major therapeutic alkaloids are vincristine and vinblastine.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure it complies with the above descriptions
- (b) Triturate 0.50 g of the drug with dilute ammonium hydroxide, then shake with 100 ml of ether. The solvent is then decanted, shake it well with 1 ml of dilute hydrochloric acid. The aqueous acid solution separated must give a clear turbidity when Mayer's reagent is added.
- (c) The aqueous acid solution in the test in b) above gives positive reaction to other common alkaloid test reagents such as Dragendorff, Wagner and Marquis reagents.

**Tests for purity:**

- (a) Thin-layer chromatographic examination of the alkaloidal extract (ether extract in test b above) of the specimen to confirm the presence of vincristine and vinblastine by co-chromatography.
- (b) Moisture: Not more than 66 per cent.; Acid-insoluble ash: Not more than 2.5 per cent.; Water-soluble ash: not less than 1.83 per cent.; Alcohol-soluble extractive: Not less than 8.3 per cent (moderately coarse powder); Water-soluble extractives: Not less than 16.2 per cent. (moderately coarse powder).

**Pharmaceutical preparations:**

Vinblastine (Vincristine) as aqueous sulfate solution at 0.10 per cent. Vincristine in form of sulfate.

**Uses:**

Periwinkle is utilised in traditional medicine as antidiabetic. Its alkaloids are utilised as anti-tumor drug.

Leurocristine (Vinecristine) administrated in form of sulfate or injections i.v. dose of 0.03 to 0.1 mg/kg in hemopathies and lymphoblastic leukemia.

Vincristine in intravenous injection dose, 0.10 to 0.15 mg/kg (physical weight) in Hodgkin disease.

**Storage:**

Aqueous solutions are kept in refrigerators. The dry drug is kept in well-closed containers in the absence of light and humidity.

## **Ceiba pentandra (L.) Gaertn.**

### **Family name:**

Bombacaceae.

### **Synonyms:**

- (a) *Bombax pentandrum* L.
- (b) *Ceiba caribaea* (Dc.) A. Chev.
- (c) *Eriodendron anfractuosum* DC.

### **Common names:**

Kapok, Ceiba, Silk-cotton tree, White Silk-cotton Tree (E)  
Kapokier (F)

### **African names:**

- (a) Arabic: شجرة القابوقي
- (b) Bambara: N/A
- (c) Hausa: Riimii, Riinii
- (d) Peuhl: Bantangui
- (e) Swahili: Msufi
- (f) Yoruba: Eegun, Eegungun, Ponpolo, Araba, Odere,



### **Brief description of the plant:**

A giant in the rainforests, the kapok tree can reach up to 200 feet in height, sometimes growing as much as 13 feet per year. Due to its extreme height, the kapok, or ceiba tree, towers over the other rainforest vegetation. The trunk can expand to nine or 10 feet in diameter. In the nooks and grooves of this huge plant live a diverse number of species including frogs, birds and bromeliads. The kapok tree is deciduous, shedding all of its leaves during the dry season. As its seeds are easily blown into open areas, kapok trees are some of the first to colonize open areas in the forest. The white and pink flowers of the kapok tree emit a foul odor that attracts bats. As the flying mammals move from flower to flower feasting on the nectar, they transfer pollen on their fur, thus facilitating pollination. The kapok tree does a great job at spreading its seeds, producing anywhere between 500 and 4,000 fruits at one time, with each fruit containing 200 seeds. When these fruit burst open, silky fibers spread the many seeds all over the forest.

### **Geographical distribution:**

Africa, South America, tropical Asia.

### **Part used:**

Bark.

### **Name of drug:**

Kapok bark.

### **Definition:**

Kapok bark is the stem bark of *Ceiba pentandra* (L.) Gaertn (family, Bombaceae).

### **Description:**

The genus *Ceiba* contains species that are large trees with most species 5-20 m tall, but the largest species reaching up to 50 m in height.

**Macroscopical:** Tall tree with straight trunk and ± horizontal main branches; bark smooth, usually with scattered conical spines to 1.5 cm long; young branches glabrous or

pubescent. Leaves 5–9-foliolate; leaflets narrowly elliptic-obovate, entire, acuminate, 7–20 x 1.8–6.5 cm, glabrous; petiole 5.5–25 cm long, at the apex expanded into an almost circular disk. Flowers often on leafless branches or present when the whole tree is leafless, in 1–15-flowered axillary clusters. Calyx 9–15 mm long, lobed, glabrous outside, pubescent inside. Petals pink or white, oblong, 2–3.5 cm long. Filament-tube 5–9 mm long; anthers coiled or reniform. Ovary glabrous or nearly so; style 2.5–3.3 cm long. Capsule ± woody, smooth, brown, oblong-ellipsoid, up to c. 26 x 11 cm. Seeds subglobose, c. 6 mm across.

**Chemical constituents:**

A new naphthoquinone, 2,7-dihydroxy-8-formyl-5-isopropyl-3-methyl-1,4-naphthoquinone together with a known naphthoquinone, 8-formyl-7-hydroxy-5-isopropyl-2-methoxy-3-methyl-1,4-naphthoquinone, isolated from the heartwood. A new isoflavone glycoside was isolated from the bark, with 80 per cent ethanol, along with known isoflavones, vavain and vavain glucoside. New isoflavones, pentandrin and pentandrin glucoside, were isolated from the stem bark along with beta-sitosterol and its 3-O-beta-D-glucopyranoside. New isoflavone glucoside vavain 3'-O-beta-D-glucoside and its aglycon, vavain, were isolated from the bark together with flavan-3-ol, (+)-catechin, 8-formyl-7-hydroxy-5-isopropyl-2-methoxy-3-methyl-1,4-naphthaquinone and 7-hydroxycadalene. The new compounds were characterized as 2,7-dimethoxy-5-isopropyl-3-methyl-8,1-naphthalene carbolactone and 2-hydroxy-5-isopropyl-7-methoxy-3-methyl-8,1-naphthalene carbolactone.

**Tests for identity**

- Macroscopical and microscopical examination of the specimen to make sure it complies with the descriptions given above.
- Thin-layer chromatographical examination of an 80 per cent alcoholic extract of the bark to confirm the presence of vavain (an isoflavone) by co-chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antioxidant, antidiabetic, antisickling, anti-leishmaniasis, antimicrobial, hepatotoxicity.

**Storage:**

In a cool dry place.

## **Centella asiatica (L.) Urb.**

### **Family name:**

Apiaceae.

### **Synonym:**

- (a) *Hydrocotyle asiatica* L.
- (b) *Trisanthus cochinchinensis* Lour.

### **Common name:**

- (a) Asiatic pennywort, Gotu kola, Indian pennywort (E)
- (b) Herbe boileau (F)

### **African names:**

- (a) Arabic: سنتيلا
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Smooth herbaceous plant with slender radiating stalks, producing rosettes of knotted round leaves, very tortuous at the base, crenated edges; leaf stalks of 2 to 15 cm long, inflorescence 2 to 4 small flowers on short stalks, fruits tuberous with mericarps rounded at the top.

### **Geographical distribution:**

Throughout the tropical regions.

### **Part used:**

Entire plant.

### **Names of the drug:**

Hydrocotyl, Centella.

### **Definition of drug:**

Centella is the dried herb of *Centella asiatica* (family, Apiaceae)

### **Description:**

**Macroscopical:** Centella is a thin herb, thin leaves entirely with dented and round-shaped limbus-umbels of simple appearance, have numerous small white flowers. When dried leaves appear greyish-green powder, odour characteristic and taste sweet and slightly bitter.

**Microscopical:** Small seeds greyish-green with calcium oxalate crystals and fiber cells of pericyclic fibres.

### **Chemical constituents:**

The entire plant contains asiaticoside composed of 3 sugars (2 glucose) and one thamose and of a genin of asiatic acid (pentacyclic, triterpenic acid derived from amyrine-a).

### **Test for identity:**

(See vol. 2 under identifications of reductive oses and triterpenes).

### **Test for purity:**

N/A

***Pharmaceutical preparations:***

Centella asiatica is prepared in form of extract titred 70 per cent of asiatoside in powder, tablets, pomade and compresses. It is sold under the label of 'Madegassol'.

***Uses:***

Asiatic acid is active on connective tissue in the biosynthesis of collagen. It has cicatrizing and atrophic properties on connective tissue.

Centella is used in form of titred extract in the treatment of aricosis, ulcers, burns, eschars, skin ulcers and stomach ulcers.

Powder or pomade are applied as external uses, internal administration is given by intramuscular injection.

***Storage:***

In closed containers protected from light.

## **Cephaelis ipecacuanha (Brot.) L.**

### **Family name:**

Rubiaceae.

### **Synonyms:**

- (a) *Uragoga ipecacuanha* Bail!.
- (b) *Calliococca ipecacuanha* Brot.
- (c) *Psychotria ipecacuanha* Stok.
- (d) *Cephaelis ipecacuanha* (Brot.) Rich.

### **Common names:**

- (a) Ipecacuanha radix; Ipecacuanha root;  
Ipecac, Rio or Cartagena Ipecacuanha (E).
- (b) Ipeca; Rio Ipecacuanha, Annele mineur (F).



### **African names:**

- (a) Arabic: عرق الذهب
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of plant:**

Shrub with cuneate stipuled opposite leaves; inflorescence terminal with involucrate flower heads; numerous flowers.

### **Geographical distribution:**

Originates from latin America, widely cultivated in the tropics.

### **Parts used:**

Dried roots and rhizomes.

### **Names of drug:**

Radix Ipecac. Ipecac Root. Racine d'Ipeca. Ipecacuanha

### **Definition:**

Ipecacuanha is the dried root or the root and rhizome of *Cephaelis ipecacuanha* (Brot.) A. Rich. (= *Uragoga ipecacuanha* Baillon, *Psychotria ipecacuanha* Stokes), known as Rio or Brazilian Ipecacuanha, or of *Cephaelis acuminata* karsten (= *Uragoga granatensis* Baillon) known as Cartagena, Nicaragua or Panama Ipecacuanha (fam. Rubiaceae).

Ipecacuanha contains not more than 2 per cent of foreign organic matter, and yields not less than 2 per cent of total alkaloids calculated as emetine, of which not less than 60 per cent consists of non-phenolic alkaloids, calculated as emetine.

### **Description:**

Odour, faint, characteristic, irritating and sternutatory when in fine powder; taste, bitter and acrid.

***Macroscopical:***

**RIO OR BRAZILIAN IPECACUANHA:**

Root, occurs in cylindrical slightly tortuous pieces, usually unbranched; 3 to 20 cm, mostly 5 to 7 cm, long; 1 to 4 mm rarely up to 6 mm in diameter; dark brick-red to very dark-brown; externally, occasionally smooth, closely annulated, with thickened rounded almost complete

rings, usually exhibiting transverse, very deep cracks, or even part of the bark absent, sometimes bearing scars or remains of rootlets; fracture, short in the bark, splintery in the wood; internally, consisting of a broad, greyish-white bark, constituting about two-third of the diameter of the root, easily separable from the light yellow, small, uniformly dense, tough, non-porous central wood (distinction from Undulated and Lesser Striated Ipecacuanha). Rhizome, in short pieces

attached to roots, cylindrical, up to 2 mm in diameter; externally, finely longitudinally wrinkled but without annulations, and showing scars and occasional buds; internally, showing a narrow bark and a ring of dense yellowish xylem surrounding a central pith, about one-sixth of the total diameter.

**CARTAGENA, NICARAGUA, OR PANAMA IPECACUANHA:**

Resembles Rio Ipecacuanha but differs in being larger, 3 to 9 mm thick; greyish-brown or reddish-brown, with transverse ridges at intervals of 1 to 3 mm, the ridges about 0.5 to 1 mm, wide, extending about half-way round the circumference and fading at the extremities into the general surface level.

***Microscopical:*** RIO IPECACUANHA root shows a cork, narrow, dark-brown, formed of several layers of thin-walled cells, usually with brown granular contents; cortex, of phelloderm, parenchymatous, containing numerous starch granules, also scattered idioblasts with bundles of raphides of calcium oxalate; phloem, very narrow, with short wedges of seive tissue,

but no fibres or sclereids; projecting into the parenchyma; xylem, wholly lignified; consisting of tracheids, with rounded ends and linear pits, narrow tracheidal-vessels with rounded lateral perforations near the ends, substitute fibres with oblique, slit-like pits, containing starch granules, few lignified fibres, and traversed by medullary rays, 1 - rarely 2-cells wide, lignified and containing starch granules; primary xylem, 3-arch, at the centre. Rhizome, shows a cork, a narrow parenchymatous cortex, an endodermis, pericycle with thick-walled, pitted, elongated rectangular sclereids, phloem, with fibres; xylem, radiating with fibres having linear pits and spiral vessels in the protoxylem and pith with isodiametric lignified cells having thin walls. Starch granules, rarely simple, mostly compound of 2 to 5 sometimes up to 8 components; individual granules, being oval, rounded or muller-shaped, 4 to 10  $\mu$ , rarely more than 15  $\mu$  in diameter.

CARTAGENA IPECACUANHA resembles in structure and characters of elements the Rio variety but many of the starch granules are larger and measure up to 22  $\mu$  in diameter.

**Powder:** Powdered Ipecacuanha, greyish-brown to light brown; characterized by numerous fragments of thin-walled parenchymatous cells filled with starch granules, scattered cells with bundles of raphides of calcium oxalate; few brown fragments of cork; few fragments of wood showing tracheids, tracheidal-vessels, 10 to 20  $\mu$  wide and fibrous cells with starch granules; raphides of calcium oxalate, 20 to 80  $\mu$  long scattered throughout the powder, sometimes in fragments; numerous starch granules, simple or mostly compound of 2 to 8 components; individual granules, oval, rounded or muller-shaped, up to 15  $\mu$  in diameter in Rio and up to 22  $\mu$  in Cartagena variety; few vessels, few sclereids and occasional phloem fibres from rhizome.

**Chemical constituents:**

*Rio* Ipecacuanha root contains several related alkaloids. The amount of total alkaloids present is about 2 to 3 per cent. The major alkaloids being emetine, cepheline, psychotrine, o-methylpsychotrine. 0.4 per cent of crystallisable glycoside ipecacuanhin. 30-40 per cent of starch, calcium oxalate, an acid saponin and ipecacuanhic acid.

**Test for identity:**

Digest about 0.1 g of powdered Ipecacuanha with 4 ml of hydrochloric acid and 1 ml of water, filter, and add to the filtrate a few small crystals of potassium chlorate; a yellowish colour is rapidly produced, which gradually changes to orange and finally to red within an hour.

**Tests for purity:**

- (a) Powdered Ipecacuanha contains no gelatinised starch (Root treated with steam); no cluster crystals of calcium oxalate (*Ionidium Ipecacuanha*); no foreign starch (Arrow-root, Potato starch, etc.); no inulin (*Ionidium Ipecacuanha*); no cells containing colouring matter (*Ipecacuanha cyanophyloca* or *Ipecacuanha nigra*).
- (b) Ash, not more than 5.5 per cent; acid-insoluble ash, not more than 3 per cent. Foreign matter not more than 1 per cent.

**Assay:**

For total alkaloids: Introduce about 10 g of finely powdered Ipecacuanha, accurately weighed, into a flask, and add 50 ml of a mixture of 3 volumes of ether and 1 volume of chloroform. Shake well for 15 minutes, and set aside for 10 minutes. Add 10 ml of dilute solution of ammonium hydroxide, and shake frequently for 1 hour. Transfer the mixture to a small percolator, plugged with cotton-wool and when the liquid ceases to flow, pack firmly, and continue the percolation with the same mixture of ether and chloroform, until complete extraction of the alkaloids is effected.

Concentrate the extract to about 15 ml and transfer to a separator. Wash the receiver with 3 successive portions, each of 5 ml, of ether, then transfer each to the separator. Add to the mixed extracts and washings 20 ml of N/10 sulfuric acid, shake well, allow to separate, and run off the lower layer into another separator. Continue the extraction with successive portions, each of 10 ml of N/10 sulfuric acid, until complete extraction of the alkaloids is effected. Mix the acid liquids, and wash with 3 successive portions, each of about 10 ml of chloroform, shaking each portion of chloroform with the same 10 ml of water contained in a second separator, then reject the chloroform. Transfer the water to the separator containing the acid liquid, make distinctly alkaline with dilute solution of ammonium hydroxide, and shake with successive portions, each of 20 ml of chloroform,

until complete extraction of the alkaloids is effected, washing each chloroform extract with the same 10 ml of water contained in a second separator, and reject the water. Dehydrate the chloroform extract with about 2 g of anhydrous sodium sulfate, filter through a dry filter paper into a porcelain dish, and wash the sodium sulfate and filter with a few ml of chloroform, adding the washings to the chloroform extract in the dish.

Evaporate the chloroform, add to the residue 2 ml of alcohol, evaporate to dryness, and dry for half an hour at 100°C. Dissolve the residue in 15 ml of N/10 sulfuric acid, and titrate with N/10 sodium hydroxide, using methyl red T.S. as indicator.

Each ml of N/10 sulfuric acid is equivalent to 0.0240 g of total alkaloids, calculated as emetine.

For non-phenolic alkaloids: Transfer to a separator the above titrated liquid, obtained in the assay for total alkaloids, add 5 ml of sodium hydroxide T.S., and shake with successive portions, each of 20 ml of ether, until complete extraction of the alkaloids is effected. Mix the ethereal extracts, shake with further portions of 10 ml and 5 ml of sodium hydroxide T.S. and then wash with successive portions, each of 10 ml of water, until free from alkali, washing each of the aqueous liquids with the same 10 ml of ether contained in a second separator, and reject the water.

Evaporate the ether, dissolve the residue in 10 ml of N/10 sulfuric acid, and titrate with N/10 sodium hydroxide, using methyl red T.S. as indicator.

Each ml of N/10 sulfuric acid is equivalent to 0.0240 g of non-phenolic alkaloids, calculated as emetine.

Acidify 5 ml of the titrated liquid with a few drops of hydrochloric acid, and then add a few crystals of potassium chlorate, and warm; an orange red colour is produced, within an hour.

***Pharmaceutical preparations:***

Extractum Ipecacuanha Fluidum.

Pulvis Ipecacuanha Standardizatus.

Ammonia and Ipecacuanha Mixture (Syn. Mistura Expectorans).

Ipecacuanha and Morphine Mixture (Mistura Tossi Migra).

Ipecacuanha Tincture.

Paediatric Belladonna and Ipecacuanha Mixture.

Paediatric Ipecacuanha and Ammonia Mixture.

Paediatric Ipecacuanha and Squill Linctus.

Paediatric Ipecacuanha Emetic Dranynt (Ipecacuanha Emetic).

Prepared Ipecacuanha (Ipecacuanhae Pulvis Mormatus).

***Uses:***

Emetic. Emetine is anti-amoebic.

***Storage:***

In well-closed containers, protected from light.

## **Chamaecrista absus (L.) H.S. Irwin & Barneby**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia absus* L.
- (b) *Cassia coccinea* Wall.
- (c) *Grimaldia absus* (L.) Link
- (d) *Grimaldia opifera* Schrank
- (e) *Senna absus* (L.) Roxb.
- (f) *Senna exigua* Roxb.
- (g) *Cassia viscosa* Zoll.

### **Common names:**

Tropical Sensitive Pea, Four-leaved senna,  
Black grain (E)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Fedali, Fidili
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

An erect branched ,viscidly glandular biennial herb, 15-45cm tall, leaves compound, leavelet 4, ovate, 2.5-5cm tall obtuse, a small awl-shaped gland between each shaped gland between each pair, flowers few, reddish-yellow, 3-4cm diameter appearing in shorty racemes. Stamens 3, equal, perfect. Pod hairy, flat, seeds 6.

### **Geographical distribution:**

Widespread in tropical Africa, Asia and Australia.

### **Part used:**

Roots

### **Name of drug:**

Four-leaved senna root

### **Definition:**

Four-leaved senna is the dried roots of *Cassia absus* L. (family, Fabaceae)

### **Description:**

**Macroscopical:** Erect or procumbent much-branched annual or short-lived perennial c. 0.1–1.2 m high, sticky on account of glandular-based setae in the indumentum. Leaves, apart from glandular hairs, with only a scale-like scarcely glandular structure between each of the 2 pairs of leaflets; leaflets obliquely elliptic or obovate, 1–4.5 x 0.8–3 cm. Racemes 1–13 cm long, with few to numerous small flowers. Sepals obtuse. Petals yellow to red or occasionally white, 5–7 mm long. Stamens 5, subequal. Pods linear-oblong, flat, (2.5–)4–5.5 x 0.6–0.8 cm, elastically dehiscent, pubescent and glandular hairy. Seeds brown to black, glossy, ovate or subrhombic, compressed, 4–5.5 x 3.4–4.5 mm.

***Chemical constituents:***

Roots contain anthraquinones, Chrysophanol, aloe-emodin, alkanoids-chaksine and isochaksine. Leaves contain alkanoids quercetin and rutin. Seeds have sitosterol glycosides.

***Tests for identity***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Test the root powder for the presence of anthraquinones as described under the monograph for Alexandrian senna.
- (c) Thin-layer chromatographical examination of the root powder to show the presence of aloe-emodin by co-chromatography.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

See under the monograph for Alexandrian senna

***Uses:***

Powder of leaves is used for ulcer dressings. leprosy. Seeds for ringworms and other skin infections, in conjunctivitis and ophthalmia. Roots: laxative

***Storage:***

In a cool dry place.

## **Chamaecrista nigricans (Vahl) Greene**

### **Family name:**

Fabaceae.

### **Synonyms:**

*Cassia nigricans* Vahl

### **Common names:**

Black grain (E). Casse noircissante (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Annual, erect herb or undershrub, up to 1.5 m tall, hairy, pale green. Leaves distichously alternate, paripinnate with 10–18 pairs of leaflets; stipules 5–8 mm long; petiole with a sessile gland 2–4 mm long, rachis channelled; leaflets sessile, narrowly oblong, symmetrical, up to 25 mm × 6 mm, apex rounded, mucronate. Inflorescence a raceme, inserted slightly above the leaf axil, 3–8-flowered. Flowers bisexual, nearly regular, 5-merous; pedicel 1–3 mm long; sepals acute, slightly longer than petals; petals obovate, up to 4.5 mm long, yellow; stamens 8–10; ovary superior, 1-celled. Fruit an erect compressed pod 2–4 cm × 0.5 cm, slightly raised over the seeds, brown to black when ripe, splitting into 2 thin, spiralling valves, finely pubescent, with up to 10 seeds. Seeds obovate or rhombic, up to 4 mm long, smooth.



### **Geographical distribution:**

Widespread in tropical Africa, also in Arabia and India.

### **Part used:**

Leaf.

### **Name of drug:**

Black grain leaf.

### **Definition:**

Black grain leaf is the dried leaf of *Cassia nigricans* Vahl otherwise known as *Chamaecrista nigricans* (Vahl) Greene (family, Fabaceae).

### **Description:**

**Macroscopical:** Herb, apparently annual, erect, simple or branched, 25–45 cm. (–1.8 m.) high. Stems pubescent with short crisped and longer spreading hairs. Leaves ± oblong, 3–10 cm. long, 2–4 cm. wide; gland at top of petiole, sessile, cushion-shaped, 2–4 mm. long, 1–1.25 mm. wide; rachis glandular, channelled but not crenate-crested along upper side; leaflets sessile, mostly in 7–15(–18, fide L.T.A., but not confirmed) pairs, narrowly oblong, straight, (10–)12–25(–33) mm. long, (2–)2.5–5(–7.5) mm. wide, rounded to obtuse and mucronate, rarely subacute, at apex, shortly and rather densely pubescent on both surfaces; midrib central or almost so, particularly above. Inflorescences supra-axillary (sometimes a second axillary one present), 3–8-flowered; pedicels very short, 2–

4(–5) mm. long. Petals small, yellow, 3.5–4.5 mm. long, 1.5–3.5 mm. wide. Pods erect, 1.7–2.4(–4) cm. long, 4–5 mm. wide. Seeds brown, obovate or rhombic, 2.5–4 mm. long, 1.5–2.5 mm. wide, not areolate.

**Chemical constituents:**

The leaves of *Chamaecrista nigricans* contain the anthraquinone emodin and its anthrone.

**Tests for identity**

- a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) The specimen should comply with the test for anthraquinone derivatives as described under the monograph for Alexandrian senna
- c) Carry out thin-layer chromatographic examination on the leaf powder to confirm the presence of emodin by co-chromatography

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

See under the monograph for Alexandrian senna

**Uses:**

Laxative

**Storage:**

In a cool dry place.

## **Chenopodium ambrosioides L.**

### **Family name:**

Chenopodiaceae.

### **Synonyms:**

- (a) *Adonois ambrosioides* Lour.
- (b) *Ambrina ambrosioides* Spach.
- (c) *Atriplex ambrosioides* Crant.

### **Common names:**

- (a) Mexican tea; Worm-seed; Mexican goose-american; Wormseed; Gooxfoot; Chenopodium Sweet pigweed (E).
- (b) Anserine, Chenopode vermifuge (F).



### **African names:**

- (a) Arabic: شای المکسیک
- (b) Bambara: N/A
- (c) Hausa: Kafi kasha wari
- (d) Peuhl: N/A
- (e) Swahili: Kwima = *C. botrys*.
- (f) Yoruba: Arunpale, A run tan tan, O-n-orun goo, Koriko Oyinbo, Ewe imi, Asin

### **Brief description of the plant:**

Annual or perennial plant that exceeds 1 m in height more or less downy with amber-coloured acorns; ovate lanceolate leaves with widely dentate edges; presence of glandulous dots under the lamina; inflorescence axillary spike-like tufts; flowers, greenish, numerous and very small; fruit dehiscent with seed, bright and brownish.

### **Geographical distribution:**

Originates from America, ruderal in mediterranean Africa and the sahel region.

### **Parts used:**

Fruit, flowering and fruiting overground parts.

### **Name of drug:**

Fructus chenopodium. Chenopodium. Worm seed.

### **Definition:**

Chenopodium consists of the dried or fresh flowering or fruiting aerial parts of *Chenopodium ambrosioides* L. var. *anthelminticum*. A. Gray (family, Chenopodiaceae).

### **Description:**

The odour is strong, peculiar, and recalls that of eucalyptus, and the taste is pungent and bitter.

**Macroscopical:** Leaves are simple, oval-lanceolate and serrated when at the base of the stem; the lamina is 15-60cm by 5.20mm or 5.20cm by 1.5mm at the base of stem. Apex is acuminate to obtuse. The flowers are small and usually clustered on the axillary spikes but dense towards the extremities of branches. The leaves are greenish in colour and possess a characteristic, strong aromatic odour with pungent and bitter taste. The fruits are small and subglobular; each surrounded by the five partite perianth, from 0.7 to 1.0 mm in diameter, very light, and dull greenish yellow or brownish in colour. On gently

rubbing the fruit, the perianth and membranous pericarp are removed, exposing a single, shining, block, lenticular seed about 0.5 to 0.9 mm in diameter, containing a strongly curved embryo and a scanty endosperm. The fruits occasionally occur in small groups attached to short pieces of stem.

**Microscopical:** The leaf has wavy epidermal cells on both surfaces, 20.3-71.3 um by 11.6- 37.8um; devoid of calcium oxalate crystals but rich in trichomes, with few unicellular, covering trichomes and more glandular trichomes 60.9- 124.7um by 11.6- 20.3um at the base. Large egg-shaped oil globules situated on the epidermis, are also characteristic. Anomocytic stomata are present on both surfaces and two layers of palisade cells lie immediately below the upper epidermis. Stomatal index: 6.3-14.4-25 for both epidermises; Palisaderatio; 3.5-4.1-4.8; Vein-islet number: 8-12-14; Veinlet termination number: 11-14.5-19.

**Powder:** Contains parenchymatous epidermal cells with wavy anticlinal walls; fragments of trichomes, mostly glandular, and anomocytic stomata; calcium oxalate crystals are absent. Odour and taste are aromatic and characteristic.

**Chemical constituents:**

Chenopodium contains about 1 per cent of volatile oil, which consists mainly of 70 per cent ascaridol.

**Tests for identity:**

- Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- Thin-layer chromatographic examination to confirm the presence of ascaridole by co-chromatography.

**Test for purity:**

- Chenopodium contains not more than 2 per cent of stalks and other foreign organic matter.
- Moisture: Not more than 76 per cent.; Ash: Not more than 16.5 per cent.; Water-soluble ash: Not less than 3 per cent.; Acid - insoluble ash, not more than 2 per cent.; Alcohol-soluble extractive: not less than 10 per cent.; Water-soluble extractive: Not less than 14 per cent.;

**Assay:**

Ascaridol content of the oil can be estimated chemically briefly as follows:

The preparation of 5 per cent w/v solution of the oil in acetic acid (90 per cent) of which 5 ml are added to a previously cooled mixture to - 3°C and consisting of 3 ml of an 83 per cent aqueous solution of potassium iodide, 5 ml of hydrochloric acid and 10 ml of glacial acetic acid placed in a stoppered tube.

After setting the tube, with its contents, aside in a cool place for 5 minutes, the liberated iodine is titrated with N/10 sodium thiosulphate. At the same time a blank experiment is carried out without the oil.

The difference between the two titrations represents the iodine liberated by ascaridol. Each ml of N/10 sodium thiosulphate is equivalent to 0.00665 g of ascaridol.

**Uses:**

Chenopodium is a vermifuge used to expel round-worms and hookworms. It is administered in the form of powder, but the volatile oil, Oleum chenopodii, is now generally preferred. It should be taken at bed time, fasting, and followed by a purgative.

Dose: 1-4 g

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Chrysopogon nigritanus (Benth.) Veldkamp**

### **Family name:**

Poaceae.

### **Synonyms:**

- (a) *Vetiveria nigritana* (Benth.) Stapf
- (b) *Andropogon nigritanus* Benth.
- (c) *Jardinea kibambeleensis* Vanderyst
- (d) *Mandelorna insignis* Steud.

### **Common names:**

Black Vetivergrass, vertiver, Adrenaline grass (E). Vétiver (F)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Ngongonari, Bangasa, Ngokoba, Babin, Gongo-dili, Ngɔngɔn
- (c) Hausa: Jema, Čeemà, Darambuwa, Kambu
- (d) Peuhl: Sêban, Sâban
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Tufted perennial; culms 1.5–3 m. high. Leaf-blades narrow, up to 90 cm. long and 7 mm. wide. Panicle lanceolate, 15–40 cm. long, its longest raceme 5–15 cm. Sessile spikelet 4.5–7 mm. long, including the bearded (hairs 0.5–1 mm.) callus which is rounded to fit the slightly hollowed tip of the internode; lower glume spinulose; upper glume awnless; upper lemma with a straight or curved awn 1–4(–9) mm. long, usually protruding from the glumes but sometimes enclosed by them.

### **Geographical distribution:**

Tropical and S. Africa generally.

### **Part used:**

Roots, Culms, Stem, Stalk, Foliage.

### **Name of drug:**

Vertiver.

### **Definition:**

Vertiver is the dried tops of *Vetiveria nigritana* (Benth.) Stapf (family, Poaceae)

### **Description:**

**Macroscopical:** Caespitose perennial; culms 150–300 cm high, unbranched, the uppermost nodes exposed, glabrous; ligule scarious with shortly ciliate margin or a line of hairs on an extremely short scarious rim; leaf laminas up to 90 cm × 7 mm, narrow. Panicle 15–40 cm long, lanceolate; main axis minutely ciliolate; whorls 8–10 each with up to 15 racemes; racemes very slender; rhachis internodes longer than the spikelets, glabrous; pedicels shorter than the sessile spikelets, glabrous. Sessile spikelet c. 7 mm long, narrowly linear-lanceolate; inferior glume coriaceous, spinulose on the back; superior glume coriaceous to chartaceous, sharply keeled in the middle and with inflexed margins, spinulose along the keel, drawn out into a shortly aristate tip; inferior floret with ovate hyaline lemma; superior floret bisexual, the lemma hyaline with a bilobed apex;

awn c. 5 mm long, sometimes slightly exserted from the glumes, glabrous on the column, minutely scabrid on the bristle. Pedicelled spikelet neuter, shorter than the sessile; glumes similar to those of the sessile spikelet but less coriaceous and less spinulose; inferior glume c. 5 mm long, sparingly aculeolate along the keel towards the apex or almost smooth; superior glume smooth with flexible ciliate margins; inferior lemma hyaline with ciliate margins.

***Chemical constituents:***

Saponin, fish poison.

***Tests for identity:***

- (a) Macroscopical examination of the specimen to ensure compliance with the above descriptions.
- (b) Shake the powdered drug with water. It foams and the foam does not disappear on heating.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Molluscicidal, antimicrobial. Anti-diarrhoea, antioxidant.

***Storage:***

In a cool dry place.

## **Chrysanthemum cinerariaefolium (Trevir.) Vis.**

### **Family name:**

Asteraceae

### **Synonyms:**

- (a) *Pyrethrum cinerariaefolium* Trev.
- (b) *Tanacetum cinerariaefolium* (Trevir.) Sch. Bip.

### **Common names:**

Insect flower plant; Pyrethrum (E). Pyrethre (F).

### **African names:**

- (a) Arabic: اقحوان الرماد
- (b) Bambara: N/A
- (c) Hausa: Raariyaar kasa = *C. americanum*
- (d) Peuhl: N/A
- (e) Swahili: Pareto
- (f) Yoruba: N/A



### **Brief description of the plant:**

Herbaceous plant in light tufts, highly fragmented; 20 to 30 cm high, leaves with numerous and close subdivisions, velvety and silvery on the surface; bracts of yellowish involucre.

### **Geographical distribution:**

Cultivated in the mountainous regions of Africa.

### **Part used:**

Flower heads.

### **Names of drug:**

Flos Pyrethri. Pyrethrum Flower. Fleur de Pyrethre.

### **Definition:**

Pyrethrum flower is the dried flower heads of *Chrysanthemum cinerariaefolium* Visiani (fam. Asteraceae).

### **Description:**

Pyrethrum flower occurs loose or in compressed masses; odour faintly aromatic; taste, bitter and acrid.

**Macroscopic:** Flower head hemispherical or subglobular; about 5 to 12 mm in diameter; dull brownish-yellow or greyish-brown, commonly attached to a short piece of longitudinally striated stalk; composed of few ray florets, and numerous disc florets, carried on a receptacle surrounded

by an involucre. Involucre of 2 to 3 rows of hairy imbricated bracts, having a membranous white but not dark brown margin (distinction from *C. roseum*); outer bracts, lanceolate, each with a distinct keel, inner bracts, spathulate, somewhat longer than the outer ones. Ray florets 15 to 23, in a single outer whorl, pistillate, corolla, pale brownish or whitish but not red or reddish-purple (distinction from *C. roseum*), shrivelled, ligulate, oblong, 10 to 20 mm long, having three short obtuse or rounded teeth, the middle tooth being smaller than the lateral ones and showing about 17 veins of which 4 to 6 are more strongly developed. Disc florets, about 6 mm long, hermaphrodite; corolla, tubular,

yellow, with 5 short lobes at the summit; stamens, 5, epipetalous, ovary, inferior, 5-ribbed, 5 mm long and crowned by a membranous cap-shaped calyx, about 11 mm high. Receptacle, nearly flat, usually about 4 to 10 mm wide, and destitute of paleae. Fruit, cypsela, 5-ribbed.

**Microscopical:** Involucral bracts show epidermis, with striated cuticle, numerous stomata, twisted T-shape hairs, ovoid or spherical glandular hairs of compositae type and lignified hypodermis. Upper epidermis of ligulate corolla, slightly papillosed (distinction from *C. roseum*), while the lower epidermis consists of sinuous cells with striated cuticle. Epidermis

of the tubular corolla, papillosed near the apex, and consists of regular cells with striated cuticle and containing small clusters of calcium oxalate.

Calyx shows numerous elongated, lignified cells and large, irregular pitted cells, some containing prismatic crystals of calcium oxalate. Fruit or ovary bears numerous scattered glandular hairs of compositae type, and shows in pericarp rhombic crystals of calcium oxalate and ducts filled with a brown granular secretion.

**Powder:** Powdered Pyrethrum flower is yellowish-green; characterised by the fragments of invuceral bracts, showing lignified hypodermis, epidermal cells with striated cuticle T-shape hairs and glandular hairs of compositae type; fragments of the ovary exhibiting glandular hairs, prisms of calcium oxalate and ducts with brownish secretion; numerous spiny pollen grains, 30 to 40  $\mu$  in diameter; and fragments of the corolla.

#### **Chemical constituents:**

The esters: Pyrethrin I and Pyrethrin II.

#### **Tests for purity:**

- (a) Pyrethrum flower does not contain numerous fibres or large rounded pith cells or wider vessels (stalk).
- (b) Ether-extractive, not less than 5 per cent.
- (c) Ash, not more than 8 per cent; acid-insoluble ash, not more than 1 per cent.

#### **Assay:**

Introduce 10 g of powdered Pyrethrum flower, .module No. 22 accurately weighed, into a flask, add 50 cc of petroleum-benzine R., shake well, set aside for 15 minutes, and shake frequently for 1 hour. Transfer the mixture to a small continuous extraction apparatus, plugged with cotton-wool, and when the liquid ceases to flow pack firmly and continue the extraction, until complete exhaustion of the drug is effected. Filter the extract through a dry filter paper into a flask, and wash the receiver and filter with a little petroleum-benzine R. adding the washing to the content of the flask. Add 5 cc of N/1 sodium hydroxide in methyl alcohol R., connect the flask with a reflux condenser, and heat on a water-bath for 2 hours. Cool, acidify with N/1 sulfuric acid, and distil in a current of steam, until 150 cc of the aqueous distillate are collected below the petroleum-benzine layer in the receiver. Transfer both liquids to a separator, then add 10 g of sodium chloride, and shake vigorously. After separation, run off the aqueous layer into a second separator, and shake with two successive portions, each of 20 cc of petroleum-benzine R., Mix the petroleum-benzine extract, and wash with three successive portions each of 10 cc of water. Transfer the petroleum-benzine extract to a stoppered bottle, and rinse the separator successively with 10 cc of neutral alcohol and 20 cc of water, adding the rinsings to the bottle. Add 3 drops of phenolphthalein T.S., and titrate with N/50 sodium

hydroxide, until the aqueous layer shows a distinct red colouration after vigorous shaking in the stoppered bottle for at least a minute. Carry out a blank test in exactly the same manner, but without the Pyrethrum flower. The difference between the two titrations represents the amount of N/50 sodium hydroxide used.

Each cc of N/50 sodium hydroxide is equivalent to 0.00663 g of Pyrethrin I.

***Uses:***

Insecticide.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

**Cinchona calisaya** Wedd.  
**Cinchona ledgeriana** Moens ex Trimen  
**Cinchona succirubra** Pav.ex Klotzch

**Family name:**

Rubiaceae.

**Synonym:**

- (a) *Cinchona calisaya* Wedd. var. *pedigenana* Rav.
- (b) *Cinchona pubescens* Vahl

**Common names:**

- (a) Quinine plant, Cinchona (E).
- (b) Quinquina (F).

**African names:**

- (a) Arabic: كينيا
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Mkwinini
- (f) Yoruba: N/A



**Brief description of the plants:**

These are arborescent shrubs or small trees with branches and red bark (*C. succirubra*) or yellow (*C. calisaya*); the *C. ledgeriana* is a hybrid between *C. calisaya* and *C. succirubra*; opposite leaves, elliptic stipules; inflorescence paniculate at terminal cymes.

**Geographical distribution:**

Originates from latin America, introduced and grown in the mountainous humid tropical region of Africa.

**Parts used:**

Stem and root bark.

**Names of drug:**

Cortex cinchonae. Cinchona bark. Jesuit bark.

**Definition:**

Cinchona bark is the dried stem and root barks of *Cinchona succirubra* Pavon, and its hybrids, known as red cinchona, of *Cinchona ledgeriana* Hoen., *C. calisaya* Weddel and their hybrids with other species of Cinchona, known as Calisaya bark or yellow cinchona, and of *C. officinalis* Linne, known as Pale Cinchona or Quinquina (family, Rubiaceae). Cinchona contains not more than 2.0 percent of foreign organic matter, yields not less than 5.0 per cent of cinchona alkaloids, of which not more than 50 per cent consists of quinine and cinchonine.

**Description:**

Odour, faint and characteristic, taste, bitter to very bitter and astringent.

**Macroscopical:** Stem bark, occurs usually in quills, double quills, chips or curved pieces, varying in sizes, up to 30 cm or more long, 1 to 4 cm wide and 2 to 9 mm thick, outer surface, grey or greyish-brown' to reddish brown, usually bearing whitish or grey lichens

and mosses, more or less rough, with corky longitudinal ridges of variable distinctness, with or without reddish warts and variable longitudinal and transverse fissures; exfoliation of the cork may be common as in yellow cinchona, or may not be common as in red cinchona; inner surface, pale yellowish-brown to brown, finely to coarsely longitudinally striated; fracture, short in the outer part and shortly fibrous in the inner part, the longitudinally cut surface shows, especially when examined by a lens, numerous whitish points and pale streaks in brownish matrix.

Root bark, occurs in irregularly, channelled, often twisted pieces 2 to 7 cm long, both surfaces of similar colour, the outer somewhat scaly whilst the inner surface, striated, frequently fissured; other characters are similar to those of the stem bark.

**Microscopical:** Stem bark: Cork, frequently bearing dense masses of lichens tissues on the outer surface and formed of thin-walled, rectangular cells with brownish contents. Cortex, rather narrow, consisting of parenchyma cells with brown walls, containing starch granules, and showing numerous scattered idioblasts of microcrystals of calcium oxalate and in the inner part a row of widely separated long laticiferous tubes 25 to 115  $\mu$  thick and 42 to 365  $\mu$  wide.

Phloem, traversed by numerous medullary rays 1 to 3 cells, wide with rectangular thin-walled cells and showing numerous bast fibres, isolated or in small groups of single files. The fibres 300 to 470  $\mu$  long and 20 to 135  $\mu$ , mostly up to 200  $\mu$  wide, spindle-shaped, with narrow lumen, stratified strongly lignified walls having numerous funnel-shaped pits and blunt, rarely forked tips.

Root bark: Almost entirely formed of secondary phloem similar to that of the stem bark, but the fibres mostly forked; occasional sclereids with thick striated pitted walls are present; laticiferous tubes, absent.

**Powder:** Powdered cinchona is yellowish-brown, brown or reddish brown, characterised by the yellowish bright bast fibres, either entire or in broken pieces fragments of brown parenchyma, occasionally with idioblasts brown fragments of cork, few small starch granules usually simple,

6 to 12  $\mu$ , occasionally up to 21  $\mu$  in diameter, rarely compound of 2 to 5 components; scattered very minute microsphenoidal crystals of calcium oxalate and only occasional sclereids.

#### **Chemical constituents:**

About 30 alkaloids have been reported in cinchona. The four most important alkaloids are quinine, cinchonidine, cinchonine and quinidine. The alkaloids are combined with a tannin, named cinchotannic acid.

#### **Test for identity:**

- a) Heat 0.5 g of powdered cinchona in a dry test-tube; purplish-red or carmine-red vapours evolve, which condense on the cold walls of the tube as purplish-red tarry drops, soluble in 10 ml alcohol (70 per cent); the solution having a blue fluorescence when examined under U.V. lamp (366 nm) max.
- b) Shake vigorously about 0.1 g of powdered cinchona with 2 ml of dilute hydrochloric acid and filter. To 1 ml of the filtrate, add a drop of potassiomercuric iodide T.S.; a precipitate is immediately formed. Dilute the remainder of the filtrate to 10 ml with

water. The resulting solution when examined under U.V. lamp (366 nm) shows a blue fluorescence which disappears on the addition of hydrochloric acid.

**Tests for purity:**

(a) Carry out the method for thin-layer chromatography, as described in vol. 2, using silica gel G as the coating substance and a mixture of chloroform and diethylamine (9: 1) as the mobile phase. Apply separately to the chromatoplate at 2 cm intervals, 1  $\mu$ l and 2  $\mu$ l of each of the

following two solutions A and B: for solution (A), to 0.1 g, in fine powder, in a test-tube add 0.1 ml of 12.3.5M ammonia and 5 ml of chloroform, allow to stand for thirty minutes, occasionally shaking vigorously and filter; evaporate the filtrate to dryness on a water-bath and dissolve the residue in 1 ml of absolute ethanol. Prepare solution (B) by dissolving 17.5 mg of quinine, 0.5 mg of quinidine, 10 mg of cinchonine and 10 mg of cinchonidine in 5 ml of absolute ethanol.

After removal of the chromatoplate, dry at 100 to 105°C for about ten minutes, until the odour of diethylamine is no longer detectable, cool, spray with anhydrous formic acid and examine under an ultra-violet lamp having a maximum output at about 366 nm. The spots corresponding to quinine and quinidine show a distinct blue fluorescence. Spray with iodoplatinate reagent. The chromatogram obtained with solution (B) shows three violet spots, later becoming violet-grey, due to quinine ( $R_f$ , 0.2 to 0.3), quinidine ( $R_f$ , 0.3 to 0.4) and cinchonine ( $R_f$ , 0.4 to 0.5). Cinchonidine shows as an intense dark blue spot slightly below that of quinidine. The chromatogram obtained with solution (A) shows spots corresponding in position to, and having at least the same intensity as, the spots due to quinine, cinchonine and cinchonidine in the chromatogram obtained with solution (B) but spots due to quinidine may be absent.

(b) Cinchona contains not more than a few sclereids (cuprea).

(c) Ash, not more than 6.0 per cent; acid insoluble ash, not more than 20 per cent.

**Assay:**

a) For total alkaloids: Introduce 10 g of powdered cinchona, module No. 22, accurately weighed, into a flask add 10 g of calcium hydroxide and 10 ml of water, mix well and set aside for 15 minutes, add 50 ml of alcohol (90 per cent), mix well and shake frequently for one hour. Transfer the mixture to a small continuous extraction apparatus plugged with cotton-wool and when the liquid ceases to flow, pack firmly and continue extraction for about four hours or until complete extraction of the alkaloids is effected. Evaporate the alcohol extract to about 10 ml, add 10 ml of N/1 sulfuric acid and 40 ml of water, heat to boiling, cool and filter into a separator. Wash the residue in the flask with several portions, each of about 10ml of boiling N/10 sulfuric acid until complete extraction of the alkaloids is effected. Filter each portion into the separator then add to the mixed acid filtrate and washings in the separator, about 20 ml of chloroform and shake vigorously. Allow the chloroform to separate and run it into a second separator containing 20 ml of N/10 sulfuric acid, shake well, allow the chloroform to separate to reject it. Repeat the shaking of the acid liquid in the first separator with two further portions, each of about 10 ml of chloroform, running each into the second separator and washing it with the same acid liquid as before. Transfer the acid washing contained in the second separator, to the first one, make strongly alkaline with dilute solution of ammonium hydroxide and shake

with successive portions, each of 20 ml of chloroform until complete extraction of the alkaloids is affected. Wash the combined chloroform extracts with about 1 g of anhydrous sodium sulphate filter through a dry filter paper into a porcelain dish and wash the filter and sodium sulfate on the filter, with a few ml of chloroform, adding the washings to the chloroform extract in the dish. Evaporate

the chloroform to dryness, add 5 ml of alcohol and evaporate again to dryness. Dissolve the residue in 20 ml of N/10 hydrochloric acid and titrate with N/10 sodium hydroxides using methyl red T.S. as indicator. Each ml of N/10 hydrochloric acid is equivalent to 0.03091 g of cinchona alkaloids.

b) For quinine and cinchonidine: filter the titrated liquid, and wash the dish and filter with successive portions, each of 5 ml of distilled water, to obtain 50 ml of filtrate. Add to the filtrate 12.5 g of powdered sodium potassium tartrate, shake until dissolved, and set aside for 24 hours. Filter through a small hardened filter, and wash the flask and filter with 20 ml of an

aqueous solution of sodium potassium tartrate (1 :4), using small quantities of the solution at a time. Return the filter to the flask, add 10 ml of sodium hydroxide T.S. and 20 ml of chloroform and set aside with frequent shaking, until the alkaloidal tartrates are completely decomposed.

Transfer to a separator, and run off the chloroform layer. Extract the flask and the liquid in the separator with further portions, each of 20 ml of chloroform until complete extraction of the alkaloids is effected. Wash the combined chloroform extracts with little water, reject the water, dehydrate the chloroform extract with about 1 g of anhydrous sodium sulfate, filter through a dry filter into a porcelain dish, and wash the filter and sodium sulfate on the filter with a few ml of chloroform adding the washings to the chloroform extract in the dish. Evaporate the chloroform, add 5 ml of alcohol and evaporate again. Dissolve the residue in 10 ml of N/10 hydrochloric acid and titrate with N/10 sodium hydroxide, using methyl red T.S. as indicator. Each ml of N/10 hydrochloric acid is equivalent to 0.03091 g of alkaloids, calculated as quinine and cinchonidine. To 5 ml of titrated liquid, add 2 drops of bromine T.S., followed by 1 ml of dilute solution of ammonium hydroxide; an emerald-green colour is produced.

**Pharmaceutical preparations:**

Extractum Cinchonae Fluidum.

Extractum Cinchonae Siccum.

Tinctura Cinchonae Composita.

**Uses:**

Bitter stomachic and tonic and as a source of quinine, quinidine and cinchonidine. Antimalarial.

**Storage:**

In well-closed containers, protected from light.

## **Cinnamomum camphora (L.) J. Presl**

### **Family name:**

Lauraceae.

### **Synonyms:**

- (a) *Camphora officinarum* Nees ex Wall.
- (b) *Camphora camphora* (L.) H. Karst.
- (c) *Laurus camphora* L.

### **Common names:**

Camphor, Camphor Laurel, Camphor Tree,  
Japanese Camphor, Chinese camphor tree  
(E)  
Camphre, Camphrier(F)

### **African names:**

- (a) Arabic: قرفة كافورية
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

*Cinnamomum camphora* (commonly known as Camphor tree, Camphorwood or camphor laurel) is a large evergreen tree that grows up to 20–30 metres tall. The leaves have a glossy, waxy appearance and smell of camphor when crushed. In spring it produces bright green foliage with masses of small white flowers. It produces clusters of black berry-like fruit around one centimetre in diameter. It has a pale bark that is very rough and fissured vertically.

### **Geographical distribution:**

Moist subtropical areas, including the Gulf Coast.

### **Part used:**

Leaves and Seeds.

### **Name of drug:**

Camphor leaf.

### **Definition:**

Camphor leaf is the leaf of *Cinnamomum camphora* (L.) J. Presl (family, Lauraceae)

### **Description:**

**Macroscopic:** Camphor is an evergreen tree with oval to elliptical leaves, arranged alternately on the stem. Slender twigs are initially green but change to reddish brown. Buds are sharply pointed, roughly 1/2 inch in length. Camphor tree bark is variable, from scaly to irregularly furrowed with flat topped ridges. The camphor tree habit ranges from small to medium (25 to 40 feet tall), but some specimens have attained over 100 feet. Leaf margins are entire, but can be wavy with a shiny, dark green color. Fragrant flowers are greenish white to pale yellow, borne on panicles about 3 inches long. The fruit is dark

blue to black, fleshy and approximately 1 to 1.5 cm in diameter. These are produced in large quantities during the winter and spring months in central and north Florida.

***Chemical constituents:***

The main chemical components are a-pinene, camphene, b-pinene, sabinene, phellandrene, limonene, 1,8-cineole, y-terpinene, p-cymene, terpinolene, furfural, camphor, linalool, bornyl acetate, terpinen-4-ol, caryophyllene, borneol, piperitone, geraniol, safrole, cinnamaldehyde, methyl cinnamate and eugenol.

The brown and yellow camphor oil has a very high safrole content, with yellow having between 10 - 20 % and the brown having 80%. These two oils are considered toxic, as well as carcinogenic.

***Tests for identity:***

- a) A quick and easy method of identifying camphor is by crushing the leaves or peeling a twig or bark. This will release oils and the scent of camphor.
- b) Macroscopical and microscopical examination to ensure compliance with the descriptions given above.
- c) Gas chromatographical examination of the sample to confirm the presence of camphor.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Analgesic; Anthelmintic; Antianxiety; Antiarrhythmic; Antirheumatic; Antispasmodic; Aromatherapy; Cardiotonic; Carminative; Deodorant; Diaphoretic;

## **Cinnamomum zeylanicum** Blume

### **Family name:**

Lauraceae.

### **Synonym:**

- (a) *Cinnamomum verum* J. Presl
- (b) *Laurus cinnamomum* L.

### **Common names:**

- (a) Cinnamon tree Celon cinnamon, True cinnamon (E).
- (b) Cannelle de Ceylan; Cannelier de Ceylan (F).

### **African names:**

- (a) Arabic: قرفة سيلانية
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Abdalasini, Mdalasini
- (f) Yoruba: N/A



### **Brief description of the plant:**

Shrub or small tree with brownish-green smooth bark, with opposite, oblong ovate coriaceous shiny leaves 15 to 20 cm long equipped with 3 or 5 longitudinal ribs; inflorescence axillary and terminal panicles; unisexual whitish flowers.

### **Geographical distribution:**

Originates from Ceylon and cultivated in humid African region and in the islands of the Indian Ocean.

### **Part used:**

The inner bark of shoots of coppiced trees.

### **Names of drug:**

Cortex cinnamomi ceylanici. Cinnamon bark. Cannelle de Ceylan.

### **Definition:**

Cinnamon is the dried bark of the shoots of coppiced trees of *Cinnamomum zeylanicum* Nees (fam. Lauraceae), deprived of most of its cortex, and known as Ceylon Cinnamon.

Cinnamon contains not more than 2.0 per cent of foreign organic matter. It yields not less than 1.0 per cent of volatile oil.

### **Description:**

Odour, fragment: taste, sweet and aromatic.

**Macroscopic:** Cinnamon occurs in long, flexible, slender single or double, closely packed compound quills; up to about 2 meters long, 1 cm in diameter and about 0.5 mm thick; outer surface, yellowish-brown, smooth, with fine pale undulating longitudinal lines and occasional small scars or holes, rarely showing patches of reddish-brown cork; inner surface, rather darker than the outer and finely striated longitudinally; brittle; fracture, short and splintery.

**Microscopical:** Cortex may be represented by a few parenchyma cells. Pericycle, consisting of an almost continuous tangential band of sclereids with small groups of long, narrow fibres on the outer side; the sclereids, isodiametric or slightly tangentially elongated, with unequally thickened

walls, and occasionally containing starch granules. Phloem, traversed by medullary rays, 1 to 3 mostly 2 cells wide, and showing numerous bast fibres, isolated or rarely in small groups of single fibres; each up to 700  $\mu$  long, and not more than 30  $\mu$  wide, with strongly thickened lignified walls and very narrow lumen; axially elongated secretion cells containing volatile oil or mucilage; parenchyma, generally containing small starch granules, mostly 8 to 10  $\mu$  in diameter and a few minute acicular crystals of calcium oxalate, especially those of the medullary rays.

**Powder:** Powdered Cinnamon is light brown or yellowish-brown; characterized by fragments of bast fibres, mostly isolated with thick walls and rarely exceeding 30  $\mu$  in diameter; sclereids, numerous and unequally thickened; fragments of parenchyma, containing starch granules and minute acicular crystals of calcium oxalate and accompanied with occasional isolated secretion cells. Starch granules, simple or compound, mostly 4 to 8, rarely up to 10  $\mu$  in diameter; calcium oxalate, minute acicular crystals, up to 8  $\mu$  long; very few cork cells.

**Chemical constituents:**

Volatile oil 1-2 per cent., tannins and mucilage. The volatile oil contains 55-65 per cent cinnamic aldehyde and 4-10 per cent of eugenol.

**Test for identity:**

Carry out the method for thin-layer chromatography as described in vol. 2, using silica gel GF<sub>254</sub> as the coating substance and dichloromethane as the mobile phase, but allowing the solvent front to ascend 10 cm above the line of application. Apply separately to the plate, as bands 20 mm long and not more than 3mm wide, 10  $\mu$ l of each of the following two solutions:

(A) shake 0.1 g of the substance being examined, in powder sufficiently fine to pass through a sieve with a nominal mesh aperture of 500  $\mu$ m, for two minutes, with 2 ml of dichloromethane, filter and evaporate to dryness over a water-bath; dissolve the residue in 0.4 ml of toluene; (B) dissolve 50  $\mu$ l of cinnamaldehyde and 10  $\mu$ l of eugenol in 10 ml of toluene. After removal of the chromatoplate, allow the solvent to evaporate. Examine under an ultra-violet lamp having a maximum output at 254 nm, marking the quenching zones, and at 365 nm, marking the fluorescent zones. The chromatogram obtained with solution (A), when examined in ultra-violet

light of wavelength 254 nm, shows a quenching zone due to eugenol, which corresponds to that in the middle of the chromatogram obtained with solution (B), and when examined in ultra-violet light of wavelength 365 nm, a light-blue band due to O-methoxycinnamaldehyde is visible.

Spray with a solution of 2.5 g of O-dianisidine in 10 ml of glacial acetic acid; just above the band due to O-methoxycinnamaldehyde, the band due to cinnamaldehyde is coloured yellowish-brown.

**Tests for purity:**

- (a) Cinnamon contains no vessels (wood); no starch granules exceeding 10  $\mu$  in diameter (foreign starches Cassia bark); no fibres over 30  $\mu$  wide (Cassia bark); not more than occasional cork cells (Cassia Bark, Cinnamon Feathering).
- (b) Ash, not more than 7.0 per cent; acid-insoluble ash, not more than 2.0 per cent.
- (c) 14-16 per cent Alcohol (90 per cent) Soluble extractive; 26-36 per cent Crude fibre. Not more than 2 per cent foreign matter.

**Assay:**

Carry out the assay described under "Determination of Volatile Oils" using about 100 g of powdered Cinnamon, Module No. 21, accurately weighed.

**Pharmaceutical preparations:**

Aqua Cinnamomi.  
Pulvis Creta Aromaticus.  
Tinctura Cinnamomi.  
Tinctura Cardamomi Composita.

**Uses:**

Flavouring agent, carminative.

**Storage:**

In well-closed containers, in a 'cool dry place, protected from light.

## **Citrullus colocynthis (L.) Schrad.**

### **Family name:**

Cucurbitaceae.

### **Synonyms:**

- (a) *Colocynthis vulgaris* Schrad.
- (b) *Cucumis colocynthis* L.

### **Common names:**

Colocynth, Bitter apple, Bitter cucumber,  
Desert gourd,vine of Sodom(E)  
Coloquinte.(F)

### **African names:**

- (a) Arabic: **الحنظل**
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Egusi-baara



### **Brief description of the plant:**

Annual or perennial (in wild) herbaceous vine; stems angular and rough; leaves rough, 3- to 7-lobed, 5-10 cm long, middle lobe sometimes ovate, sinuses open; flowers monoecious, solitary, peduncled, axillary, corollas 5-lobed; ovary villous; fruit a pepo, nearly globular, 4-10 cm in diameter with somewhat elliptical fissures, about size of small orange, green and yellow variegated becoming yellow when ripe, with hard rind, pulp light in weight, spongy, easily broken, light yellowish-orange to pale yellow; intensely bitter; seeds numerous, ovoid, compressed, smooth, dark brown to light yellowish-orange, borne on parietal placenta.

### **Geographical distribution:**

Tropical and subtropical north Africa and Asia, in the semi-desert regions from the Atlantic Is. eastwards to Afghanistan and Pakistan.

### **Part used:**

The dried pulp.

### **Name of drug:**

Colocynth pulp.

### **Definition:**

Colocynth pulp is the dried pulp of *Citrullus colocynthis* (L.) Schrad. (family, Cucurbitaceae).

### **Description:**

**Macroscopical:** Perennial trailing herb with somewhat woody tuberous rootstock; stems angled, shortly hairy when young becoming scabrid. Leaf-blade ± elongate-ovate in outline, distinctly scabrid-hairy beneath, smooth except on the nerves above, 26–110 mm. long, 24–66 mm. broad, palmately deeply 3–5-lobed; lobes pinnately lobulate, with the central lobe longest, long-ovate in outline; petiole 8–60 mm. long, rather densely rough-hairy. Tendrils simple, less often bifid. Probracts lanceolate-elliptic, 4–5 mm. long, caducous. Male flowers on 8–20 mm. long pedicels; receptacle-tube broadly obconic,

1.5–2.5 mm. long, green; lobes lanceolate, 2–4 mm. long; petals greenish-yellow, ± 8–9 mm. long and 5 mm. broad, united below. Female flowers on 10–45 mm. long pedicels; ovary hairy, subglobose, 7–9 mm. long, 5–8 mm. across; receptacle-tube short; lobes lanceolate, 3–5 mm. long; petals 6–10 mm. long, 4–6 mm. broad. Fruit on a stalk up to 55 mm. long, subglobose, smooth, green longitudinally striped or mottled with yellow or rather uniformly yellow when ripe, 50–120 mm. or more in diameter, firm-walled, fleshy. Seeds ovate in outline, smooth, 6.5–10 × 3.5–5 × 2–2.5 mm.

***Chemical constituents:***

The pulp contains Colocynthin, extractive, a fixed oil, a resinous substance insoluble in ether, gum, pectic acid or pectin, calcium and magnesium phosphates, lignin and water.

***Tests for identity***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

It is a powerful drastic hydragogue cathartic .

***Storage:***

In a cool dry place.

## **Citrus aurantium L. (pro. Sp)**

### **Family name:**

Rutaceae.

### **Synonyms:**

- (a) *Citrus aurantium* L. var. *amara* L.
- (b) *Citrus bigaradia* Loisel
- (c) *Citrus bigarradia* Duhamel
- (d) *Citrus vulgaris* Risso

### **Common names:**

Bitter-orange tree (E). Bigaradier; Orange amer (F).

### **African names:**

- (a) Arabic: Thamarratil naring, Arenddj, Narenddj
- (b) Bambara: N/A
- (c) Hausa: Babban-leemuu, Lenu maka, Lemun zaakii, Dan-kaabuga
- (d) Peuhl: N/A
- (e) Swahili: Mkaburi shenzi, Chungwa-chungu
- (f) Yoruba: Oro-oyibo, Jaganyin, Ganin ganin



### **Brief description of the plant:**

Shrub 4 to 5 m high, very branched with thorny branches, oval leaves, unbroken, 6 x 4 cm, lamina joined to a winged leaf-stalk and pitted with cells containing essential oil; flowers white and solitary; fruits acidic and very bitter and inedible.

### **Geographical distribution:**

Originates from the north of India and grown in mediterranean parts of Africa reaching into forest areas.

### **Part used:**

Outer part of the pericarp, fresh or dried.

### **Names of drug:**

Flavdo Aurantii Amari, Bitter-Orange Peel, Ecorce d'orange.

### **Definition:**

Bitter-Orange Peel is the fresh, or the dried outer part of the pericarp of the ripe or nearly ripe fruit of *Citrus aurantium* L. Subsp. *amara* Engl. (Fam. Rutaceae). Bitter-Orange Peel contains not less than 2.5 per cent v/w of volatile oil.

### **Description:**

Odour, aromatic, fragrant and characteristic; taste aromatic and bitter.

**Macroscopical:** Dried Bitter-Orange Peel occurs in thin, narrow strips, or occasionally in irregular ribbon-like bands; 2 to 12 cm mostly 4 to 6 cm long, up to 4 cm wide, 2 to 6 mm thick; outer-surface, red or deep orange-red, to reddish-brown or dark orange-red, somewhat rough with numerous small minute pits; inner surface, whitish, with little amount of the white spongy part of the pericarp attached, and showing small raised points and fine anastomosing raised lines, marking the course of the vascular bundles; fracture, short.

**Microscopical:** Epidermis, consisting of small polygonal cells, showing stomate and thick cuticle, followed by parenchyma, the outer layers formed of slightly thick-walled

cells, containing chloroplasts or chromoplasts and occasional calcium oxalate prisms and showing numerous schizolysigenous oil glands, arranged mostly in two irregular rows; the inner layers, formed of branched parenchymatous cells with large intercellular spaces, traversed by delicate, anastomosing vascular bundles and containing sphaerocrystalline masses of hesperidin; some of the cells contain prismatic crystals of calcium oxalate.

**Powder:** Powdered Bitter-Orange Peel is whitish-yellow to yellowish-grey; characterised by numerous fragments of parenchyma, the cell walls from 2 to 12  $\mu$  thick; numerous oil droplets or fragments of oil glands; few fragments of epidermal cells; few lignified, narrow, spiral, or pitted vessels; calcium oxalate prisms, 15 to 45  $\mu$  long.

**Chemical constituents:**

Volatile oil, bitter principle aurantiamarin, hesperidin, isohesperidin, hesperic acid, bitter resin, bitter aurantiomaric acid and eriodictyol glycoside and small amounts of vitamins A, B, C and D. Also pectin, a little fixed oil, carotenoid pigments kryptoxanthin, zeaxanthin, citraurin and violaxanthin.

**Tests for identity:**

- Mix little powdered Bitter-Orange peel with a few drops of potassium hydroxide T.S., a yellow colour is produced.
- Mount little powdered Bitter-Orange peel in hydrochloric acid; a pale green colour is produced (distinction from sweet-orange peel which gives a deep green colouration).

**Tests for purity:**

- Ash, not more than 7.0 per cent.
- Yields 30-40 per cent of extractive to alcohol (60 per cent).

**Pharmaceutical preparations:**

Extractum Aurantii Amari Fluidum.

Syrupus Aurantii Amari.

Tinctura Aurantii Amari.

Tinctura Cinchonae Composita.

Tinctura Gentiana Composita.

Concentrated orange peel Infusion (Infusum Aurantii Concentratum).

**Uses:**

Stomachic, flavouring agent.

**Storage:**

In the entire form, in well-closed containers, protected from light and heat.

## **Citrus limonum Risso**

### **Family name:**

Rutaceae.

### **Synonyms:**

- (a) *Citrus aurantifolia* Swingle
- (b) *Citrus limon* (L.) Burm. f.
- (c) *Citrus medica* var. *acida* Brandis

### **Common names:**

Lemon, Citron (E). Citronnier, Limonier,  
Lime, Citron vert (le fruit) (F).

### **African names:**

- (a) Arabic: ليمون
- (b) Bambara: Limono, nemuna, bulm mu'na,  
leburu kumuni
- (c) Hausa: Olomankilisi
- (d) Peuhl: Lemo, Limo
- (e) Swahili: Limao
- (f) Yoruba: Osan, orombo-were



### **Brief description of plant:**

Short-boled shrub that sometimes branches off near the base, branches more or less wide spreading, and thorny; leaves, simple, dentate 6 cm by 4.5 cm; articulated near the lamina, pitted with essential oil cells; inflorescence small axillary; highly fragrant white flowers, fruit is a spherical or ovoid berry of 3 to 4 cm in diameter, yellow when ripe.

### **Geographical distribution:**

Grown all over tropical Africa and in the mediterranean region.

### **Part used:**

The fresh or dried part of the pericarp.

### **Names of drug:**

*Flavedo Limonis*. Lemon Peel. Ecorce de Citron.

### **Definition:**

Lemon Peel is the fresh or the dried outer-part of the pericarp of the ripe, or nearly ripe, fruit of *Citrus limonum* Risso, (family, Rutaceae).

### **Description:**

Odour, aromatic, fragrant and characteristic; taste, aromatic and bitter.

**Macroscopical:** Dried Lemon Peel occurs in strips or pieces, up to 2 cm wide, 2 to 3 mm thick, often 10 cm or more long; outer surface, citron yellow, more or less rough; inner surface, white, with a small amount of the white spongy part of the pericarp; fracture, short.

**Microscopical:** Epidermis, consisting of small polygonal cells, with thick cuticle and occasional stomata; followed by parenchyma containing numerous prisms of calcium oxalate and sphaerocrystalline masses of hesperidin; the outer layers, with numerous large ovoid schizolysigenous oil glands, almost in one row and formed of parenchyma, with yellow

chromoplasts, and the inner layers, of spongy parenchyma of branched cells, with large intercellular spaces, and traversed by scattered vascular bundles.

***Chemical constituents:***

Volatile oil, hesperidin (and other flavonoid glycosides) and Vitamins B2, C and also a bitter principle, mucilage, pectin and calcium oxalate.

***Tests for identity:***

- a) Macroscopical examination of the specimen to ensure compliance with the above given Descriptions
- b) Choromatographical examination to confirm the presence of hesperidin by co-chromatography

***Test for purity:***

N/A

***Pharmaceutical preparations:***

Compound Orange Spirit (Spiritus Auranti Compositus).

Aetheroleum Citri.

Lemon syrup.

***Uses:***

Flavouring agent.

***Storage:***

In the entire form, in well-closed containers, in a cool dry place, protected from light.

## **Cissus quadrangularis L.**

### **Family name:**

Vitaceae.

### **Synonyms:**

*Vitis quadrangularis* (Linn.) Wall. ex Wight & Arn.

### **Common names:**

Adament Creeper, Bone Setter, Edible-stemmed Vine, Veld Grape, Winged Treebine (E)  
Vigne de Bakel, Cissus de Galam, Raisin de Galam (F)

### **African names:**

Arabic: As fèl èl fil, Syèd'ap

Bambara: N/A

Hausa: Da'ddori, Geewaya-tsaamiya, Do'doriya

Peuhl: N/A

Swahili: N/A

Yoruba: Ogbakiiki



### **Brief description of the plant:**

A glabrous large climber or trailer, with stout succulent quadrangular and almost winged stems, leafy only on the young shoots; fruits glabrous, red when ripe; in savannah regions.

### **Geographical distribution:**

Widespread in the drier parts of Africa, Arabia and India

### **Part used:**

Roots and leafy stem

### **Name of drug:**

Veld grape. Bone-setter

### **Definition:**

Veld grape is the leafy stem of *Cissus quadrangularis* L. (family, Vitaceae)

### **Description:**

**Macroscopical:** A Succulent climber up to 4 m long, frequently leafless; stems 4-angled, up to 1.5 cm wide, green with often reddish edges, glabrous to shortly pubescent; internodes 4–7 cm long; old stems woody with greyish bark. Leaves somewhat fleshy; petiole 1–40 mm long; blade ± broadly ovate, 1.5–10 x 1–11 cm, cuneate, rounded or cordate at the base, rounded to acute at the apex, sometimes ± deeply 3–5-lobed, dentate. Flowers in 2–10 cm long inflorescences; peduncle 0.1–3.5 cm long; pedicels 3–8 mm long, up to 12 mm in fruit. Calyx 1 mm long, glabrous. Petals yellowish-green to cream, c. 2.5 mm long, glabrous. Fruits ovoid to ellipsoid, 8–12 x 5–8 mm, reddish, smooth or with slight swellings, glabrous. Seed ellipsoid, compressed, 7–9 x 4–6 mm, with dorsal ridge, otherwise smooth.

### **Chemical constituents:**

Fish poisons. Phytosterols, friedelin, ascorbic acid,

Two new iridoids 6-O-[2,3-dimethoxy]-trans-cinnamoyl catalpol and 6-O-meta-methoxybenzoyl catalpol along with a known iridoid picroside 1, two stilbenes quadrangularin A and pallidol, quercitin, quercitrin, beta-sitosterol and beta-sitosterol glycoside. The following marker constituents were also characterized : onocer-7-ene-3 alpha, 21 beta-diol, delta-amyrin, delta-amyrene and 3,3',4,4'-tetrahydroxybiphenyl and 3,3',4,4'-Tetrahydroxybiphenyl.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions.
- (b) HPTLC or HPLC examination of the specimen for the marker constituents listed under constituents following the method described by Mehta M, Kaur N and Bhutani KK. in *Phytochem Anal.* (2001) Mar-Apr;12(2):91-5.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Anti-inflammatory, aphrodisiac, bone fracture repair, anti-oxidant, anti-arthritis, anti-osteoporosis, hepatoprotective.,anti-obesity, analgesic, tonic, antimicrobial.

**Storage:**

In a cool dry place.

## **Claviceps purpurea (Fr.) Tul.**

### **Family name:**

Clavicipitaceae.

### **Synonym:**

*Sclerotium clavus* DC.

### **Common names:**

Ergot of rye and other cereals; e.g.: millet, sorghum.

### **African names:**

- (a) Arabic: Ergot
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description:**

Ascomycete fungus whose mycelium develops as parasite in the flowers of gramineae which are thereby castrated; the conidia which are accompanied by an honeydew much sought after by insects ensure the development of the fungus. The final phase of the development is a sclerotium or ergot (form of resistance) replacing the flower when the gramineae ripens. Ergot germinates from the soil in spring and produces ascus and ascospores.



### **Geographical distribution:**

Cosmopolitan.

### **Parts used:**

Sclerotium.

### **Name of the drug:**

Ergot.

### **Definition:**

Ergot (Ergot of Rye) is the dried sclerotium of a fungus, *Claviceps purpurea* Tulsane (family, Clavicipitaceae), arising in the ovary of the rye, *Secale seriale*.

### **Description of the drug:**

The Sclerotia are elongated masses, more or less curved, pointed at the two ends, 1 to 4 cm long and 2 to 7 mm wide. The surface is black-purple, is coloured with many longitudinal furrows, one of them deeper than the others on the curved side. The crease is net, whitish on the inner side and surrounded by brownish-purple edge. Odour unpleasant becoming more unpleasant while getting old; extract by trituration with sodium hydroxide. Taste slightly bitter.

**Powder:** Shows small groups of pseudo-parenchyma with rounded cells in transverse sections; oily globules present.

### **Chemical constituents:**

Moisture: 2 to 10 per cent.

Minerals: 2 to 6 per cent of calcium, magnesium, potassium phosphates.

Sugars: Glucose. Manitol.

Lipids: 20 to 40 per cent. Lipidic extract contains 1 per cent sterols.

Colouring substances: 1 to 2 per cent.

- Red hydroxylated and carboxylated derivates of Anthraquinone.
- Yellow colouring matter.

Proteinoid:

- Amino-acids.
- Amines some of which are active components of the drug.
- Amino-alcohol (choline).
- Sulphated betain.
- Alkaloids which are active principles of the drug.
  - (a) Polypeptidic alkaloids insoluble in water (80 per cent).
    - group of Ergotamine.
    - group of Ergotoxine.
  - (b) Non polypeptidic alkaloids water soluble (20 per cent).

**Assay:**

(a) Identification of anthraquinone pigments: To one g of powder moistened with a few drops of sulphuric acid 1/10, add 10 ml ether; progressive pink colour appears. The solvent is collected and shaken with 2 ml of calcium carbonate (10 per cent) in water. The aqueous layer develops purple colour.

(b) Identification of alkaloids: The powder is cleaned with petroleum-ether, impregnated with ammonium hydroxide; add more ether. The organic phase is collected, shaken with aqueous solution of tartric acid (1 per cent).

To 1 ml of the aqueous phase add same volume of solution of PDAB (dimethyl amino benzaldehyde). A blue-purple colouration, characteristic of indole alkaloids is obtained.

(c) Total alkaloids: 10 g of ergot powder is cleaned with petroleum-ether. The powder, dried at a temperature less than 40°C is moistened with ether and ammonium hydroxide to free the alkaloids. Then extract in a soxhlet for 5 hours. Separate and filter the ether phase and shake it several times with an aqueous solution of tartric acid 1 per cent in separating funnel. The

aqueous solutions which dissolve the alkaloids are collected and make up to 50 ml. Pipette 1 ml and add to 2 ml of p-dimethylaminobenzaldehyde reagent. After 5 minutes, the blue-purple colour obtained is compared with the colour obtained in the same conditions with a reference solution of ergotamine tartarate, 1 ml of which corresponds to 0.1 g of ergotamine base. The percentage of total alkaloids should not be less than 0.15 per cent (calculated as ergotomine).

(d) Water soluble alkaloids: 25 ml of the aqueous solution of alkaloid tartrates are made alkaline with ammonium hydroxide and exhausted, with ether. The ether phase solutions are collected and washed several times with water. The ether solution without water soluble alkaloids is shaken with the tartric acid aqueous solution, 1 per cent.

The dosage as previously gives the percentage of water insoluble alkaloids.

The water-soluble alkaloids are obtained by deduction, and expressed as ergometrine using a coefficient.

According to the *International Pharmacopoeia*, ergot of rye should not contain less than 0.023 per cent of water-soluble alkaloids (calculated as ergometrine).

**Pharmaceutical preparations:**

Powder.

Prepared Ergot.  
Liquid extract.

**Uses:**

Vasodilatator. Oxytocic. Anti-migrain. Central nervous system sedative.

**Storage:**

To be stored in well-closed dry containers, in cold dry places, protected from light.

## **Cocculus pendulus (J.R.Forst. & G.Forst.) Diels**

### **Family name:**

Menispermaceae.

### **Synonyms:**

- (a) *Cocculus leaeba* (Del.) DC.
- (b) *Cebatha pendula* (J. R. & G. Forst.) O. Ktze.
- (c) *Epibaterium pendulum* J. R. & G. Forst.
- (d) *Menispermum leaeba* Del.

### **Common names:**

Moonseed.

### **African names:**

- (a) Arabic: Alenda, L'élende, Trèk
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Much-branched woody, glaucous, puberulent, dioecious climber with elongate twining branches. Leaves are subsessile, leathery and lanceolate-oblong or ovate-oblong, entire or rarely lobed and mucronate. Flowers are small, solitary and axillary. Fruit is a spherical drupe with hourseshoe-shaped seeds.

### **Geographical distribution:**

Widely spread from the Cape Verde Is. & Spanish Sahara to Somalia

### **Part used:**

Leafy stem.

### **Name of drug:**

Cocculus herb.

### **Definition:**

Cocculus herb is the leafy stem of *Cocculus pendulus* (J.R.Forst. & G.Forst.) Diels (family, Menispermaceae).

### **Description:**

**Macroscopical:** Dioecious, much-branched liana or scandent shrub; stem up to 15 cm in diameter at base, striped, dark grey, branchlets long, slender, terete, hairy. Leaves arranged spirally, simple; stipules absent; petiole 2–10 mm long; blade oblong-lanceolate, in lower leaves sometimes ovate, 1.5–5 cm × 0.5–2 cm, base cuneate, rounded or sometimes spear-shaped, apex obtuse, with mucro, sometimes notched, leathery, glabrous, basal veins 3, conspicuous. Inflorescence a small axillary cyme, solitary or clustered; male inflorescence few- to many-flowered, up to 2 cm long; female inflorescence 1–2-flowered, up to 1.5 cm long. Flowers unisexual, small; sepals 6, ovate-elliptical, fleshy to membranous, 3 outer ones 1–1.5 mm long, slightly hairy, 3 inner ones larger, finely hairy to glabrous; petals 6, ovate-obovate, 0.5–2 mm × 0.5–1 mm, apex notched; male flowers sessile or with short pedicel, stamens 6–9, up to 1.5 mm long, free; female flowers with pedicel up to 1 cm long, staminodes 6, c. 1 mm long, ovary superior,

consisting of 3(–6) free, ovoid, laterally compressed carpels c. 1 mm long, stigma c. 0.5 mm long. Fruit composed of 1–3 obovoid, flattened drupes, each drupe 4–7 mm × 4–5 mm, dark red, stone ribbed on lateral faces, 1-seeded. Seed horse-shoe shaped, laterally flattened.

***Chemical constituents:***

The stems and leaves contain a great variety of bisbenzylisoquinoline dioxine alkaloids, including cocsuline, coesoline, coesulinin, siddiquine, penduline, tetrarine, isotrilobine, siddiquamine, kohatine, telobine, pateline, kurramine, isotrilobine and tricordatine, and many derivatives of these.

***Tests for identity:***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above
- (b) Examine an alkaloidal extract of the specimen and test with the common alkoid reagents (Wagner's, Dragendorff's, Mayer's reagents). Positive reaction (precipitate) should be obtained.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Febrifuge, Vermifuge, diuretics; leprosy; liver disease.

***Storage:***

In a cool dry place.

## **Cocos nucifera L.**

### **Family name:**

Arecaceae.

### **Synonym:**

*Cocos mamillaris* Blanco.

### **Common names:**

Coconut (E); Cocotier (F).

### **African names:**

- (a) Arabic: جوز الهند
- (b) Bambara: Coco
- (c) Hausa: Kwar kwar-atta-gara, Attacara, Attagara
- (d) Peuhl:
- (e) Swahili: Mnazi, Nazi (Mbata = Copra)
- (f) Yoruba: Igi Agbon

### **Brief description of the plant:**

Monoecious palm tree of 20 m, strait or curved stem with marked foliar scars; pinnets leaves gather at the top of the stem ranging from 5 to 10 m in length; inflorescence surrounded by spathes; flowers male and female succeed each other on a long stalk; the fruit is a drupe; the seed is the coconut spherical in shape with a hard shell that encloses an oil-rich albumen and the coconut milk.



### **Geographical distribution:**

Originates from the Pacific and is generally grown along intertropical coastal regions.

### **Part used:**

The carefully dried shredded soft parts of the fruits formed of spermoderm and endosperm known as coconut meat or copra.

### **Names of drug:**

Fructus cocos nucifera. Coconut fruits. Fruit de Coco.

### **Definition:**

Coconut is the carefully dried shredded soft part of the fruits formed of spermoderm and endosperm, containing not more than 3 per cent of foreign organic matter and yielding not less than 37 per cent of fixed oil.

### **Description:**

Odour, faint; taste, agreeable.

**Macroscopical:** Fruit, oval or subspherical with blunt pointed tips. The tough epicarp, mass of fibrous tissue forming meso carp and woody shell or endocarp are several mm thick. The thin soft spermoderm and endosperm are closely united. A raphe with numerous branches runs through the spermoderm; Embryo, minute and lies below the micropyle. The edible part (copra) occurs in the form of white or almost white raspings.

**Microscopical:** Pericarp; epicarp undifferentiated in mature and ripe fruits. Mesocarp, fibrous, formed of longitudinal bundles of fibres running in a thin-walled parenchymatous ground tissue, often impregnated with brown substance. Fibres; thick-walled, pitted, lignified, showing here and there on the surface warty siliceous bodies up

to 12  $\mu$  in diameter; vascular bundles running in the mesocarp are bicollateral with two phloem patches accompanied with bast fibres, the xylem being formed of spiral, reticulate and pitted lignified vessels and tracheids. Endocarp, of elongated sclereid cells in groups arranged in different directions. The sclereids having yellow thick pitted, strongly lignified walls, lumen narrow, with dark brown contents.

**Copra:** Spermoderm (testa); in the outer spermoderm, cells are large, elongated in various directions, with porous walls of medium thickness; in the inner spermoderm, they are small and non-porous. Endosperm; the first 2-3 layers are isodiametric becoming gradually radially elongated and larger towards the inner side, cells contain oil globules or crystals of fat and aleurone grains with crystalloids; having no distinct outer coat or ground substance; varying from minute up to 25  $\mu$  or more. On defatting with ether, protein matter left is in form of a network or groups, resembling aggregates of starch.

**Powder:** Copra; coarsely powdered soft parts (spermoderm and endosperm) consist chiefly of fragments of parenchyma cells; those of the outer spermoderm are distinctly pitted and arranged in various directions, while the cells of inner spermoderm are smaller and not pitted; isodiametric cells from the outer parts of endosperm; elongated cells from the inner parts of endosperm. The latter parenchyma cells are thin-walled, contain oil globules and fat crystals, in addition to aleurone grains with crystalloids only; powder contains not more than few sclereid cells from endocarp

**Chemical constituents:**

Dry copra (coconut meat) contains protein about 6.3 per cent, fat (oil) about 57.3 per cent, carbohydrates about 38 per cent, and minerals about 2 per cent. Carbohydrate is formed mainly of sucrose 14.33 per cent, raffinose 2.42 per cent, galactose 2.42 per cent, pentose 2.40 per cent, fructose 1.20 per cent, glucose 1.19 per cent, dextrin 0.58 per cent, starch 0.87 per cent.

**Tests for identity:**

- a) Macroscopical and miroskopical examination of the specimen to ensure compliance with the above given descriptions
- b) Chromatographical examination to confirm the presence of simple sugars by paper chromatography

**Test for purity:**

N/A

**Uses:**

In domestic cookery and confectionary, desiccated canned. From the dried meat (copra) coconut oil is obtained used in the butter manufacture and as lard substitute, as well as soap; coconut cake, a by-product that ranks among the most concentrated of cattle foods. Coir fibres from the pericarp are used in making mats, matting and cordage, and for caking.

**Storage:**

Whole nuts should be stored in a cold place. Copra and oil in well-closed containers, protected from light, at a low temperature.

## COCONUT OIL

**Names of drug:**

Oleum Cocos nicifera. Coconut oil. Huile de Coco.

**Definition:**

Coconut oil is the refined oil obtained by expression of the spermoderm and endosperm *Cocos nucifera* L. contains an amount of volatile fatty acids corresponding to a Reichert Meissel value not less than 6 and a Polenske value not more than 20.

**Description:**

Coconut oil is a solid fat, melting at about 20-27°C, almost white or yellowish-white, odourless; taste, bland.

**Macroscopical:** Greasy, somewhat crystalline fat, with a certain degree of brittleness at low temperature; becoming a nearly colourless liquid at high temperatures; having a good keeping quality.

**Chemical constituents:**

Mainly glycerides of caprylic (5-10 per cent), capric (4-15 per cent), lauric (37-51 per cent), myristic (7-19 per cent), palmitic (2-11 per cent), stearic (1.3 per cent), oleic (5-8 per cent) and linoleic acids (1-3 per cent).

**Tests for identity and purity:**

- (a) Coconut oil is very slightly soluble in alcohol (9 per cent). It is miscible with ether, with chloroform, with carbon tetrachloride and with petroleum-benzine.
- (b) Specific gravity 0.917 to 0.919, refractive index 1.4475 to 11.4495, unsaponifiable matter, not more than 0.5 per cent; saponification value, 250 to 265; Iodine value 7.5 to 10.5; Reichert Meissel value 6-8; Polenske value 15 to 20. Coconut oil does not respond to tests for rancid oils.
- (c) Shake 5 ml of the oil or melted fat for 1 minute with 5 ml, of hydrochloric acid, add 5 ml of a saturated solution of resorcinol in bezine R. and shake the mixture for 5 seconds, then set aside for 5 minutes; the colour of the acid layer is deeper than that produced by diluting 3.8 ml of N100 potassium permanganate in 100 ml with water.

**Pharmaceutical preparation:**

Coal Tar and Salicylic acid Ointment.

**Uses:**

Oil is enormously used in every form of food stuff to which a solid fat may be required, sometimes as adulterant to butter-fat. In pharmacy, it is mainly used in the manufacture of soap, cosmetics and as an ointment base.

Coconut oil is used as a source of medium chain-length triglycerides in dietary preparations for patients with fat malabsorption syndromes. The medium chain-length triglycerides are more readily absorbed from the gastro-intestinal tract than long-chain triglycerides and are not dependent on biliary and pancreatic secretions for their absorption.

**Storage:**

In well-closed containers, in a cold place, protected from light.

## **Coffea arabica L.**

### **Family name:**

Rubiaceae.

### **Synonym:**

- (a) *Coffea corymbulosa* Bertol.
- (b) *Coffea moka* Heynh.
- (c) *Coffea laurifolia* Salisb.
- (d) *Coffea sundana* Miq.
- (e) *Coffea vulgaris* Moench.

### **Common names:**

- (a) Coffee tree, Arabian coffee (E).
- (b) Cafeier d'Arabie (F).

### **African names:**

- (a) Arabic: قهوة
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Kahawa, Buni
- (f) Yoruba: Kofi



### **Brief description of the plant:**

Shrub 2 to 3 m high with numerous wide spreading leaves; leaves opposite, elliptical dark green shiny and smooth of 5 to 15 cm by 3 to 5 cm; inflorescence in contracted axillary cymes; flowers white and sweet-smelling; fruits: berry-shaped containing one to 2 seeds.

### **Geographical distribution:**

Cultivated in the highland of tropical Africa.

### **Part used:**

Seeds.

### **Names of drug:**

Semen coffea arabica, Coffee beans. Grains de cafe.

### **Definition:**

Coffee beans are the dried seeds of *Coffea arabica* L. (family, Rubiaceae) deprived of most of the seed coat. It contains not more than 2 per cent of foreign organic matter and not less than 1 per cent of caffeine.

### **Description:**

Taste very characteristic and agreeable. Odour, fragrant aroma.

**Macroscopical:** Seeds planoconvex, light green in colour 0.5-0.8 cm long, 0.3-0.4 cm broad, having a characteristic longitudinal groove on one surface, surface smooth, glabrous; seeds albuminous, with a curved embryo.

**Microscopical:** The epidermis and one or two layers immediately beneath it are composed of cells with evenly thickened walls, the rest of the endosperm consists of parenchymatous cells with thick walls and very large pits; the pits are so large that they form ovate spaces that may be as long as the cell width or attain half that length. The leafy cotyledons consist of small delicate, parenchymatous cells containing mainly oil, proteid matter and occasional small starch granules.

**Powder:** Powdered coffee bean is deeply coloured brown, but may be decolourised by a short maceration in solution of chlorinated soda; powder revealed fragments of endospermal cells, parenchymatous cells with oil globules, starch granules of cotyledons, very few sclerenchymatous cells of the seed coat; they are almost about eight times as long as they are

broad, usually taper bluntly but sometimes terminated by flat transverse walls often arranged side by side width their long axes parallel and bear numerous large oblique pits, also fragments of small vessels derived from the raphe may also be found.

**Chemical constituents:**

Caffeine, trigonelline, a non-toxic alkaloid, tannin, volatile oil.

**Test for identity:**

Extract 1 g of powdered coffee beans with 10 ml of dilute hydrochloric acid, filter, evaporate in an evaporating dish to dryness, add 1 ml concentrated hydrochloric acid and 0.1 g potassium chlorate, evaporate to dryness on a water bath, a yellow residue is left, which becomes crimson on further heating. The colour turns purple when the dish is exposed to vapours of ammonia.

**Test for purity:**

Yields 4 to 7 per cent of total ash, nearly all of which is acid-soluble.

**Assay:**

Extract for 3 hours in a Soxhlet with chloroform 11 g of finely powdered sample which has been previously moistened with 3 ml water and allowed to stand for 30 minutes. Evaporate the extract to dryness. Take up the residue of fat and caffeine with water (hot), filter through cotton plectet and a moistened paper into 55 ml volumetric flask, wash with H<sub>2</sub>O (hot), make up to the mark, pipette 50 ml of the liquid into separating funnel and shake with four portions of H<sub>2</sub>SO<sub>4</sub>. Evaporate the combined chloroformic extracts in a tared dish, dry at 100°C and weigh the caffeine. Remove the weighed caffeine to a Kjeldahl flask by means of chloroform, rinse with H<sub>2</sub>SO<sub>4</sub> and determine the percentage of nitrogen by the Kjeldahl-Gunning method. Multiply by the factor 3.464 to obtain the percentage of anhydrous caffeine.

**Uses:**

It is one of the most important beverage plants, stimulant, diuretic, in treatment of poisoning with morphine.

**Storage:**

In well-closed containers, in cool dry place, protected from light.

**Cola acuminata** (P. Beauv.) Schott et Endl.

**Cola nitida** (Vent.) Schott et Endl.

**Family name:**

Sterculiaceae.

**Synonyms:**

(a) *Cola acuminata* (P. Beauv.) Schott et Endl.

1. *Sterculia acuminata* P. Beauv.
2. *Cola pseudo-acuminata* Engl.

(b) *Cola nitida* (Vent.) Schott et Endl.

1. *Sterculia nitida* Vent.
2. *Cola vera* K. Schum.
3. *Cola acuminata* Engl.



**Common names:**

Cola. Kola tree(E). Colatier (F).

**African names:**

جَوْزُ الزَّنجُ أو الْفُورُو: Arabic

Bambara: Goro

Hausa: Goro, Ajaaru

Peuh1: Goro, Goroyi

Swahili: N/A

Yoruba: Goro, Obi gbanja, Obi abata = *C. acuminata*.

Obi-gidi, Obi-abata (*C.acuminata*); Goro, Obi-gbanja (*C.nitida*)

**Brief description of the plant:**

A tree attaining 10 to 20 m with dark gnarled bark; leaves: alternate, oval lanceolate, cuneate at the base and acuminate at the tip or long stalks; flowers: male and female greenish-yellow or cream striped with red on the inner side. They are characteristic to both species of the cola. Fruits:

Follicles reaching 13 cm for the *Cola nitida* and 20 cm for the *Cola acuminata*, the *Cola nitida* seed contains 2 cotyledons and the *Cola acuminata* seed contains 4 to 6 cotyledons.

**Geographical distribution:**

Humid dense West African forests.

**Part used:**

Dried ripe seeds.

**Names of drug:**

Kola nuts. Semen Kola. Ko1a tier.

**Definition:**

Kola nuts are the dried ripe seeds of *Cola nitida* (Vent.) Schott & Endl. or of *C. acuminata* (P. Beauv.) Schott & Endl. (family, Sterculiaceae).

**Names of drug:**

Kola nuts. Semen Kola. Ko1a tier.

**Description:**

**Macroscopical:** Dried seeds consist of the kernels only, mostly entire, sometimes separated into two cotyledons (or more in the case of *C. acuminata*). Externally, with dull dark brown or reddish-brown colour, internally, usually somewhat paler. Seeds are hard, solid and exhibit when

cut a perfectly uniform section. They are about 2 to 5 cm long and about 2 cm in breadth and in thickness. They are flat on one side and curved on the other or wedge-shaped or irregularly 6-sided. A shallow furrow encircles the kernel, where the two cotyledons meet; transverse to this furrow at one end of the seed, a distinct cleft may be found, partially separating each cotyledon into two portions; a small radicle will be found towards the bottom of the transverse cleft. Kola is odourless, has a bitterish astringent taste.

**Microscopical:** Cotyledon cells consist of thin walled parenchyma cells, with fat masses, abundant small simple starch granules which are polyhydral, ovoid or spherical, with 2-3 radiate hilum, often eccentric; measuring from 10 to 25 to 40  $\mu$  in diameter larger granules exhibit faint concentric striations.

**Powder:** Light greyish-brown to light reddish-brown, odourless, almost tasteless. It is characterised by the presence of cellulosic parenchyma cells, fatty masses, abundant small simple starch grains with cleft hilum.

**Chemical constituents:**

Alkaloid caffeine 1-2.5 per cent, kolatin, kolatein, starch (40 per cent), lipids (2 per cent), lipase and oxydase enzymes, sugars: glucose and laevulose.

**Test for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- b) It gives a positive reaction to Murexide test for purine alkaloids as described under 'Test for identity' in *Coffea arabica* monograph.

**Assay:**

For caffeine content as described in vol. 2 and under *Coffea arabica*.

**Uses:**

Central Nervous System stimulant.

**Storage:**

In well-closed containers, protected from light.

## **Combretum aculeatum Vent.**

### **Family name:**

Combretaceae.

### **Synonyms:**

- (a) *Combretum stefanicianum* Pampan.
- (b) *Combretum ovale* G. Don.
- (c) *Poivrea aculeata* (Vent.) DC
- (d) *Poivrea ovalis* (G. Don) Walp.
- (e) *Poivrea hartmanniana* Schweinf.
- (f) *Combretum leuconili* Schweinf.
- (g) *Combretum leuconiloticum* Schweinf.
- (h) *Commiphora holstii* Engl.
- (i) *Combretum denhardtiorum* Engl. & Diels



### **Common names:**

N/A

### **African names:**

- (a) Arabic: ikik, savât
- (b) Bambara: Kolobé, Konti, Uolo, Wolo-konti, Kabana, Kôti, Wolo, Wolo koli
- (c) Hausa: Fara-geeza, Bubukia
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Scandent shrub or woody climber up to 4 m tall; young branches pubescent or pilose. Leaves subopposite; blade elliptic to obovate, up to 6.5 x 4 cm, acute to emarginate at the apex, sparsely to densely pubescent or pilose on both surfaces; petiole 1–10 mm long, persisting as a recurved spine. Flowers 5-merous, fragrant in pubescent short racemes; bracts sometimes ± leafy. Lower receptacle 4–7 mm long, tomentose, upper 4–5 mm long, campanulate, pubescent. Sepals greenish or red. Petals 4–6 x 1–2 mm, white, pubescent outside; filaments 5–10 mm long. Fruits 5-winged, 1.2–2.7 cm long, ovoid, yellowish brown, glabrous to pubescent; wings papery, 4–6 mm wide.

### **Geographical distribution:**

Eritrea, Ethiopia, westwards to Senegal, and in East Africa.

### **Part used:**

Leaves, root, stem and bark.

### **Name of drug:**

*Combretum aculeatum* leaf

### **Definition:**

*Combretum aculeatum* leaf is the dried leaf of *C. aculeatum* Vent. (family, Combretaceae)

### **Description:**

**Macroscopical:** Climbing shrub up to 8 m tall or, in the absence of support, a compact or rambling shrub up to 4.5 m tall; young branches grey to rufous pubescent, older shoots with yellow-brown to dark red bark; inner bark greenish or pale yellow. Leaves alternate

or subopposite; petiole up to 1.5 cm long, usually persistent and forming recurved spines up to 17(–30) mm long; blade broadly elliptical to obovate, up to 7(–8.5) cm × 5 cm, base cuneate, apex retuse to shortly acuminate, lightly to densely pubescent on both surfaces, lateral veins in 4–6 pairs, rather prominent below. Inflorescence of short axillary racemes c. 2 cm long. Flowers bisexual, 5-merous, fragrant; lower receptacle 4–8 mm long, constricted above and below the ovary, tomentose; upper receptacle urceolate-campanulate, (3–)4–6 mm × 3–4 mm, pubescent; sepals deltate, sometimes attenuate, greenish or red; petals oblanceolate to obovate, 4–8 mm × 1–2 mm, white, lightly pubescent outside; stamens 10, in 2 circles, filaments 4–10 mm long, anthers c. 7 mm long; ovary inferior, style c. 8 mm long. Fruit indehiscent, 5-winged, obovate in outline, up to 27 mm × 23 mm, apex emarginate; body shortly pubescent; wings papery, c. 5 mm wide, purplish and somewhat shiny when young, yellow-brown when ripe; stipe 6–12 mm long. Seed c. 1 cm long, beige-brownish.

**Chemical constituents:**

N/A

**Tests for identity**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

**Tests for purity:**

The feed composition of *Combretum aculeatum* browse per 100 g dried green leaves (dry matter content 90.7%) was: organic matter 91.0 g, crude protein 16.1 g, neutral detergent fibre 28.5 g, acid detergent fibre 21.7 g, lignin 3.8 g, tannin 6.8 g. An analysis in Niger indicated per 100 g dry matter: crude protein 9.5 g, neutral detergent fibre 33 g, acid detergent fibre 27 g, ash 6 g.

**Pharmaceutical preparations:**

N/A

**Uses:**

Leaf: diuretics; laxatives, vermifuges. Root: naso-pharyngeal affections; stomach troubles, antiplasmodial,

**Storage:**

In a cool dry place.

## **Combretum indicum (L.) DeFilips**

### **Family name:**

Combretaceae.

### **Synonyms:**

*Quisqualis indica* L.

### **Common names:**

Creeper, Rangoon; Drunken Sailor; Rangoon Creeper, Chinese honeysuckle, Red jasmine, Yesterday, today, and tomorrow, ‘Love and Innocence’ (E). Liane vermifuge (F)

### **African names:**

- (a) Arabic: الكيكوال الهندي أو القمبريط الهندي
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ogan-funfun, Ogan-igbo



### **Brief description of the plant:**

*Quisqualis indica* is a large climbing, woody shrub reaching a length of 2 to 8 meters. Brown hairs give the younger parts a rusty appearance. Leaves are oblong to elliptic, opposite, 7 to 15 centimeters long, rounded at the base and pointed at the tip. Flowers are fragrant, tubular, showy, first white, then becoming red, reddish-purple or orange, exhibiting the range of colors in clusters, on the same flower stalk. Fruit is narrowly ellipsoid, 2.5 to 3 centimeters long, with five, sharp, longitudinal angles or wings. Seeds are pentagonal and black.

### **Geographical distribution:**

Widespread in tropical Africa and Asia; cultivated throughout the Tropics.

### **Part used:**

Roots, fruits, Seeds (dried nuts) and leaves.

### **Name of drug:**

Red Jasmine.

### **Definition:**

Red jasmine is the dried leaves of *Quisqualis indica* L (family, Combretaceae).

### **Description:**

**Macroscopical:** Woody climber; young branchlets tomentose to sparsely pubescent, rarely sparsely glandular. Leaves opposite or subopposite; lamina papyraceous, elliptic or oblong-elliptic, 8–14.5 cm. long, 3.5–9 cm. wide, apex acuminate or subcaudate, base rounded or subcordate, tomentose to nearly glabrous, minutely verruculose; lateral nerves 5–7 pairs, domatia sometimes present; petiole up to 10 mm. long, the base sometimes persisting and forming a spine. Inflorescence terminal and axillary spikes 2–5(–10) cm. long, sometimes forming a leafy panicle; bracts lanceolate-acuminate or elliptic, 6–10 mm. long, 1–3 mm. wide. Flowers fragrant. Lower receptacle 3–4 mm. long, pubescent to sericeous-tomentose; upper receptacle narrowly tubular, expanding slightly at the apex,

6–8 cm. long, tomentose to pubescent. Sepals triangular, 1–3 mm. long, acute. Petals imbricate in bud, white becoming dark red on the inner face, enlarging at anthesis, oblong to oblong-obovate, up to 25 mm. long, 13 mm. wide, apex acute (in the Flora area) or obtuse, shortly clawed. Stamen-filaments 7–8 mm. long; anthers 0.9 mm. long. Style with upper part free for 10–20 mm. Fruit (from West African material) ovate-elliptic in outline, 2.5–4 cm. long, 0.75–1.25 cm. wide, appressed pubescent to glabrous; wings 1–2 mm. wide, stout; stipe 0.5–1 mm. long.

**Chemical constituents:**

Phytochemical screening yields major classes of constituents: alkaloids, carbohydrates, protein, amino acid, saponins, glycosides, steroids, tannins, flavonoids and phenolic compounds.

- (a) Plant yields a fatty oil, 15%; gum; resin.
- (b) The nut yields 12.96 percent moisture; a yellow oil, 28.37 percent of the original nut.
- (c) Studies yield quisqualic acid, quisqualin A.
- (d) An analysis of the seed reported the presence of oleic and palmitic acids in the oil, in addition to sitosterol, and an acetyl derivative from the saponifiable matter.
- (e) Leaves yield rutin, trigonelline, L-proline, L-asparagine, and quisqualic acid.
- (f) Flower gum yields pelargonidin-3-glucoside.

**Tests for identity:**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

The seeds of this and the related species *Quisqualis fructus* and *Quisqualis chinensis* contain the chemical quisqualic acid, used in neuroscience in the treatment of such conditions as spinal cord injury, strokes, multiple sclerosis, Alzheimer's Disease, Parkinson's Disease, Huntington's Chorea, and alcoholism. Antimicrobial, antitumour, anthelmintic, astringent.

**Storage:**

In a cool dry place.

## **Combretum micranthum** G. Don

### **Family name:**

Combretaceae.

### **Synonyms:**

- (a) *Combretum altum* Lerr.
- (b) *Combretum floribundum* Engl. and Diels
- (c) *Combretum raimbaultii* Heck

### **Common name:**

Kinkeliba (F)

### **African names:**

- (a) Arabic: عص
- (b) Bambara: Kokobe, Dolabe, Baraule, Singolobé
- (c) Hausa: Geza, Siesa, Farar geézaà, Gaiza, Gaza Geézaà
- (d) Peuhl: Talli gugumi, Gougoumi
- (e) Swahili: N/A
- (f) Yoruba: Okan, òOgàn bulé, Ogàn ibule



### **Brief description of the plant:**

The *Combretum micranthum* is a bushy shrub or sarmentous creeper that can climb up to 15 to 20 m; opposite leaves, oval acuminate, lamina covered with reddish scales on the inner side with downy tufts at the axis of lateral ribs; short axillary clusters on scaly stalks; calyx covered with ferruginous scales; whitish corolla; fruit: four winged, smaller 1.5 x 1.5 cm with a scaly and ferruginous uberuhum.

### **Geographical distribution:**

The two combretum species are found in the Sudano-Sahelian and other tropical regions.

### **Part used:**

Leaf.

### **Name of drug:**

Kinkeliba leaf.

### **Definition:**

Kinkeliba leaf is the dried leaf of *Combretum micranthum* G. Don. (family, Combretaceae)

### **Chemical constituents:**

The principal substances identified belong to the following groups:

- Flavonoids.
- Quaternary alkaloids named Combretin A and Combretin B.
- Gallic tannins.
- Catecho tannins.
- Choline.
- Organic acids: tartaric, citric.
- Mineral substances with abundant potassium.

### **Tests for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

- b) Add a few drops of ferric chloride reagent to an aqueous extract of the sample. A dark colouration is produced

***Test for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

- (a) In decoction (5 to 10 per cent) it is diuretic and cholagogue.
- (b) In less concentrated decoction it is used as hygienic drink.

***Storage:***

To be stored in a cool dry place.

## **Combretum nigricans Lepr.**

### **Family name:**

Combretaceae.

### **Synonyms:**

- (a) *Combretum elliotii* Engl. & Diels
- (b) *Combretum lecanthum* Engl. & Diels

### **Common names:**

N/A

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: diangara, diangara ké, iribéléni, sama m'bali, simbabali, tiankara, Takara
- (c) Hausa: Ciiriiri, Dangeera, Dagara, Dagra tsiriri, Dageera , Chiriri, δàgeera,
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

A small tree to 10 m high by 1 m girth with smooth bark and bole often twisted, of savanna and fringing forest of dry regions. The species is represented by two varieties: var. *nigricans* is recorded from Senegal and The Gambia, and var. *elliotii* (Engl. & Diels) Aubrév. from Senegal across the Region to Nigeria, and on into Sudan. Var. *nigricans* has the leafy stems puberulous, and var. *elliotii* is distinguishable by their near glabrousness. The wood is dirty white to yellowish-green at the heart. It is very hard and is included in the general designation of 'breakaxe' (Hausa, karya gatari) (14). When dry it is reported to be susceptible to borer attack. It has no recorded use except for firewood (6, 11). The bark in the hot season freely yields a gum known as chiriri in Hausa, which is an item of market-trade in the sudano-guinean region (1, 4, 5, 12). It is white, yellow or red-brown, water-soluble and of good viscosity. It might substitute Acacia gums but it does not appear to have been accepted for industrial use. It is edible. It has good adhesive properties.

### **Geographical distribution:**

It is a widespread Sahelian species distributed throughout tropical West Africa from Senegal to Cameroon and eastwards to the Sudan.

### **Part used:**

Bark.

### **Name of drug:**

*Combretum nigricans* gum.

### **Definition:**

It is the gum exudates obtained from *Combretum nigricans* Lepr. (family, Combretaceae)

### **Description:**

**Macroscopical:** The species is either a tree or a shrub, 4-12 m high, with a dense, rounded crown. The bark is rough or finely scaly, grey to ochre, the slash is brown on the upper surface and pink-yellow beneath. The bole is twisted and often low branched, up to

30 cm in diameter, the bark of the bole and older branches are pinkish-brown. The branches and leaves are glabrous to sparsely pubescent, glutinous when young. The leaves are opposite to sub-opposite, 8-12 cm long and 3-5.5 cm wide including a 0.3-1 cm long petiole. The blade is ovate to elliptic with acuminate apex and rounded or shortly cuneate base. Nerves are pinnate; 6-8 pairs of lateral nerves are visible on both surfaces. The under surface of the leaves are sometimes glabrous, but without white scales. The mature dry leaves have a reddish brown colour. The inflorescence is an axillary or spike-like raceme, glabrous or downy, 1-7 cm long. The flowers are 4merous, glabrous to pubescent, greenish yellow, 34mm in diameter. The petals are about 1 mm long, spatulate, pilose on back and strongly ciliate. The petals and filaments are cream. A bright red disk is present. The stamens are longer than the petals.

***Chemical constituents:***

Pentacyclic triterpene: 11alpha-acetoxy-20,24-epoxy-25-hydroxy-dammar-3-one and the corresponding diol, 20,24-epoxy-11alpha, 25-dihydroxy-dammar-3-one.

***Tests for identity:***

Macroscopical examination of the specimen to ensure compliance with the above given descriptions.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Anthelminthic, cytotoxic

***Storage:***

In a cool dry place.

## **Commiphora myrrha (Nees) Engl.**

### **Family name:**

Burseraceae.

### **Synonyms:**

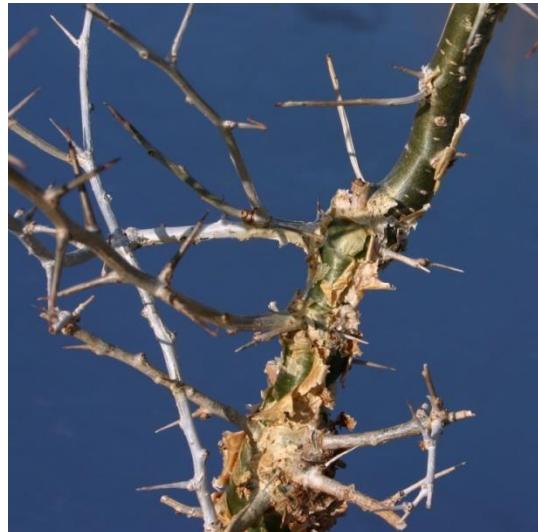
- (a) *Commiphora molmol* Engl. ex Tschirch
- (b) *Balsamodendron myrrha* Nees,
- (c) *Commiphora myrrha* Holm,
- (d) *C. myrrha* (Nees) Engl. var. *molmol* Engl.

### **Common names:**

Myrrh, Arabian myrrh, Somali myrrh (E).  
Molmol; myrrhe des somalis; oleo-resine (F).

### **African names:**

- (a) Arabic: مُر
- (b) Bambara: Barakande = *C. balsamifera*
- (c) Hausa: Dashi, 'Biskiti
- (d) Peuhl: Bardi = *C. africana*
- (e) Swahili: Mbebe, Mbele
- (f) Yoruba: Turari



### **Brief description of the plant:**

Small short-baled tree with rounded top with a deep brown bark exuding a gum-oleo-resin from its shales. The branches covered with deciduous leaves generally end in thorny top.

### **Geographical distribution:**

Originates from Somalia, found in arid and tropical regions of Africa.

### **Part used:**

Oleo-gum-resin.

### **Names of drug:**

Gummi Resina Myrrha. Myrrh. Myrrhe. Gummi Myrrha.

### **Definition:**

Myrrh is the air-dried oleo-gum-resin obtained from the stems and branches of *Commiphora molmol* Engler, and possibly other species of *Commiphora* (family Burseraceae). Myrrh contains not more than 4 per cent of foreign organic matter.

### **Description:**

Myrrh occurs in rounded or irregular tears, or lumps of agglutinated tears of variable sizes; externally, brownish-yellow to reddish-brown and more or less covered with a greyish or yellowish dust; internally, rich-brown or reddish-brown, sometimes marked with nearly white spots or lines; thin splinters, translucent or almost transparent; brittle; fracture, waxy, granular, concoidal; odour, characteristic and aromatic; taste, aromatic, bitter and acrid.

### **Chemical constituents:**

Myrrh consists of a mixture of resin about 25 to 35 per cent, volatile oil, about 2.5 to 6.5 per cent. The remainder of the drug consisting of gum (57 to 61 per cent). .

### **Tests for identity:**

- (a) Triturate a little of the crushed Myrrh with water; a yellowish-brown emulsion is obtained.

(b) Triturate 0.4 g of Myrrh with 1 g of sand, shake for a few minutes with 10 ml of ether, filter and divide the filtrate into 2 porcelain dishes. Allow the filtrate to evaporate. To the film left in one porcelain dish add a few drops of nitric acid; a purplish violet colour is instantly produced (distinction from Bisabol).

***Test for purity:***

- (a) Alcohol-insoluble residue, not more than 70 per cent.
- (b) Myrrh leaves on ignition not more than 10 per cent, of ash; acid-insoluble ash not more than 5 per cent.
- (c) Finely powdered myrrh is deficient in volatile oil and may yield as much as 13 per cent of ash.

***Pharmaceutical preparations:***

Tinctura Balsami Benzoini Compositae.

Tinctura Myrrhea.

Pilula Rhei Compositae.

***Uses:***

Myrrh has stimulant and antiseptic properties. It is used as a mouth wash and as a uterine stimulant and emenagogue.

***Storage:***

In the unground form, in well-closed containers, in a cool dry place, protected from light.

## **Convolvulus scammonia L.**

### **Family name:**

Convolvulaceae.

### **Synonyms:**

*Convolvulus scammonia* var.  
*pseudoscammonia* Sa'ad.

### **Common names:**

Scammony, Syrian Bindweed (E)

### **African names:**

- (a) Arabic: Sakmunia
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

It is a twining perennial, bearing flowers like those of *Convolvulus arvensis*, and having irregularly arrow-shaped leaves and a thick fleshy root. The dried juice, virgin scammony, obtained by incision of the living root, has been used in medicine as scammonium. It has flowers of a very delicate tint of sulphur yellow and leaves of a similar shape to our native species.

The roots are 3 to 4 feet long and from 9 to 12 inches in circumference; tapering, covered with a light grey bark and containing a milky juice. Scammony is a gummy resin, obtained from this milky juice of the root by clearing away the earth from the upper part of the root and cutting off the top obliquely, about 2 inches below where the stalks spring. Then a vessel is fixed in such a position as to receive the exuding juice, which gradually hardens and becomes the Scammony of commerce. The best Scammony is black, resinous and shining when in the lump, but of a whitish-ash colour when powdered, with a strong cheesy smell and a somewhat acrid taste, turning milky when touched by the tongue. It occurs in commerce in irregular pieces 1 to 2 inches or more in diameter.

### **Geographical distribution:**

Native to the countries of the eastern part of the Mediterranean basin; it grows in bushy waste places, from Syria in the south to the Crimea in the north, its range extending westward to the Greek islands, but not to northern Africa or Italy.

### **Part used:**

Gum.

### **Name of drug:**

Scammony.

### **Definition:**

Scammony is a gummy resin, obtained from the milky juice of the root of *Convolvulus scammonia* L. by clearing away the earth from the upper part of the root and cutting off the top obliquely, about 2 inches below where the stalks spring. Then a vessel is fixed in such a position

as to receive the exuding juice, which gradually hardens and becomes the Scammony of commerce.

**Description:**

**Macroscopical:** *Convolvulus scammonia* is a perennial growing to 0.8 m (2ft 7in). It is hardy to zone 7. It is in flower in July, and the seeds ripen in September. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees, flies, self. The plant is self-fertile. Suitable for light (sandy) and medium (loamy) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: neutral and basic (alkaline) soils. It cannot grow in the shade. It prefers dry or moist soil.

**Chemical constituents:**

The active principle is the glucoside scammonin or jalapin, C<sub>34</sub>H<sub>114</sub>O<sub>6</sub>.

**Tests for identity**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

Powdered scammony root

Powdered Scamony resin, B.P.

Compound scamony resin Powder, B.P.

**Uses:**

Scammony is a drastic cathartic, closely allied in its operation to Jalap; though not so nauseous, it is more active and irritating, and in inflammatory conditions of the alimentary canal should not be used.

**Storage:**

In a cool dry place.

## **Corchorus olitorius L.**

### **Family name:**

Tiliaceae.

### **Synonyms:**

- (a) *Corchorus longicarpus* Don
- (b) *Corchorus lanceolatus* Don

### **Common names:**

Jute mallow, Indian Jute , nalta jute, Tossa  
Jute (E);  
corète potagère, jute potager (F);



### **African names:**

- (a) Arabic: الجوت
- (b) Bambara: N/A
- (c) Hausa: Laaloo, Malafia, Tungurnuwa, Turgunnuwaa
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ooyo, Eeyo, Ewedua, Ewedua-ga nbe, Eyo-ganbe

### **Brief description of the plant:**

*Corchorus olitorius* is a annual/perennial growing to 3.5 m (11ft 6in) at a fast rate. it is hardy to zone 10. it is in flower from August to October, and the seeds ripen in October. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Insects. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils. Suitable pH: acid, neutral and basic (alkaline) soils and can grow in very alkaline soils. It cannot grow in the shade. It prefers moist soil.

### **Geographical distribution:**

Wild, or cultivated as a potherb in every part of tropical Africa, and also widely diffused throughout the tropics, extending even into Australia.

### **Part used:**

Fibre, Wood.

### **Name of drug:**

Indian jute.

### **Definition:**

Indian jute is the fibre obtained from the stem of *Corchorus olitorius* L. (family, Tiliaceae)

### **Description:**

**Macroscopic:** Annual or suffrutescent, with erect, branching, nearly glabrous stem. Leafstalks 1–2 in. long, pilose. Stipules setaceous, half the length of the petioles. Leaves 2–4 in. long, 1–2 in. wide, ovate-lanceolate, 3–5-nerved, smooth, serrate; the two lowermost serratures prolonged into long setaceous appendages. Pedicels 2–3-flowered, erect, shorter than the petioles. Sepals sharply pointed, shorter than the spatulate yellow petals. Pod cylindrical, appressed, straight or slightly curved, 1–3 in. long, 10-ribbed, 5-valved, each valve ending in a long point, the whole forming a long, straight, undivided beak to the fruit; inner surface of the valves transversely septate and pitted to receive the numerous blackish seeds.

***Chemical constituents:***

Beta-carotene: extremely high; vitamin E: medium; riboflavin: high; folic acid: extremely high; ascorbic acid: extremely high; calcium: medium to high; iron: high to extremely high; protein: 4.5%. Leaves contain mucilage and several phenolic compounds.

***Test for identity***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

A fibre is obtained from the stems,

***Storage:***

In a cool dry place.

## **Coriandrum sativum L.**

### **Family name:**

Apiaceae

### **Synonyms:**

- (a) *Bifora loureirii* Kostol
- (b) *Coriandrum diversifolium* Gilib.,
- (c) *Coriandrum globosum* Salisb.,
- (d) *Coriandrum majus* Gouan,
- (e) *Coriandrum melphitense* Ten. et Guss.,
- (f) *Coriandrum testiculatum* Lour
- (g) *Selinum coriandrum* E. H. L. Kraus

### **Common names:**

Coriander (E). Coriandre (F).

### **African names:**

- (a) Arabic: Kozbara, Kuzbura
- (b) Bambara:
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Giligilani
- (f) Yoruba: N/A



### **Brief description of the plant:**

Herbaceous plant of 30 to 60 cm high; upper leaves suborbicular, lower leaves divided into linear strips; flowers white or pink; fruits round with a diameter of 5 mm; fresh plant with a repulsive odour.

### **Geographical distribution:**

Mediterranean basin and tropical Africa.

### **Part used:**

Fruits.

### **Names of drug:**

Fructus Coriandri. Coriander. Coriandre.

### **Definition:**

Coriander is the dried ripe fruits of *Coriandrum sativum* L. (family, Apiaceae). Coriander contains not more than 2 per cent of foreign organic matter and yields not less than 0.3 per cent v/w of volatile oil. It contains about 13 per cent fixed oils and also proteins.

### **Description:**

Odour, aromatic; taste, aromatic, spicy and characteristic.

**Macroscopical:** Fruit, cremocarp usually entire nearly globular, 2 to 5mm in diameter; brownish-yellow, or brown, sometimes with a purplish tint; externally, glabrous, marked with 10 inconspicuous wavy primary ridges and 8 more prominent, straight secondary ridges; usually crowned by a short conical stylopod and the remains of the sepals; mericarp, usually remaining attached by margin, concave on the commissural side, internally the pericarp shows no vittae in the dorsal, but only 2 on the commissural side of each mericarp and an almost

complete ring or sclerenchyma in the dorsal side, a large colospermous oily endosperm and a small curved apical embryo,

**Microscopical:** Outer epidermis of the pericarp, if present, consists of small, thick-walled cells, and showing occasional small prismatic crystals of calcium oxalate few stomata of cruciferous type and no hairs. Outer zones of mesocarp consist of few layers of tangentially elongated parenchymatous cells usually collapsed, showing degenerated vittae as tangentially

flattened cavities, and longitudinally traversed by 10 vascular strands with small spiral vessels. In the ripe fruits, the outer epidermis of the pericarp and the outer layers of the mesocarp with the dorsal vittae are usually absent. Middle zone of mesocarp, formed of a broad layer of

sclerenchyma consisting of strongly lignified pitted, fusiform fibres, in 2 bands crossing each other at right angles, one running longitudinally and the other tangentially. Inner zone of mesocarp, formed of 2, sometimes 3 layers of large, tangentially elongated thin-walled parenchyma with wide intercellular spaces and an innermost layer of flattened hexagonal thin-walled sclerenchyma usually adhering to the endocarp. Mesocarp on the commissural side shows no sclerenchyma layer, but 2 large elliptical yellowish-brown, schizogenous vittae. Endocarp, formed of very narrow elongated thin-walled cells, in groups variously oriented. Endosperm consists of thick-walled polygonal cellulosic parenchyma containing much

fixed oil and several aleurone grains, about 4 to 12 microns in diameter, each enclosing a micro-rosette crystal, rarely a prism of calcium oxalate, about 3 to 10 microns in diameter. Carpophore, split, passing at the apex of each mericarp into the raphe; traversed by a flattened vascular strand,

consisting of fibres surrounded by spiral vessels.

**Powder:** Powdered Coriander is light-brown to brown; characterised by numerous irregular fragments of endosperm cells containing globules of fixed oil and aleurone grains containing micro-rosette crystals of calcium oxalate; fragments of endocarps associated with the hexagonal sclerenchyma of mesocarp; parenchymatous cells of the mesocarp without reticulate thickening; very few fragments showing pieces of yellowish-brown vittae, usually crossed elongated polygonal yellowish-brown cells, fragments of characteristic irregularly curved, yellowish pitted lignified fusiform fibres of mesocarp, in sinuous rows, often crossing at right angle; and abundance of minute oil globules; hairs and starch granules, absent.

**Chemical constituent:**

Volatile oil containing up to 90 per cent linalool.

**Test for identity:**

- a) Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above.
- b) Examination of the volatile oil extract for the presence of linalool by gas chromatography.

**Test for purity:**

Ash, not more than 7 per cent; acid-insoluble ash, not more than 1.5 per cent.

**Assay:**

Carry out the assay as described under "Determination of Volatile oils in Drugs", in vol. 2, using about 10 g of powdered Coriander, module No. 24, accurately weighed. It yields not less than 0.3 per cent volatile oil.

**Uses:**

Flavouring agent, carminative.

**Pharmaceutical preparation:**

Tinctura Rhei Composita.

**Storage:**

In well-closed containers, in a dry cool place, protected from light.

## **Crateva religiosa G. Forst.**

### **Family name:**

Capparaceae.

### **Synonyms:**

- (a) *Crataeva religiosa* Oliv.
- (b) *Crateva adansonii* DC
- (c) *Crataeva adansonii* (orth. aberr.) DC.

### **Common names:**

Sacred Garlic-pear; March Dalur, Three-leaved caper, Bidasi, Barna (E)

### **African names:**

- (a) Arabic: نبتة المعبد أو زهرة العنکبوت أو كمثري الثوم المقدس
- (b) Bambara: Balasirani, Banidiugu, Gandolo, Mogo iri, Mongo kulu, Mugnien, Sunamin
- (c) Hausa: Unguduudu, Gude, Gudai, Ingidiido, Ingudiidi, Kalu, K'ok'irmo , Bududu, Ingidudu, Engedid, Guve,
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Eegun-orun, Taniya, Ajanaka



### **Brief description of the plant:**

A small handsome tree of the galleried forest and savanna woodland, often on river-banks, from Senegal to N Nigeria and across Africa to Zare, Tanganyika and Madagascar. As understood here this species is confined to Africa but bears very close affinity to the Asian *C. religiosa* Forst. f. with which it has been equated by some authorities. The tree attains 7 m height or more. The trunk is irregular, seldom straight, but it is worthy of cultivation as an ornamental for its dense masses of white flowers borne at the ends of all the shoots. In the bush, owing to grass-burning, which it survives, and repeated stripping of its leaves, the tree is often stunted. The wood is soft and yellow (2, 5) and strong-smelling when cut (9). It is of no practical use though it is reported in Togo to be usable like boxwood (5) — presumably for small items of joinery. Leaves have a disagreeable smell when crushed.

### **Geographical distribution:**

Widely spread throughout drier parts of tropical Africa north of the equator and in India and Burma.

### **Part used:**

Leaves and bark

### **Name of drug:**

Sacred garlic pear leaf or bark.

### **Definition:**

Sacred garlic pear leaf or bark.is the dried leaf or stem bark of *Crateva religiosa* G. Forst. (family, Capparaceae).

## **Description**

### **Macroscopical:**

**Leaves:** Twig pith septate. Compound leaf petiole quite long, but variable, often almost as long as the leaflets. Leaflet blades about 6-18 x 3-7 cm. Lateral veins curved throughout their length but not forming conspicuous loops. Elongated pale lenticels usually obvious and numerous on the twigs.

**Flowers:** Flowers large and showy, the petals turning +/- orange with age. Petals large, e.g. about 5-6 cm long overall, two petals large and two smaller. Petals clawed. Staminal filaments about 6-8 cm long, red or purple in colour.

**Fruit:** Fruits large, about 6-15 x 5.5-9.5 cm, stalk about 12 cm long, surface +/- scurfy. Ripe fruit emits a strong nauseating odour. Exocarp hard, woody but brittle. Seeds quite large, about 6-17 mm diam. +/- horseshoe-shaped. Testa rugose. Embryo shaped like a horseshoe.

**Seedlings:** Cotyledons about 20-34 x 7-9 mm, +/- strap-like, thick and fleshy, flat on the upper surface and rounded on the lower surface. Venation longitudinal but obscure. Two cataphylls or axillary buds often produced just above the cotyledons. First pair of true leaves with narrowly lanceolate or elliptic leaflets. At the tenth leaf stage: lateral leaflets unequal-sided for at least half their length; leaflets sessile, stipules very small, only visible with a lens; stem usually marked with conspicuous pale lenticels.

### **Chemical constituents:**

Lupeol. Dichloromethane:methanol extract of the seed shows: oleanolic acid and 4-epi-hederagenin.

### **Tests for identity**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

### **Tests for purity:**

N/A

### **Pharmaceutical preparations:**

N/A

### **Uses:**

It is used as a cure for urinary infections. The bark and leaves are used to cure rheumatic pain and swellings. Antimycotic, Antiarthritic

### **Storage:**

In a cool dry place.

## **Crotalaria retusa L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Crotalaria retusifolia* Stokes
- (b) *Dolichos cuneifolius* Forssk.
- (c) *Crotalaria cuneifolia* (Forssk.) Schrank,  
P.P.A
- (d) *Crotalaria hostmannii* Steud.
- (e) *Lupinus cochinchinensis* Lour.
- (f) *Crotalaria retusa* var. *maritima* Trimen

### **Common names:**

Wedge-leaf Rattlepod, Shak-shak, Rattlebox, Wedge-leaf, Big Yellow Puppush, Yellow Lupin, Rattleweed, Yellow rattlebox (E). Pois France Marron, Sonnettes, Arachide de brousse (E)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Alatun-unse, Saworo, Koropo

### **Brief description of the plant:**

Erect annual or short-lived perennial, up to 1.5 m tall; stem shortly pubescent. Leaves simple, oblanceolate to oblong-obovate, up to 35–110 x 18–40 mm, rounded or emarginate at the apex, glabrous above, finely appressed pubescent beneath; petiole c. 2–4 mm long. Stipules linear, 1–5 mm long. Racemes many-flowered. Calyx 11–14 mm long, glabrous to appressed puberulous. Standard yellow, veined purplish, usually with a few hairs along the midvein outside; keel rounded, 13–15 mm long, with a twisted beak. Pod up to 40–50 x 13–18 mm, glabrous, c. 12–20-seeded.

### **Geographical distribution:**

Widespread in the tropics; probably introduced into our area and now naturalized.

### **Part used:**

Leaf, seed.

### **Name of drug:**

Wedge-leaf Rattlepod.

### **Definition:**

Wedge-leaf Rattlepod is the leaf of *Crotalaria retusa* L. (family, Fabaceae).

### **Description:**

**Macroscopic:** It is a much-branched annual that can grow to 1.3 m tall but is usually much less. The leaves are simple and wedge-shaped, slightly indented at the apex, lower

surface covered with adpressed hairs. The pea-shaped flowers are borne on a terminal raceme. Standard is about 24 mm long, yellow often slightly streaked with red, wings are as long as or longer than the keel. Pod is much inflated 3-5 cm long, black when ripe. It contains 12-20 seeds yellowish to brown.

***Chemical constituents:***

Leaf, seed: alkaloids. Pyrrolizidine alkaloid, monocrotaline

***Tests for identity***

- (a) Macroscopical examination of the specimen source to comply with the descriptions above
- (b) Macrochemical tests on the alkalidal extract with common alkaloid reagents: Wagner's, Dragendorff's Mayer's etc. to confirm the presence of alkaloids
- (c) Thin-layer chromatographic examination of the specimen's extract to confirm the presence of monocrotaline by co-chromatography.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

The plant is very poisonous and should be avoided by amateur herbalists. Leaf, febrifuges; leaf and seed, sedatives; seed, laxative, vermifuge; root: pulmonary and stomach troubles. Insecticidal, antimicrobial,

***Storage:***

In a cool dry place.

## **Cucurbita pepo L.**

### **Family name:**

Cucurbitaceae.

### **Synonyms:**

- (a) *Cucumis pepo* (L.) Dumort.
- (b) *Cucurbita aurantia* Willd.,
- (c) *C. courgero* Ser.,
- (d) *C. esculenta* Gray,
- (e) *C. fastuosa* Salisb.,
- (f) *C. melopepo* L.,
- (g) *C. ovifera* L.,
- (h) *C. subverrucosus* Willd.,
- (i) *C. verrucosus* L.,
- (j) *Pepo melopepo* Moench.,
- (k) *P. verrucosus* Moench.,
- (l) *P. vulgaris* Moench.



### **Common names:**

Pumpkin, Summer squash, Autumn squash, Marrow, Courgette, Crookneck, Pattypan, scallop squash, Acorn squash, Spaghetti squash, Squash and Gourd Varieties, Ornamental gourd, Vegetable Gourd, Vegetable Marrow (E)

Courge, Potiron, Citrouille, Courge nue, Courge citrouelle, Giraumon (F)

### **African names:**

- (a) Arabic: قرع بلدي
- (b) Bambara: ié
- (c) Hausa: Wawan goma, Kubushi, Kabaiwa, Kabus, Ruguguwa, Ganwon fatake, Gojii, Yar gari, Akwato, Balaya, Gesuma, Gwadadhasai, Zazzaße, ψar-garii, Rugudu, Gesuma, Bakanuwa.
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Apala, Elegede, Esin, Isi, Gbòrò, Gbòrò esi, Langbade, Légedé

### **Brief description of the plant:**

Leaves; prostrate or climbing; branched, prickly stems, up to 10 m long. The solitary flowers are large and yellow being arranged singly in the axils of leaves; the male flowers have a peduncle of 10–17 cm, a calyx with very small sepals, a campanulate deep yellow corolla (7–10 cm in diameter) gradually widening towards the top. Calyx lobes are narrow. Female flowers are similar to the male ones, but with a shorter peduncle, small staminodes, and inferior ovary of various shapes. The gourd-fruit varies in size (15–40 cm in diameter) and shape in the many cultivated varieties, and the toughened, furrowed peduncle does not enlarge near it.

### **Geographical distribution:**

A native of North and Central America.. It is now cultivated throughout the world except in arctic regions in numerous cultivars.

**Part used:**

Seed.

**Name of drug:**

Semen Cucurbitae.

**Definition:**

Semen Cucurbitae consists of the dried seeds of *Cucurbita pepo* L. (family, Cucurbitaceae) or its cultivars.

**Description:**

Odour: indistinct; taste: bland, oily and slightly nut-like

**Macroscopical:** The seeds are ovate, constricted at one end forming a short, blunt extension; flat or weakly biconvex; up to 25 mm long and 8–14 mm wide, 3–4 mm thick; on both faces, close to the edge, is an encircling ridge and groove, 1–2 mm wide, absent from projection; testa creamy-white to pale beige with a satiny sheen, smooth or with irregular wrinkles; texture brittle, somewhat papery; inner surface of seed coat fawnish-white, dull, rough or scurfy. The seed is non-endospermic. Embryo easily separated from testa, more or less entirely covered in a dark olive-green pellicle, with metallic lustre; light patches of inner seed coat may be adherent. Embryo pale greenish-yellow, oily; large, almost flat cotyledons, small conical radical at constricted end of seed; inner surfaces of cotyledons with three or five rudimentary veins, palmately arranged

**Microscopical:** Epidermal cells of testa erect, prismatic, up to 200 µm long; walls thin, bearing slender vertical strips of thickening, usually sinuous in upper portion; in surface view polygonal, large with conspicuous beads; starch grains abundant, up to 5 µm, simple but frequently clumped; a band, about six cells deep, of small, thin-walled, isodiametric or small, elongated parenchymatous cells, finely reticulately thickened and strongly lignified; a few larger, irregular simple pits; a single layer of large, sub-rectangular sclereids, lumen narrow, ovoid, walls very thick and conspicuously layered, pits few and not well-defined, only middle lamella and primary wall strongly lignified; in surface view the sclereids are somewhat elongated and the anticlinal walls deeply sinuous. Internal to the sclereid band several layers of progressively larger lignified parenchymatous cells with very fine reticulate thickening; the cells, having short arm-like projections, form a spongy, lacunose tissue; areas of contact between branches of cells have quite large simple perforations. Innermost layers less welldefined, parenchymatous, largest cells internally; greenish chromoplasts present. Cotyledon cells variable, very thin-walled, containing oily globules and aleurone grains up to 4 µm in diameter

**Chemical constituents:**

The chemical composition of the whole seed varies: 36–40% oil, 30–41% crude protein, 15–18% fibre, 3–4% ash and 2% carbohydrates. The oil consists of glycerides of the following acids: linoleic 43%, oleic 34%, palmitic 16% and stearic 8% (3). Cold press extraction which produces about 30–35% of the oil content is said to be suitable for edible purposes

*C. pepo*, *C. maxima* and *C. moschata* grown in Lebanon have been reported to contain a water soluble amino acid, 3-amino-3-carboxypyrro-lidine, or cucurbitin, which is taenifugal but only in large dosage. A resin, which may be taenicidal, and a toxalbumin have been reported. A fairly strong presence of alkaloids in Nigerian material is recorded

The fruit-pulp contains 87–94% water, 4–8% carbohydrate, 0.5–1.8% protein and small amounts of fibre, oil and minerals, especially iron, phosphorus and calcium . Fresh fruit-pulp contains vitamin C and niacin, riboflavin and thiamine, and the level of these declines on maturity , and some bitter forms have a high amount of cucurbitacin.

**Tests for identity**

Macroscopical and microscopical examination of the seed to comply with what is described above

**Tests for purity:**

Foreign organic matter: Not more than 1 per cent.

Ash: Not more than 7 per cent..

Moisture: Not more than 12.0 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

For symptomatic treatment of difficulties with micturition associated with stage I-II prostatic adenoma and irritable bladder. Anthelmintic. Oral daily dose: 10 g of seed; equivalent preparations

**Storage:**

Store in a cool dry place away from heat and light.

## **Cymbopogon citratus (DC.) Stapf**

### **Family name:**

Poaceae.

### **Synonym:**

- (a) *Andropogon citratus* DC. ex Nees
- (b) *Andropogon cerifer* Hack.
- (c) *Andropogon citriodorum* Hort. ex Desf.
- (d) *Andropogon roxburghii* Nees ex Steud.
- (e) *Andropogon citriodorus* Desf.
- (f) *Andropogon ceriferus* Hack.

### **Common names:**

Lemon grass (E). Citronnelle, Fausse citronnelle, Verveine des Indes (F).



### **African names:**

- (a) حشيشة الليمون أو حشيشة الزيت: Arabic: Lemon grass
- (b) Bambara: Bin boulou, Ce kala
- (c) Hausa: Ciyawar tsabre mai turare, Gajirii, Mobefa, Tsauri
- (d) Peuhl: C. giganteus= Dagé, Gageli, Nipéré
- (e) Swahili: N/A
- (f) Yoruba: Koko oba, Koriko oyibo, Tii

### **Brief description of the plant:**

Perennial herbaceous plant with aromatic green leaves in dense tufts that can reach 2 m in height; inflorescence in agglomerated clusters on a branched spike that overreaches the tuft of leaves.

### **Geographical distribution:**

Grown or introduced in all intertropical regions.

### **Part used:**

Herb.

### **Names of drug:**

Herbus *Cymbopogon citratus*. *Cymbopogon*. Lemon grass. Citronnelle.

### **Definition:**

Lemon grass is the dried herb of *Cymbopogon citratus* Stapf. (family, Poaceae).

### **Description:**

Odour, characteristic and aromatic; taste, bitter.

**Macroscopical:** Root, adventitious, yellowish-white in colour small in length, cylindrical, odourless with a bitter taste. Rhizome, cylindrical, showing nodes and internodes. The culm is a solid cylinder interrupted at intervals by transverse partitions. Leaves, born on the culm, green, sessile, erect composed of two parts, the sheath and the lamina. The sheath surrounds the bases of the next higher leaves on the culm, but the two margins of the sheath are free although they may overlap. The sheath is tubular and split on the side opposite to the lamina. The lamina has a well-defined midrib, lanceolate with acute to acuminated apex; with longitudinal parallel venation.

**Microscopical:** Root shows a piliferous layer with long root hairs, a comparatively narrow exoderm, followed by a wide cortex. Fixed oil globules are scattered in the

parenchyma cells. Rhizome shows an epidermis followed by a moderately wide cortex, an endodermis and a wide ground tissue with scattered vascular bundles. The vascular bundles are of closed type, they are surrounded by lignified sclerenchymatous fibres.

Leaves show upper and lower epidermises, homogenous mesophyll traversed by vascular bundles which are surrounded by lignified fibres.

**Powder:** Powdered lemon grass is greenish in colour, characterised by fragments of thickened lignified fibres with wide lumen and tapering ends; fragments of vascular tissue of pitted, annular and reticulate vessels, non-lignified, non-glandular trichomes and numerous oil globules.

**Chemical constituents:**

Lemon grass contains 0.75 per cent volatile oil containing citral, citronellal, camphene, nerolidol and limonine. 0.03 per cent alkaloid along with rutin and querectin, glucose, maltose and sucrose are also present.

**Tests for identity:**

- (a) Examination of the specimen to ensure compliance with the descriptions given above.
- (b) Microchemical test to confirm the presence of alkaloid
- (c) Thin-layer or gas chromatographic examination to confirm the presence of citral

**Test for purity:**

Moisture: Not more than 68 per cent; Ash: Not more than 8.1 per cent; Acid-insoluble ash: Not more than 0.9 per cent.; water -soluble ash: Not less than 2.5 per cent.; Water-soluble extractive: Not less than 7 per cent.; Alcohol (70 per cent.)-soluble extractive: Not less than 9.2 per cent.; Volatile oil content: Not less than 0.75 per cent.

**Assay:**

See assay of citral in oils in vol. 2.

**Uses:**

It is used as diuretic, emenagogue, diaphoretic, stomachic, carminative, tonic, antirheumatic and against diarrhea. It is also used in the form of an aqueous decoction in treating feverish conditions. The essential oil is used in perfumery in making bath soap and in cosmetics, insect repellent.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## LEMON GRASS OIL

**Definition:**

Lemon grass oil is the volatile oil obtained by steam distillation from the herb of *Cymbopogon citratus* Stapf. (fam. Graminae).

**Description:**

Lemon grass oil is pale yellow; odour, lemon-like; taste, agreeable. Lemon grass oil is soluble in ether, ethanol, petroleum ether and chloroform.

**Test for identity:**

Sp. gr., 0.8850; refractive index, 1.4850 at 25°C, optical rotation, - 60.

**Assay:**

See assay of citral in oils as described in vol. 2.

**Storage:**

In well-closed containers, as full as possible, in a cool place, protected from light.

## **Cynara scolymus L.**

### **Family name:**

Asteraceae.

### **Synonyms:**

- (a) *Cynara cardunculus* L. ssp. *Scolymus* Hay
- (b) *Cynara cardunculus* L.

### **Common names:**

Globe artichoke. Leaf artichoke (E). Artichaut (F).

### **African names:**

- (a) Arabic: خروف شوكي أو الخرسف
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Herbaceous plant reaching 1.5m in height rather thorny with leaves deeply dentate almost pinnatifid whitish capitulum of tall purple flowers subtended by thick and imbricate bracts.



### **Geographical distribution:**

Cultivated in mediterranean Africa and subtropical regions.

### **Part used:**

The fresh lower part of the flower head.

### **Names of drug:**

Flos *Cynara scolymus*, Artichoke. Folium Cynareae.

### **Definition:**

Artichoke is the fresh, thickened lower part of the involucral bracts and the receptacle of thistle-like flowers of *Cynara scolymus* L. (family Asteraceae) gathered before blossoming. It yields not less than 0.1 per cent of cynarin.

### **Description:**

Odour, faint characteristic; taste, characteristic.

**Macroscopical:** The involucral scales are greenish or purplish, arranged in many series, more or less enlarged at the base with a short, sharp spine arising from the notched apex. The receptacle is soft and tender throughout, enlarged, forming a cushion-like mass.

**Microscopical:** The involucral bracts consist of six layers but the tissues of the fourth, classed as mesophyll, vary greatly in character according to the position. Outer (lower) epidermis of isodiametric or enlarged, irregularly arranged, striated, beaded cells and ranunculaceous stomata; hypodermis of about 5 rows of longitudinally elongated cells; fibres in about 15 rows; mesophyll with fibro-vascular bundles, oleoresin cavities and latex tubes with granular contents in a ground tissue varying from rounded cells to spongy parenchyma and then to chains of small cells with large intercellular spaces; collenchyma of several layers; inner epidermis, toward the apex is similar to the outer epidermis but at the base, mostly of elongated cells. The spine consists of a vascular bundle with narrow elements surrounded by broad fibres with broad lumens, the whole

enclosed in an epidermal tissue of elongated elements. Receptacle, the ground tissue consists of rounded cells with intercellular spaces, through this run small vascular bundles.

**Powder:** Greyish-green to brown powder with faint odour; fragments of the lamina with more or less sinuous walls and anomocytic stomata; covering trichomes, scattered or in felted masses and large, glandular trichomes with brown contents; groups of lignified fibres and vessels from the midrib and petiole, the larger vessels with reticulate thickening

**Chemical constituents:**

Cynarin (polyphenolic compound), proteins, inulin.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to comply with the above descriptions
- (b) Thin-layer chromatography of the extract of the specimen to show the presence of cynarin.

**Test for purity:**

Ash: not more than 13 per cent.

Moisture: not more than 8 per cent.

**Assay:**

Take 10 g of powdered artichoke extract with 70 per cent methanol by maceration overnight and then percolate till complete extraction. Concentrate under reduced pressure. Extract with ether, ether extract to be shaken with 25 ml of 50 per cent methanol. Collect ether extract and washings and concentrated to 10 ml, transfer to 25 ml flask, complete with methanol (80 per cent). 0.06 ml spotted in a form of a band in the centre of Kieselgel G plates. Develop the plates with ethyl acetate-methanol-acetic acid (9:4:2). Scrape the bands and elute with 80 per cent methanol. Evaporate to 1 ml, complete with 50 per cent methanol to 2 ml, add the colour reagent (0.5 ml of modified Arnow's reagent). Measure at 510 nm. Results are deduced from a standard curve done under the same conditions as mentioned before.

**Uses:**

In liver and kidney dysfunctions, diuretic and anti-atherosclerotic. Treatment of digestive complaints (e.g. dyspepsia, feeling of fullness, flatulence, nausea, stomach ache and vomiting). Adjunct treatment of mild to moderate hypercholesterolaemia

**Storage:**

Used fresh.

## **Datura metel L.**

### **Family name:**

Solanaceae.

### **Synonyms:**

- (a) *Datura fastuosa* Clarke
- (b) *Datura alba* Nees

### **Common name:**

Datura herb.

### **African names:**

- (a) Arabic: عشب الداتورا
- (b) Bambara: Batine = *D. inoxia*, Almukayekaye
- (c) Hausa: Han Kai-yaro, Babbajuuji, Zakani, Zakamii, Faren-juujii, Haukata-yaaro, Itaacen-aljan, Kwarakko, Mairawiya, Sitira, Sutura
- (d) Peuhl: Lofose
- (e) Swahili: Mnanaa, Mnawha, Muranha
- (f) Yoruba: Apikan, Apakan



### **Brief description of the plant:**

The *Datura metel* is generally annual, lignified at the base, reaching 1 m in height; stalks, smooth and breakable; leaves, elliptical widely oval, slightly lobed, downy of 20 cm by 14 cm; large wide flowers standing erect from a tubular calyx with single or double corolla and long acuminate lobes; hanging capsules more or less verrucose opening into two valves.

### **Geographical distribution:**

Native of America, now widely distributed in tropical and subtropical regions.

### **Part used:**

Herb.

### **Name of drug:**

Datura herb.

### **Definition:**

Datura herb is the dried flowering or fruiting tops of *Datura metel* Linn. or *Datura metel* variety *fastuosa* Safford, (family, Solanaceae).

### **Description:**

Datura herb occurs matted together, much shrunken and twisted or broken; frequently consisting of leaves, stems, flowering tops and occasional young fruits; odour, slight disagreeable and characteristic, taste, bitter and disagreeable.

**Macroscopical:** Leaves simple, alternate, with short cylindrical petiole, grooved on the upper side and generally bent. Lamina ovate; 8 to 13 cm long and 7 cm broad; base, usually asymmetric, wedged or cordate; margin, with 3 or 4 coarse teeth on each side; apex acute; thin and brittle, dark green on the upper, and paler on the lower surface; nearly glabrous; midrib prominent on upper and lower surfaces, veins 4 to 6, run into marginal teeth. Stems, often flattened, longitudinally, wrinkled, occasionally deeply grooved; light-brown to purple brown, dichasially branched.

Flowers absent or very few; solitary, shortly pedicellate, erect; calyx, green, tubular, 5-toothed, about 6 cm long; corolla, white, funnel-shaped, about 11 cm long; stamens, epipetalous; ovary, superior, conical bicarpellary, bilocular in the upper part, tetralocular in the lower part, covered by short emergences. Fruit immature, shrivelled, with short protuberances; capsule, containing numerous compylotropous albuminous seeds on axile placenta.

**Microscopical:** Leaf; dorsiventral; epidermal cells with thin wavy anticlinal walls and smooth thin cuticle; stomata present on both surfaces but more on the lower, and surrounded by 3 to 5 mostly 3 subsidiary cells; one of which is distinctly smaller than the others, anisocytic type. Hairs, generally few, present particularly near the veins on the lower surface usually less than 35  $\mu$  in diameter at the base, the basal cell up to 50  $\mu$  in length; glandular hairs, rare, small, each with unicellular curved stalk and multicellular head 3 to 7 celled. Mesophyll shows a single layer of palisade, followed by a crystal layer, each cell containing a cluster crystal of calcium oxalate or occasionally prisms or microsphenoidal crystals; large irregular masses about 170  $\mu$  in diameter extending throughout several cells; soluble in solution of ammonia. Midrib, with upper and lower hypodermal collenchyma, and containing an area of collateral bundles, with upper numerous groups of peri-medullary phloem; single prisms and idioblasts of microsphenoidal crystals in the cortical tissue but no fibres. Stem exhibits epidermis with, uniseriate non-glandular hairs; few pericyclic fibres; xylem, with numerous fibres and large, annular, spiral and reticulate vessels; numerous groups of perimedullary phloem and pith with idioblast of micro sphenoidal, cluster and prismatic crystals of calcium oxalate. Calyx, with outer epidermis having scattered simple uniseriate hairs, stomata of cruciferous type; inner epidermis with rare stomata and hairs of short capitate glandular type; epidermal cells, with wavy anticlinal walls; many mesophyll cells with cluster crystals of calcium oxalate, also some prisms. Corolla, with short uniseriate 1- to 4-celled non-glandular hairs, on the lower half of the inner epidermis; mesophyll, with numerous small crystals and some prisms, characteristic plastids as collar-like rings or flat discs with thin or hollow centres. Anther, with chain-like thickening in the endothelium.

Pollen grains, in chloral hydrate T.S., 60 to 80  $\mu$  in diameter, with finely daedalian ridging of exine, tricolpate, with three wide pores. Seed, with reticulate ridging of testa, outer wall of epidermis of young seeds, mucilaginous, swelling in water.

**Powder:** Powdered *Datura* herb is greyish-green to brownish-green; characterised by numerous green fragments of mesophyll and epidermis with stomata of anisocytic type; fragments of glandular hairs and warty non-glandular hairs; few fragments showing pitted, reticulate, spiral and annular vessels of large dimensions; numerous crystals of calcium oxalate, mostly clusters; occasionally prisms and microsphenoidal; cluster crystals; single crystals; occasional fibres and wide vessels may be present; also fragments of flower, fruit and seed, as well as pollen grains may be present.

#### **Chemical constituents:**

*Datura* herb contains about 0.5 per cent of alkaloids, chiefly hyoscine with traces of hyoscyamine and atropine.

**Tests for identity:**

- (a) Shake vigorously about 0.2 g of powdered Datura with 2 ml of dilute hydrochloric acid for 3 minutes, filter and add to the filtrate a drop of potassio-mercuric iodide, T.S., a precipitate is immediately formed.
- (b) Shake about 0.2 g of powdered Datura with 2 ml hydrochloric acid for 3 minutes, filter, and render alkaline with ammonia T.S., shake vigorously with 5 ml chloroform; separate the chloroform layer and evaporate it in an evaporating dish to dryness on a water bath. Add to the residue few drops of fuming nitric acid, evaporate to dryness, cool and add 1 ml alcoholic potassium hydroxide, a violet colour is produced.
- (c) Subject a sample of the chloroform extract obtained in a similar manner as described under Vitali test (b) above to thin-layer chromatography, as described in vol. 2, using the following systems:

STATIONARY PHASE. Silica Gel GF<sub>254</sub>, 0.25 mm.

MOBILE PHASES. System A: chloroform + acetone + diethylamine (5:4:1).

System B: n-butyl alcohol + glacial acetic acid + water (4:1:5).

Co-chromatograph the chloroform solution with solution of Hyoscyamine and Hyoscine. The chromatogram should show spots corresponding to Hyoscyamine and Hyoscine at R<sub>f</sub>s 0.30 and 0.50 in system A or 0.28 and 0.25 in system B respectively.

**Test for purity:**

Stomatal number about 60 to 140 on the upper and 140 to 250 on the lower surface.

Ash, not more than 20 per cent; acid-insoluble ash not more than 5 per cent.

**Assay:**

Introduce about 10 g of powdered Datura herb, module No. 22 accurately weighed, into a stoppered flask, and add 10 ml of alcohol and 40 ml of ether. Mix well, set aside for 10 minutes, add 5 ml of dilute solution of ammonium hydroxide, and shake frequently for one hour. Transfer the mixture to a small continuous extraction apparatus plugged with cottonwool, and when the liquid ceases to flow, pack firmly, and continue the extraction until complete exhaustion of the drug is effected. Evaporate the ethereal extract to about 20 ml and filter through a small dry filter paper into a separator. Wash the receiver and filter, previously used, with three successive portions, each of 5 ml of ether transferring each to the separator.

Add to the mixed ethereal extract and washing 20 ml of N/1 sulfuric acid, shake well, allow to separate, and run off the lower layer into another separator. Continue the extraction with several portions, each of 10 ml of N/10 sulfuric acid, until complete extraction of the alkaloids is effected.

Mix the acid liquids, wash with about 10 ml of chloroform, run off the latter into a separator containing 10 ml of water, shake, allow to separate, and reject the chloroform. Repeat the extraction of the acid liquid with two further portions, each of 10 ml of chloroform, transferring each to the separator containing the same water, and wash as before. Transfer the water from this separator to the one containing the acid liquid, add 20 ml of chloroform, followed by dilute solution of ammonium hydroxide, until distinctly alkaline, and shake at once. Separate the chloroform layer, and repeat the extraction with successive portions, each of 20 ml of chloroform

until complete extraction of the alkaloids is effected, carrying out the extraction as rapidly as possible. Wash the combined chloroform extraction as rapidly as possible. Wash the combined chloroform extracts with about 10 ml of water, reject the water, and dehydrate the chloroform extract with about 2 g of anhydrous sodium sulfate. Filter the chloroform extract through a dry filter paper into a porcelain dish, and wash the sodium sulfate and the filter with a few ml chloroform. Remove the chloroform, add to the residue 2 ml of absolute alcohol, evaporate to dryness, dry for half an hour at 100°C, and then cool. Dissolve the residue in 20 ml of N/50 sulfuric acid, and titrate with N/50 sodium hydroxide, using methyl red T.S. as indicator. Each ml of N/50 sulfuric acid is equivalent to 0.005787 g of total alkaloids calculated as hyoscyamine.

Transfer the titrated liquid to a separator, add a few drops of dilute solution of ammonium hydroxide, and shake with successive portions of chloroform. Evaporate the chloroform, add to the residue a few drops of fuming nitric acid, evaporate on a water-bath, cool and add to the residue a few drops of alcoholic potassium hydroxide T.S.; a violet colour is produced.

***Pharmaceutical preparations:***

See under Stramonium.

***Uses:***

The herb serves as commercial source of hyoscine.

Antispasmodic in renal and alimentary spasms.

Antiasthmatic, used as cigarettes for smoking.

Dilates the pupil of the eye and stops secretion of mouth and sweat.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Datura stramonium L.**

### **Family name:**

Solanaceae.

### **Synonym:**

- (a) *Datura tatula* L.
- (b) *Datura inermis* Juss. ex Jacq.

### **Common names:**

Thorn apple, Devil's apple, Jimsonweed,  
Purple Thorn-apple, Stramonium (E).  
Stramoine, Stramoine commune (F)



### **African names:**

- (a) Arabic: داتوره
- (b) Bambara: Satine = *D. inoxia*
- (c) Hausa: Ran kai-yaro, Babajuji, Zakani
- (d) Peuhl: Lofose
- (e) Swahili: Mnanaa, Mnawha
- (f) Yoruba: Apikan, Adodo-mode

### **Brief description of plant:**

The *Datura stramonium* is a shrub with deep dentate leaves, dumb bell-shaped flowers, erect capsules open into 4, bristle with dense, strong and uneven thorns.

### **Geographical distribution:**

*Datura stramonium* is cosmopolitan.

### **Part used:**

Leaves with or without the flowering tops.

### **Names of drug:**

Folium Stramonii. Stramonium Leaf. Feuille de Stramoine.

### **Definition:**

Stramonium is the dried leaves, with or without the flowering tops, of *Datura stramonium* L. or *D. tatula* L., collected from the plant in flower. Stramonium contains not more than 3 per cent of stramonium stems, over 8 mm in diameter, and not more than 2 per cent of foreign organic matter, and yields not less than 0.25 per cent of total alkaloids of stramonium, calculated as hyoscyamine.

### **Description:**

Stramonium occurs matted together, much shrunken and twisted or broken; frequently consisting of leaves, stems, flowering tops and occasional young fruits; odour, slight, disagreeable and characteristic; taste, bitter and disagreeable.

**Macroscopic:** Leaf, simple, alternate, with short cylindrical petiole grooved on the upper side and generally bent. Lamina, ovate or triangular ovate; base asymmetric, wedged or cordate; margin, distinctly unequally dentately lobed and irregularly serrate; apex, acuminate; thin and brittle; dark green on the upper, and paler on the lower surface, hairy if young and almost glabrous if old, usually showing small circular perforations surrounded by or sometimes filled with cork; midrib, prominent on upper and lower surfaces; veins leave the midrib at an angle of 45° and run into the marginal teeth. Stem often flattened, longitudinally wrinkled occasionally deeply grooved; olive-brown to purple-brown, dichasially branched.

Flowers, absent or very few; solitary, shortly pedicellate, erect; calyx, green tubular, 5-toothed, about 4.5 cm long; corolla, white or purple, plicate, funnel-shaped, about 8 cm long; stamens, 5, epipetalous; ovary, superior, conical, bicapillary, bilocular in the upper part, tetraocular in the

lower part, covered with short stiff emergences. Fruit, immature, shrivelled, thorny capsule, containing numerous campylotropous albuminous seeds on axile placenta.

**Microscopical:** Leaf, dorsiventral; epidermal cells with thin wavy anticinal walls, and smooth thin cuticle; stomata, present on both surfaces but more on the lower, and surrounded by 3 to 5, mostly 5, one of which is distinctly smaller than the others, cruciferous type. Hairs, generally, few present particularly near the veins on the lower surface; glandular hairs, rare, small, each with 1- to 2-celled curved stalk, and multicellular, usually 3- to 7-celled head; non-glandular hairs, slightly curved, with warty walls, 2- to 6-celled, uniseriate, up to 500  $\mu$  long; the basal cell being large usually more than 50  $\mu$  long (distinction from *D. metel*) and 35  $\mu$  wide at the base.

Mesophyll shows a single layer of palisade, followed by crystal layer, each cell containing a cluster of calcium oxalate or occasional prisms or microsphenoidal crystals. Midrib, with upper and lower hypodermal collenchyma, and containing an arc of collateral bundles, with upper numerous groups of perimedullary phloem; single prisms and idioblasts of microsphenoidal

crystals in the cortical tissue but no fibres. Stem exhibits epidermis with uniseriate non-glandular hairs up to 800  $\mu$  long; few pericyclic fibres; xylem, with numerous fibres and large, annular, spiral and reticulate vessels; numerous groups of perimedullary phloem and pith with idioblast of microsphaenoidal, cluster and prismatic crystals of calcium oxalate. Calyx, with outer epidermis having scattered simple uniseriate hairs, about 20 to 40  $\mu$  long; stomata of cruciferous type; inner epidermis, with rare stomata, and hairs of short capitate glandular type; epidermal cells, with wavy anticinal walls; many mesophyll cells with cluster crystals of calcium oxalate, also some prisms. Corolla, with short uniseriate, 1- to 4-celled non-glandular hairs, up to about 40  $\mu$  long on the lower half of the inner epidermis; mesophyll, with numerous small cluster crystals and some prisms, characteristic plastids as collar-like rings or flat discs with thin or hollow centres. Anther, with chain-like thickening in the endothecium. Pollen grains, in chloralhydrate T.S., 60 to 80  $\mu$  in diameter, with finely daedalian ridging of exine, tricolporate, with three wide pores.

Seed, with reticulate ridging of testa, outer wall of epidermis of young seeds, mucilagenous, swelling in water.

**Powder:** Powdered Stramonium is greyish-green to brownish-green; characterised by numerous green fragments of mesophyll and epidermis with stomata of cruciferous type; fragments of glandular hairs and warty non-glandular hairs; few fragments showing pitted, reticulate, spiral and annular vessels of large dimensions; numerous crystals of calcium oxalate, mostly clusters, occasionally prisms and microsphaenoidal; duster crystals, 10 to 25  $\mu$  rarely up to 55  $\mu$  in diameter; single crystals up to 20  $\mu$ ; occasional fibres and wide vessels may be present; also fragments of flower, fruit and seed, as well as pollen grains may be present.

**Chemical constituents:**

Alkaloids, mainly hyoscyamine and traces of atropine.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Microchemical test to indicate the presence of alkaloids using Dragendorff's or Mayer's reagent.
- (c) Carry out the Vitali's chemical test to show the presence of *Datura* alkaloids
- (d) Thin-layer chromatographic examination of the sample to confirm the presence of atropine, hyoscyamine.

**Tests for purity:**

- (a) Powdered Stramonium shows no short hairs with pointed tips and bulging basal cells (Xanthium).
- (b) Shake vigorously about 0.2 g of powdered Stramonium with 2 ml of dilute hydrochloride acid for 3 minutes, filter, and add to the filtrate a drop of potassium-mercuric iodide T.S.; a precipitate is immediately formed (Exhausted Stramonium).
- (c) Ash, not more than 20 per cent; acid-insoluble ash, not more than 5 per cent.; Alcohol-soluble extractive: Not less than 5 per cent.; Water-soluble extractive: Not less than 26 per cent.; Foreign matter: Not more than 2 per cent.; Not less than 0.25 per cent of total alkaloids of stramonium calculated as hyoscyamine; Not more than 3 per cent of stem with diameter exceeding 5 mm.

**Assay:**

Carry out the assay described under *Datura metel* using about 10 g of powdered Stramonium, module No. 22, accurately weighed.

**Pharmaceutical preparations:**

Extractum Stramonii Fluidum.  
Extractum Stramonii Siccum.  
Pulvis Stramonii Standardizata.  
Tinctura Stramonii.

**Uses:**

Anticholinergic.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Derris elliptica (Roxb.) Benth.**

### **Family names:**

Fabaceae.

### **Synonyms:**

- (a) *Cylista piscatora* Blance
- (b) *Milletia splendidissima* Vidal.
- (c) *Paraderris elliptica* (Wall.) Adema
- (d) *Pongamia volubilis* Zollo ou Mor.

### **Common names:**

Tuba-root (E). Touba. Aker tuba. Derris (F).

### **African names:**

- (a) Arabic: ديريس
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description:**

Rising and branched shrub; with a developed root system imparipinnate leaves; inflorescence in spikelike clusters; ornamental purplish-blue flowers.

### **Geographical distribution:**

Introduced and cultivated in tropical Africa.

### **Part used:**

The dried rhizomes and roots.

### **Names of drug:**

Derris root. Derris.

### **Definition:**

Derris is the dried rhizome and root of *Derris elliptica* Benth. (family, Fabaceae).

### **Description:**

The rhizome, short pieces; brown in colour; taste, somewhat bitter followed by sensation of numbness; odour, slightly aromatic; fracture, flexible and fibrous.

**Macroscopical:** The rhizome, oblique, longitudinally wrinkled, with transverse cracks and circular lenticels, 8 to 25 mm thick, the slender roots, some pieces are as much as 2 meters long, maximum diameter 8 mm to 1 cm and not more than 5 mm thick, with fine longitudinal furrow.

**Microscopical:** Thin cork; followed by phellogen, parenchymatous, filled with starch granules; single or 2-3 compound, rounded, or ellipsoid, being 3  $\mu$  to 6  $\mu$  to 12  $\mu$  to 20  $\mu$  in diameter; pericycle, parenchymatous with numerous lignified sub-rectangular sclereids; phloem, alteration of phloem fibres and bands of sieve-tissue, the parenchyma adjacent to the fibres containing a prism of calcium oxalate, measure 10 to 20  $\mu$  in diameter, the fibres of phloem and xylem have lignified middle lamella; xylem, continuous rings of secondary xylem with medullary rays which are one to six-seriate and include radial chains of three to seven cells with resinous contents, the xylem vessels are in two sizes, larger, 40-220  $\mu$  in diameter; smaller, 20-40  $\mu$  in diameter; xylem fibres are

present; both xylem fibres and vessels are embedded in a starch bearing parenchyma which is cellulosic, but near the vessels the cell walls are lignified.

***Chemical constituents:***

Rotenone, about 2 to 10 per cent; degueline, tephrosin, and toxicarol.

***Test for identity:***

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above
- b) The freshly cut surface appears grey or yellowish-grey in filtered ultraviolet light.

***Test for identity:***

The freshly cut surface appears grey or yellowish-grey in filtered ultraviolet light.

***Pharmaceutical preparations:***

N/A

***Uses:***

Insecticide, not poisonous to men or domestic animals.

***Storage:***

In well-closed containers, protected from light in a cold place.

## **Desmodium adscendens (Sw.) DC.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Desmodium caespitosum* (Poir.)DC.
- (b) *D. glaucescens* Miq.
- (c) *D. heterophyllum* sensu auct.
- (d) *D. oxalidifolium* Miq.
- (e) *D. ovalifolium* Guill. & Perr.
- (f) *D. obovatum* Vogel
- (g) *D. simplex* G. Don
- (h) *D. vogelii* Steud.
- (i) *Hedysarum adscendens* Sw.
- (j) *H. caespitosum* Poir.
- (k) *Meibomia adscendens* (Sw.) Kuntze



### **Common names:**

Hard stick, Tick-clover, Tick-trefoil, Zarzabacoa Galana (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Tahe
- (c) Hausa: waaken-zoomoo =*D. canum*
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Epa-ile, Epakun

### **Brief description of the plant:**

*Desmodium adscendens* is a vine, which grows wild in the Amazon rainforest of Peru and other South American countries and on the West Coast of Africa as well. It is an herbaceous, perennial plant which grows up the trunks of trees.

An undershrub with slender thinly pubescent branches, straggling and sometimes prostrate and rooting; flowers pink or whitish.

### **Geographical distribution:**

Extends through tropical Africa to S. Africa.

### **Part used:**

The leaves, aerial parts and stems .

### **Name of drug:**

Tick-clover.

### **Definition:**

Tick-clover is the dried leaves of *Desmodium adscendens* (Sw.) DC. (family, Fabaceae).

### **Description:**

**Macroscopical:** Straggling perennial herb or undershrub, or often prostrate and rooting at the nodes, 0.2–1 m long or tall. Stems densely covered with spreading white hairs when young, eventually glabrescent, red-brown and striate. Leaves 3-foliate; leaflets 1.5–5.6 × 1.3–3.5 cm, elliptic to round or obovate to subrhombic, broadly rounded at both ends or

somewhat acute, glabrous or with fine very short hairs above, densely appressed pilose beneath; petiole 8–30 mm long; rhachis 2–6 mm long; petiolules 1.5–2 mm long; stipules 7–10 × 1.5–2.5 mm, lanceolate, striate, hairy, persistent. Inflorescences mostly terminal, lax 2–11 cm long, finely uncinulate-puberulous and with longer hairs; peduncles 4–10 cm long; pedicels 7–16 mm long, uncinulate-pubescent; primary bracts each subtending 2 pedicels, 4–11 × 1.5–2.5 mm, ovate-lanceolate, long attenuate, pubescent, soon deciduous; secondary bracts mostly absent. Calyx finely puberulous and with sparse long hairs; tube 1.2 mm long; lobes 1–2 mm long, triangular. Standard whitish, greenish-blue, pink or mauve, 3.5–4 mm × 2–2.5 cm, obovate; wings bright pinkish-mauve; keel greenish-white. Fruit 2–2.5 cm long, of 2–5 articles, each article 5–9.5 × 2.6–3.5 mm, semi-elliptic with straight upper margin and strongly rounded lower margin, densely uncinulate-pubescent, joined by necks 1 mm wide, reticulately veined. Seeds chestnut-brown, 5 × 2.5 mm, elongate-reniform, narrowed towards one end.

**Chemical constituents:**

The therapeutic phytochemicals in *Desmodium adsendens* include alkaloids of the family of indolic alkaloids. The plant contains 4 mg/kg of alkaloids expressed in tryptamine. Fatty acids are present in a concentration of up to 3%, which is relatively rich in unsaturated acids. Tick-clover is known to be rich in flavonoids, alkaloids, and chemicals known as soyasaponins. A novel soyasaponin in it is dehydrosoyasaponin. It also contains a chemical called astragalin. Main chemicals found in it include astragalin, beta-phenylethylamines, cosmoisin, cyanidin-3-o-sophoroside, dehydrosoyasaponins, hordenine, pelargonidin-3-o-rhamnoside, salsoline, soyasaponins, tectorigenin, tetrahydroisoquinolines, and tyramine.

**Tests for identity:**

- (a) Macrochemical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Chemical tests for the presence of alkaloids with the common alkaloidal reagents
- (c) Thin-layer chromatographic examination or HPLC examination of the alkaloidal extract to confirm the presence of tryptamine

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Asthma and allergies. Generally, 1-3 cups of tick-clover leaf tea (standard infusion) daily, 4-6 ml of a standard tincture, or 4-5 g of powdered leaves in capsules daily are used for most conditions.

**Storage:**

In a cool dry place.

## **Desmodium velutinum (Willd.) DC.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Desmodium lasiocarpum* (P. Beauv.) DC.
- (b) *Desmodium latifolium* (Roxb.) DC.
- (c) *Desmodium pluknetii* (Wight & Arn.) Merr.
- (d) *Anarthrosyne cordata* Klotzsch,
- (e) *Hedysarum deltoides* Poir.
- (f) *Hedysarum deltoideum* Schum. & Thonn.
- (g) *Hedysarum lasiocarpum* P. Beauv.
- (h) *Hedysarum latifolium* Roxb
- (i) *Hedysarum velutinum* Will
- (j) *Pseudarthria cordata* (Klotzsch) C. Mueller



### **Common names:**

Velvet-Leaf Desmodium, Villous leaf Desmodium, (E)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Dankadafi, Ma'da'ddafi, Kadankadafi
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Emo, Arorin-ewuju, Imo, Abere-defe, Amo, Basore, Borodefe, Ewe-eemo

### **Brief description of the plant:**

Erect, subshrub or woody herb, 0.5 -3 m tall. Stems with dense spreading ferruginous hairs when young, becoming hairless below. Leaves 1-foliolate; leaflet lamina large, 3-19 × 2-13 cm, ovate to almost circular; apex bluntly acute to rounded; appressed-pubescent above, velvety beneath; petiole 1.5 - 3.5 mm. Inflorescences of terminal and axillary false racemes. Calyx hairy; lobes to 1.5 mm long. Standard violet, lilac, red or blue. Fruit of 2-7 articles, bearing hooked hairs; articles 2.5-4 mm long. Seeds brown

### **Geographical distribution:**

A common plant of the Old World tropics . Widespread in Africa, Madagascar, SE. Asia and Malaysia.

### **Part used:**

Leaf, root.

### **Name of drug:**

Velvet-Leaf Desmodium.

### **Definition:**

Velvet-Leaf Desmodium is the leaf of *Desmodium velutinum* (Willd.) DC. (family, Fabaceae).

### **Description:**

**Macroscopic:** Upright woody perennial herb, subshrub, or shrub, up to 3 m. tall; stem simple or somewhat branched, reddish, lineate, densely uncinulate-pubescent. Leaves 1-

foliolate (rarely 3-foliolate), occasionally opposite; stipules stramineous, rather long persistent, ovate-long-attenuate, lobed at base, soon narrowed to a slender caudate tip, 2.2–8.5 mm. long, 1–4 mm. wide at base, pilose on the outer surface, becoming ± glabrous, ciliate; petiole sulcate, usually linear, densely strigose to glabrescent, 0.3–2.2 cm. long; leaflet light green to blue-green or darker above, paler beneath and with prominent pallid veins, suborbicular to elliptic to rhombic-ovate, 3–9.4 cm. long, 2–7 cm. wide, entire or repand (indented at the termination of the lateral veins) and ciliate, thick, mostly soft velvety on both surfaces with long stiff golden, reddish or white hairs slightly hooked at apex and intermixed with straight tapering ones. Inflorescences axillary and terminal densely flowered racemes to 1 dm. or more long, at least the terminal ones often paniculately branched; rhachis striate, densely long uncinulate-pubescent with straight hairs intermixed; primary bracts each subtending 3–5 pedicels, stramineous, lanceolate-to ovate-attenuate, 1.5–4 mm. long, 0.5–1 mm. wide, somewhat pilose and uncinulate-puberulent on the outer surface, ± persistent; secondary bracts similar, slightly smaller and almost linear; pedicels abundantly uncinulate-pubescent with straight hairs intermixed, 1–3 mm. long; occasionally small bracteoles present on the pedicels. Flowers white to pink, to blue, mauve or brilliant purple, usually appearing whitish or pale when dry. Calyx rather densely strigose, central tooth of lower lobe attenuate, 3 mm. long, the lateral teeth slightly shorter; upper bifid lobe almost rounded to acute, notched at centre, 2 mm. long. Corolla ± twice the length of calyx; standard suborbicular, retuse at apex, gradually narrowed to the cuneate base, 4.2–6 mm. long, 3.5–6 mm. wide; wings ± oblong, obtuse, shortly clawed, 4–5.5 mm. long, 1–2.4 mm. wide; keel-petals remotely scythe-shaped, slenderly clawed, equalling or exceeding calyx in length, 1–2 mm. wide. Fruit sessile to shortly stipitate (stipe to 1.5 mm. long), with style usually persistent, 2–6(–7)-articled, upper suture essentially straight to slightly curved and somewhat indented at the isthmi, lower suture ± rounded, indented at isthmi (between the articles), surfaces and sutures uncinulate-pubescent throughout with straight tapering hairs intermixed; articles subrectangular, 2.5–4 mm. long and wide. Seed orbicular to reniform, reddish to almost black, 1.5–2.5 mm. long, 1.5–2 mm. wide.

**Chemical constituents:**

N/A

**Tests for identity**

Macroscopical examination of the specimen to ensure compliance with the descriptions above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Roots used in diarrhoea, vomiting, stomach pain, fever and insanity. Leaf, root: ecbolics; diarrhoea, dysentery.

**Storage:**

In a cool dry place.

## **Digitalis lanata Ehrh.**

### **Family name:**

Plantaginaceae.

### **Synonyms:**

N/A

### **Common names:**

Gerician fox glove, Wooly foxglove (E). Digitale laineuse (F).

### **African names:**

- (a) Arabic: التفعية الصوفية أو كف الثعلب أو أصبع العذراء
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Annual or biennal herbaceous plant with dark green, oblong ciliated leaves; inflorescence terminal in long dense clusters, multiflowers, bracts shorter than flowers characterised by a greyish white corolla reticulated with brown, downy underneath; lower lobe long, white, sparser with brown villous downy calyx; fruits, capsule.



### **Geographical distribution:**

Temperate and subtropical regions.

### **Part used:**

Leaves.

### **Names of drug:**

Folium Digitalis. *Digitalis lanata* leaf. Feuille de Digitala.

### **Definition:**

*Digitalis lanata* leaf is the dried leaf of *Digitalis lanata* Ehrh (fam. Scrophulariaceae), collected and rapidly dried at about 55-60°C. Digitalis leaves contain not more than 2 per cent foreign organic matter and 5 per cent acid insoluble ash. 1 g of *Digitalis lanata* leaf corresponds to, at least, 19 international Digitalis units.

### **Description:**

Odour: somewhat tea like; taste is very bitter.

**Macroscopical:** Leaves are sessile, usually about 30 cm long and 5 cm wide; the upper surface is dark green, the lower light green; the lamina is oblong lanceolate; the margin is entire and in the basal half ciliate with long trichomes, otherwise the leaf is glabrous; the main veins are few, they leave the midrib at very acute angles, and travel for some distance towards the apex, while the smaller branches are inconspicuous, thus giving an appearance simulating a parallel venation, apex is acute and the base is symmetric.

**Microscopical:** The leaf is dorsiventral; palisade may be 2-3 layers or may be undifferentiated. Calcium oxalate crystals are absent. Epidermal cells are polygonal with straight or slightly wavy anticlinal walls, more strongly, wavy in the lower epidermis; stomata, on both surfaces, more numerous on the lower surface, each surrounded by 3 to

7 mostly 4 cells, ranunculaceous type. Cuticle is striated. Glandular hairs and non-glandular hairs are very rare and present only on the margin of the basal ciliated part. Glandular hairs uni- or multicellular uniseriate stalk (1-7 cells) and a uni- or bicellular globular head. Non-glandular hairs are multicellular, uniseriate consist of 5 to 7 cells. Mesophyll with palisade of 2 or 3 layers of short cells, sometimes undifferentiated spongy mesophyl of several layers. Midrib shows an arc of vascular bundles with radiate xylem; narrow phloem one celled medullary rays, accompanied with collenchymatous pericycle of small cells and an endodermal starch sheath.

**Powder:** Powdered Digitalis leaf is dark green in colour, characterised by numerous fragments of epidermal cells, with beaded walls; striated cuticle, ranunculaceous stomata, and very few glandular and non-glandular hairs, large veins showing annular and spiral vessels; sclerenchyma and crystals are absent.

**Chemical constituent:**

1-1.4 per cent of a mixture of cardiac glycosides: digitoxin, gitoxin, digoxin, lanadigin and digilanids A, B and E.

**Tests for identity:**

(a) Boil 1 g of powder with 10 ml of alcohol (70 per cent) for 2 minutes and filter; to 5 ml of the filtrate add 10 ml of water and 5 ml of chloroform, separate the lower layer, and evaporate to dryness; dissolve the cooled residue in 3 ml of glacial acetic acid containing 0.1 ml of ferric chloride solution and transfer this solution to the surface of 2 ml of sulphuric acid; a reddish-brown layer forms at the interface and the upper layer gradually acquires a bluish-green colour which darkens on standing.

(b) Boil 1 g of powder with 20 ml of alcohol (50 per cent) and 10 ml of lead acetate solution for 2 minutes, allow to cool, and centrifuge; shake the supernatant solution with 2 portions, each of 15 ml of chloroform; if necessary, separate the 2 layers by centrifuging; dry the combined

chloroform layers over anhydrous sodium sulphate and filter; evaporate 5 ml of the solution to dryness on a water-bath and to the residue add 2 ml of dinitrobenzoic acid solution and 1 ml of IN sodium hydroxide solution; a red-violet colour develops within 5 minutes.

(c) Evaporate 5 ml of the chloroform solution, prepared as described in (b) above, to dryness on a water-bath; to the residue add 3 ml of xanthydrol solution and heat for 3 minutes on a water-bath; a red colour develops.

**Test for purity:**

Digitalis leaf shows no calcium oxalate crystals no sclerieds, no bast fibres and no thick walled hairs, no large pitted pith cells, no pitted vessels of large diameter and no fibres.

**Assay:**

The biological activity of a sample of Digitalis leaf is determined by comparing its potency with that of the International Standard Preparation of Powdered Digitalis Leaf. This potency is expressed in International Units, each of which corresponds to the potency of 0.08 g of the International Standard of Powdered Digitalis Leaf. The International Standard of Powdered Digitalis Leaf, is a mixture of dried and powdered Digitalis leaf, kept in sealed vials in the National Institute for Medical Research,

Hampstead, London, on behalf of the World Health Organisation of the United Nations. The method of comparison is based on the determination of the quantity of the prepared drug which, when injected into an animal, will cause death due to cardiac arrest.

Among satisfactory methods are those in which the frog, the cat, the dog or the guinea-pig is used for the experiment. Whatever method is used it must be so applied that the standard deviation of the result, ascertained by a large number of determinations, is not greater than 10 per cent.

The method of preparing a solution, containing the active constituents of the Standard Preparation of Powdered Digitalis Leaf, depends on the biological method selected and the procedure to be applied in testing the sample must be the same as that used for the Standard Preparation.

The solution is prepared so as to contain the maximum amount of the active principles of the drug and the volume to be administered must be proportional to the weight and sensitivity of the animal.

*The Method employing the Frog:* The method is based on determining the percentage mortality obtained in a group of frogs, in a limited time, when injected with a dose of concentrated extract of the sample to be tested sufficient to kill not less than 50 per cent, of the animals but not all, and comparing its activity with that of similar extract of the International Standard of Powdered Digitalis Leaf prepared in precisely the same way as the extract used in the test.

(a) Preparation of the solution for the tests:

Weigh a quantity of the powdered sample, module No. 22, to be tested in a stoppered weighing bottle. Transfer the contents of the weighing bottle to a small continuous extraction apparatus, extract with about 25 ml of absolute alcohol per gram of powder for 6 hours, or until the

drug is completely exhausted. Concentrate the extract to a volume of 5 ml per gram of powder taken, transfer to a measuring cylinder, and make up to volume with physiological sodium chloride T.S., so that 10 ml of this extract represents 1 g of the sample to be tested.

Prepare a similar extract of the Standard Preparation of Powdered Digitalis Leaf, and adjust it so that 10 ml of this extract represents 1 g of the Standard Preparation.

(b) Choice of the frogs:

Select healthy frogs of the same species, more or less of equal weights, and preferably males (females must not be used when distended with eggs); the frogs in anyone comparison must be either all males or females; the weight of each frog must be between 15 to 30 g. Keep the frogs, before being injected for at least 2 hours in a uniformly lighted part of the laboratory. Make the injections into the ventral lymph sac. Leave the frogs for 24 hours after the injection. Then

determine the number per group of the frogs, which dies from the specific effect of Digitalis leaf on the heart, and calculate the percentage mortality.

(c) The test:

The assay includes a preliminary test and a final test. The preliminary test is made to ascertain the doses of the extract of the Standard Preparation as well as those of sample to be tested, which are to be used in the final test. These doses must be big enough to kill some but not all the frogs, with the view of finding out the doses that would kill about one half the frogs in each batch. Usually such doses are about 0.5 ml of the extract per 100 g of frog. The method of testing is constituted by injecting similar groups of frogs with suitable dilutions of the extracts of the Standard Preparation and of the sample to be tested. The dilutions are made with physiological sodium chloride T.S. The dose, which each frog receives, must be proportional to its body weight, determined to the nearest gramme, and may conveniently be expressed in millilitres per 100 g of frog.

1. Preliminary test:

Take 12 frogs, and divide them into 2 groups of 6 each; inject each frog of one group with 0.5 ml per 100 g of frog, of the (1 in 10) dilution of the extract of the Standard Preparation, and each of the other group with the same dose and dilution of the extract of the sample to be tested. After 24 hours, calculate the percentage mortality in each group, and from the result obtained, determine the doses which kill about 50 per cent of the frogs in the final test.

2. Final test:

This test is performed in two parts on two successive days.

(a) First day's comparison:

Take not less than 24 frogs, and divide them into 2 equal groups so that the individuals of any given weight are equally distributed, as far as possible, between the two groups. Inject each frog of the first group with the extract of the Standard Preparation, giving not more than 1 ml per 100 g of body weight, of the extract diluted with physiological sodium chloride T.S., similarly inject each frog of the second group with 1 ml per 10 g of body weight of the extract of the sample to be tested which must not be necessarily diluted to the same concentration. From the number of the observed deaths in the two groups, express as percentage mortalities the potency of the

dose of the extract of the sample to be tested relative to the potency of the dose of the extract of the Standard Preparation. This is ascertained by means of the following table:

*Table of Potency Corresponding to a Given Percentage Mortality of the Frogs*

Percentage Mortality	Potency	Percentage Mortality	Potency
5	66	55	103
10	67	60	107
15	75	65	110
20	80	70	114
25	83.7	75	118

30	87	80	122
35	90	85	127
40	93.5	90	134
45	97	95	146
50	100		

Potencies corresponding to percentage mortalities other than those given may be obtained by interpolation. The relation between the potencies of the sample to be tested and of the Standard Preparation, taken as unity, is calculated from the following formula:

$$\frac{P'}{P} \times \frac{C}{C'}$$

where:

P = The potency of the Standard Preparation of Powdered Digitalis Leaf.

P' = The potency of the sample to be tested.

C' = The concentration of the extract of the sample to be tested.

C = The concentration of the extract of the Standard Preparation of Powdered Digitalis Leaf.

(b) Second day's comparison

Repeat the procedure on the second day, using a fresh batch of not less than 24 frogs. The doses to be given to this batch must be such as would produce a mortality of 50 per cent in each group; these are calculated by deduction from the results of the first day's comparison.

From each comparison, a figure is obtained for the potency of the sample to be tested and the average of these two figures is taken to indicate the true value.

The potency of the sample to be tested, in units per gramme, is obtained by dividing the figure of its average potency by the weight, in grammes, of the Standard Preparation, which contains 1 unit. The number of units per gramme multiplied by 8 gives the potency of the sample to be tested in terms of the potency of the International Standard of the Powdered Digitalis Leaf expressed as 100.

**Pharmaceutical preparations:**

Infusion of Digitalis.

Pulvis Digitalis Standardizata.

Tinctura Digitalis. Prepared digitalis.

**Uses:**

Treatment of heart failure.

**Storage:**

In tightly closed containers, in a cool dry place, protected from light.

## **Diospyros mespiliformis Hochst. ex A.DC.**

### **Family name:**

Ebenaceae.

### **Synonyms:**

N/A

### **Common names:**

Jackalberry Tree, Jakkalbessie, African Ebony, Ebony *Diospyros* (E). Ebénier d'Afrique (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Kalwaa, Kanyaa, Moowar birii,
- (d) Peuhl: Koukoui
- (e) Swahili: N/A
- (f) Yoruba: Ige



### **Brief description of the plant:**

The Jackalberry tree is found throughout Africa, from Senegal and the Sudan to Namibia. It is most commonly found on savannas or savanna woodlands where it can be found growing on termite mounds. In heavy soils the termite mounds provide the tree with aerated soil, and a source of moisture. The roots provide protection for the termites, that don't eat the living wood. Jackalberry wood is almost termite-resistant after it has been cut down. The tree prefers moist soil, rocky soils. It grows well in red loams, volcanic and loamy sands. Jackalberry trees are also commonly found along river beds and swampy areas.

### **Geographical distribution:**

The tree is widely distributed throughout the eastern part of the African continent, from Ethiopia to the south of Swaziland.

### **Part used:**

Bark, leaves, twigs, and roots.

### **Name of drug:**

Jackalberry root.

### **Definition:**

Jackalberry root is the dried roots of *Diospyros mespiliformis* Hochst. ex A.DC. (family, Ebenaceae).

### **Description:**

*Diospyros mespiliformis* is a tall, upright tree that can reach a height of 25 m, with a trunk circumference of more than 5 m. It has a dense evergreen canopy. The bark is black to grey, with a rough texture. The fresh inner skin of the bark is reddish. Leaves are simple, alternate, leathery and dark green. The margin is smooth and new leaves in spring are red, especially in young plants. Flowers are cream-coloured and bell-shaped. Male flowers are arranged in stalked bunches and female flowers are solitary. The fruit is a fleshy berry, with an enlarged calyx, yellow to orange when ripe.

***Chemical constituents:***

The leaves, bark and roots of the tree contain tannin, Root bark: Diosquinone. anthraquinones, tannins, triterpene, saponins, steroids, and sugars and the absence of alkaloids reported.

***Tests for identity***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Aqueous extract of the root powder gives blue-black colouration with ferric chloride solution
- (c) Extract of the root powder gives a positive reaction for the test for anthraquinone derivatives as described in volume 2 or under the monograph for Senna.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

It is antimicrobial, antihypertensive, antidiarrhoea, cytotoxic.

***Storage:***

In a cool dry place.

## **Drimia maritima (L.) Stearn**

### **Family name:**

Asparagaceae.

### **Synonym:**

- (a) *Charybdis maritima* (L.) Speta
- (b) *Urginea maritima* (L.) Baker
- (c) *Urginea scilla* Steinh.

### **Common names:**

Squill (E). Scille offici (F).

### **African names:**

- (a) بصل ألفار أو بصل البرأو الباصول Arabic: Alfar or Basal al-Basoul
- (b) Bambara: N/A
- (c) Hausa: Albasar kura, Albasar gizo
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Esinsin-uroro = *U. altissima*



### **Brief description of the plant:**

Bulbous plant 10 cm in diameter; handy stem reaching 1.50 m high; wide leaves of 3-6 cm; white flowers in long tight clusters.

### **Geographical distribution:**

Coastal mediterranean regions.

### **Part used:**

Dried fleshy scales of the bulbs.

### **Names of drug:**

Bulbus Scillae. Squill.

### **Definition:**

Squill is the dried, sliced, fleshy scales of the bulb of *Urginea maritima* (L.) Baker (family, Asparagaceae) collected shortly after withering of flowers and leaves, and known as White Squill. Squill contains not more than 2.0 per cent of foreign organic matter.

### **Description:**

Odour, slight; taste, mucilaginous, bitter and acrid.

**Macroscopical:** Squill occurs in irregular, curved, flattened, narrow pieces, frequently tapering towards both ends; 0.5 to 5 cm long, 5 to 8 mm wide, 2 to 5 mm up to 7 mm thick; yellowish-white to pale yellow, somewhat translucent; exhibiting raised slightly darker points or lines, the vascular bundles; brittle when perfectly dry; tough and flexible when moistened: fracture, short.

**Microscopical:** The epidermis is formed of subrectangular or polygonal, axially elongated cells, sometimes having thick cuticle; stomata, very few, large, nearly circular, with no special subsidiary cells. The mesophyll is traversed by several collateral vascular bundles, with lignified annular, spiral and rarely reticulate xylem vessels, and consists of colourless large polygonal, rounded or slightly elongated thin-walled parenchyma cells, usually containing a reducing sugar and sinistrin; many scattered, axially elongated cells containing bundles of large raphides of calcium oxalate, embedded in mucilage which

stains pink with alkaline corollin T.S.: some of the cells near the vascular bundles contain occasionally small, simple starch granules.

**Powder:** Powdered Squill is white to light yellowish-brown: very hygroscopic forming caked masses in moist atmosphere: characterised by numerous fragments of translucent parenchyma; few fragments of epidermis with occasional stomata; few fragments of vascular tissues; cells with mucilage and bundles of raphides numerous raphides of calcium oxalate, free, in bundles, or broken 50 to 1000  $\mu$ , mostly 250 to 500  $\mu$  long and 0.5 to 20 mostly 5 to 8  $\mu$  thick; very occasional simple starch granules.

**Chemical constituents:**

Cardenolides: Scillaren A and Scillaren B; mucilage, sinistrin and xanthoscillide.

**Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) The mucilage in the cells of the mesophyll stains red with alkaline corallin solution but gives no red colour with ruthenium-red solution and no purple colour with iodine water.

**Tests for purity:**

- (a) The powder contains no starch granules over 20  $\mu$  in diameter and only very few small starch granules (Flours and other adulterants), no fragments of red, pink, or purplish epidermal or parenchyma tissue (Red Squill); no trichomes and no thick-walled sclerenchymatous cells.
- (b) Soak a piece of Squill in water for a few minutes, transfer to dehydrated alcohol R. and examine with the microscope; acicular crystals of sinestrin aggregated in rosettes are seen in several cells (Exhausted Squill).
- (c) Squill yields not less than 65.0 per cent of alcohol (60 per cent) extractives.
- (d) Ash, not more than 6.0 per cent; acid-insoluble ash, not more than 2 per cent.

**Pharmaceutical preparations:**

Acetum Scillae.

Acetum Scillae Mellittus.

Tinctura Scillae.

Opiate Squill Linctus (Gees Linctus).

Opiate Squill pastilles (Gees pastilles).

Paediatric Ipecacuanha and Squill Linctus.

Paediatric Opiate Squill Linctus.

Squill Liquid Extract.

Squill Syrup.

**Uses:**

Cardiotonic, diuretic.

**Storage:**

In well-closed containers, over quick lime, in a cool dry place, protected from light.

## **Elaeis guineensis** Jacq.

### **Family name:**

Arecaceae.

### **Synonyms:**

- (a) *Elaeis nigrescens* A. Chev.
- (b) *Elaeis virescens* A. Chev.

### **Common names:**

King Palm (*Elaeis guineensis* var. *idolatrifica*) (E). Palmier a huile (F).



### **African names:**

- (a) Arabic: نخل الدهن أو نخلة الزيت
- (b) Bambara: M'te,
- (c) Hausa: Kuaku, Kwakwa, Alayyadii, Bamii, gima, Mahjaa, Kwaardr kwaakwaa
- (d) Peuhl: N/A
- (e) Swahili: Mawese (Palm oil)
- (f) Yoruba: Ope, Eyi

### **Brief description of the plant:**

Straight stemmed palm tree of 15 to 20 m high, with prominent foliar scars, dark brown leaves that gather at the top, pinnatisealed with span of about 7 m; inflorescence male and female at the axils of leaves; fruits in cluster ranging from 3 to 10 kg; ovoid drupes red when ripe (3 to 4 cm); meso carp fibrous and oily; endocarp hard containing a brown seed with an oily white albumen.

### **Geographical distribution:**

Spontaneous, or grown in dense humid tropical forest regions.

### **Chemical constituents:**

Palm oil is obtained from the mesocarp by several methods of extraction.

- Separation by decantation after grinding.
- Extraction by solvent and refining.

#### **Aspect (or characteristic)**

The palm fruit varies according to the species with the colours ranging from orange yellow to orange red. The semi-solid or liquid consistency corresponds to melting-points ranging from 30 to 45°C. It has a characteristically agreeable aromatic smell.

The main constituents are glycerides of fatty acids with high molecular weights:

Oleic acid	40 to 50 per cent.
Palmitic acid	40 per cent.
Linoleic acid	6 to 10 per cent.
Stearic acid	3 to 5 per cent.
Myristic acid	1 to 5 per cent.

The unsaponifiable fraction contains two interesting substances:

- Carotenoid pigments rich in vitamin A (Xanthophyll and ~-Carotene).
- Sterols especially ergosterol. .

Cabbage palm oil is obtained from the kernel by pressure or dissolution followed by refining of a pale yellow or even colourless oil which comprise the following glycerides of fatty acid.

Lauric acid	50 per cent of total fatty acids.
Myristic acid	15 per cent of total fatty acids.
Oleic acid	15 per cent of total fatty acids.

**Assay:**

Specific gravity at 15 or 20°C.

**Uses:**

Palm and Cabbage palm oils are edible with nutritional value linked to prevention of various manifestations of vitamin A deficiency e. g. eye troubles, xerophthalmia, growth retardation, low resistance to infections.

External medical uses are varied:

- wounds, burns, skin infections.
- Decongestant: can be applied without mixture or together with other substances.

**Storage:**

In a cool dry place.

## **Elettaria cardamomum (L.) Maton**

### **Family name:**

Zingiberaceae.

### **Synonyms:**

- (a) *Alpinia cardamomum* Roxb.
- (b) *Amomum cardamomum* Lour.
- (c) *Amomum racemosum* Lamk.
- (d) *Amomum repens* Sonnerat

### **Common names:**

Cardamom, True cardamom (E).  
Cardamome, Cardamomier (F).

### **African names:**

- (a) Arabic: جبهان أو جبهال
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Hiliki
- (f) elletaria:



### **Brief description of plant:**

Perennial plant with leafy rhizomes of 2 to 3 m; lanceolate leaves; spike with greenish white flowers, pyriform fruits with ovoid seeds emitting a pungent, lemon-scented aroma.

### **Geographical distribution:**

Humid mountainous regions of tropical Africa.

### **Part used:**

The dried ripe seeds.

### **Names of drug:**

Semen Cardamomi. Cardamom seed. Semene de cardamorne.

### **Definition:**

Cardamom seeds are the dried ripe or nearly ripe seeds of *Elettaria cardamomum* (L.) Maton var. *minuscula* Barkhill, (family, Zingiberaceae) recently separated from the fruit. Cardamom seed contains not more than 3 per cent of foreign organic matter, and yields not less than 3 per cent of volatile oil.

### **Description:**

Odour, strong aromatic; taste, agreeable, aromatic and pungent. Pericarp, almost odourless and tasteless.

**Macroscopical:** Fruit, inferior, ovoid or oblong, septicidal capsule plump or slightly shrunken; 8 to 20 mm, mostly 10 to 15 mm long, 8 to 10 mm thick; green to pale buff, sometimes yellowish-grey, mostly 3-sided; externally, smooth or longitudinal striated; base, rounded and may bear the remains of the stalk; apex, more or less blunt and sometime crowned by a short beak formed of the remains of the floral parts; internally, 3-celled, in each cell is an adherent mass of two rows of small seeds attached to axile placenta.

Seed, irregularly angular, 3- to 4-sides, oblong, ovoid; 2 to 4 mm long, up to 3 mm broad; pale orange to dark reddish-brown; usually enveloped by a thin colourless membranous arillus externally, transversely wrinkled but not minutely pitted; hilum, depressed; raphe, indicated by a channel extending on one side from base to apex; hard; internally, whitish, showing

a thin dark testa, a whitish starchy perisperm grooved on one side, and in the centre a small yellowish translucent endosperm, surrounding a paler minute embryo.

**Microscopical:** Arillus, of several layers of elongated, more or less collapsed, flattened, thin-walled cells containing small rounded or oval droplets of oil. Testa, with an outer epidermis of long, narrow cells, 20 to 30  $\mu$  wide, having slightly thickened undulating walls; followed by a layer of collapsed parenchymatous cells, with brownish contents, a single layer, becoming

2 or 3 layers in the region of raphe, composed of large thin-walled, rectangular cells containing volatile oil; a band of 2 or 3 layers of parenchymatous cells and an inner epidermis of thin-walled flattened cells. Inner integument, of 2 layers of cells, an outer layer of yellowish to reddishbrown, rectangular, radially elongated, strongly lignified sclereids, about 40  $\mu$  long, 20  $\mu$  wide, strongly thickened on the inner and anticlinal walls and each cell with a small funnel-shaped lumen, nearly filled with a small warty module of silica, and an inner epidermis of flattened cells. Perisperm, of thin-walled cells, packed with minute starch granules, 1 to 6  $\mu$ , mostly about 4  $\mu$  in diameter, and containing 1 to 7 small prisms of calcium oxalate. Endosperm, of small thin-walled parenchymatous cells, each filled with a hyaline or granular mass of protein but no starch, fibrous sclerenchyma and large vessels present in pericarp but absent from seed.

**Powder:** Powdered Cardamom seed is reddish to greyish-brown characterized by numerous fragments of perisperm cells, each filled with starch granules and containing one or more prisms of calcium oxalate, 10 to 25  $\mu$  long; polyhedral masses of adherent starch granules from peri sperm, individual granules, up to 4  $\mu$  in diameter; numerous fragments of yellowish to reddish-brown sclereids; occasional particles of epidermal cells, often crossed at right angles by the cells of the collapsed layer.

#### **Chemical constituents:**

The principal constituent of the seed is a volatile oil; yield from 2 to 8 per cent. Seeds also contain abundant starch.

#### **Tests for purity:**

- Powdered cardamom seed contains no sclerenchymatous fibres (pericarp of fruit); no starch granules measuring more than 10  $\mu$  (graminaceous fruits and ginger).
- Ash, not more than 10 per cent; acid-insoluble ash, not more than 5 per cent.

#### **Assay:**

Carry out the assay as directed under "Determination of Volatile oils" in vol. 2. The extractive value (in 45 per cent alcohol) is 7 per cent.

#### **Pharmaceutical preparations:**

Tinctura Cardamomi.

Tinctura Cardamomi Composita.

Tinctura Gentianae Composita.

Tinctura Rhei Composita.

Aromatic Cardamom Tinctura.

**Uses:**

Aromatic carminative and an agreeable flavouring agent.

**Storage:**

The seed, in the capsule until required for use; the fruits in well-closed containers, protected from light. Cardamom seed, after the removal from the fruit must not be stored.

## **Entada Africana Guill. & Perr.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Entada sudanica* Schweinf.
- (b) *Entadopsis sudanica* (Schweinf.) G.C.C.Gilbert & Boutique
- (c) *Entada ubangiensis* De Wild.

### **Common names:**

Entada (F)

### **African names:**

- (a) Arabic: Bu salel,
- (b) Bambara: 'Samanéré'
- (c) Hausa: Taawatsaa
- (d) Peuhl: Padapadi, Padapar, Padapari
- (e) Swahili: N/A
- (f) Yoruba: Ayunre-banabana

### **Brief description of the plant:**

Small, low branching tree, up to 7-12 m, with a narrow open crown. Bark fibrous and creviced grey-brown, transversally striped, slash red with white streaks, twigs grey-brown, pubescent. Leaves large bipinnate 15-45 cm long, with 2-9 pairs of pinnae with 8-24 pairs of linear-oblong leaflets 0.9-4.5 x 0.3-1.5 cm. Leaves glabrous. Flowers cream, in racemes 5-10 cm long. Pods, with an undulate margin, 10-30 x 2-5 cm, dark +/- pubescent, 12-15 seeds per pod, seeds two-winged, ca 4 000 per kg.



### **Geographical distribution:**

Throughout the Sahel to East and South Africa.

### **Part used:**

Bark and Roots

### **Name of drug:**

Entada bark.

### **Definition:**

Entada bark is the dried stem bark or root bark of *Entada Africana* Guill. & Perr. (family, Fabaceae).

### **Description:**

**Macroscopical:** *Entada africana* is a small tree up to 4-10 m in height and 90 cm in girth; branching low down, with a wide crown; bark brown-grey to black, very rough, transversely striped, scaly, peeling in long fibrous strips, slash fibrous, red or yellow-brown. Leaves bipinnate, alternate, 3-9 pairs, with a glabrous common stalk 15-45 cm; rachis 25-30 cm long with 2-9 pairs of pinnae; 8-24 pairs of leaflets. Leaflets 2-3 x 0.5-1.5 cm, elongated elliptic with the apex rounded and occasionally minutely notched, the base asymmetrical with the lower edge more rounded than the upper; midrib and nerves distinct on both surfaces. Flowers creamy-white or reddish-yellow, about 6 mm long, slightly scented, densely clustered in spike-like racemes 5-15 cm long including the short central stalk; spikes solitary or in small clusters in the leaf axils or arranged in panicles at

the ends of shoots, 1-4. Sepals glabrous, small, 5-lobed; petals 3 x 1 mm, spatulate; 10 free stamens. Fruit is a pod, 15-40 x 5-8 (15) cm, very persistent, hanging down untidily for many months and eventually breaking up on the tree, very flat and fragile (papery), with the seeds showing through, straight or slightly curved, with thick wavy margins, red-brown on the outside; breaking open with segments of the dry interior part of the pod, containing 10-15 broad elliptic flat seeds about 12 mm long; on breaking up, the outer coat of each segment of the pod peels off, the straw-coloured inner coat remaining attached to the seed and acting as a wing.

***Chemical constituents:***

Nine triterpene ester saponins isolated from the root, the aglycones were echinocystic acid for 7 compounds and acacic acid for 2.

***Tests for identity:***

- (a) Macroscopical examination of the specimen and its source to ensure compliance with the above descriptions.
- (b) Shake the powdered drug with water. It produces a foam which does not decrease with heating
- (c) Examine the hydrolysed saponin extract of the powder and extract the aglycone with an organic solvent. Use the aglycone solution to carry out chromatographic examination to confirm the presence of echinocystic acid or acacic acid by co-chromatography.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antimalaria, Alzheimer disease and other neurological diseases. Anti-inflammatory, antimicrobial, antioxidant, anti-leishmaniasis, cytotoxicity, complement fixing activity in the polysaccharide in the root

***Storage:***

Store in a cool dry place.

## **Ephedra sinica Stapf**

### **Family name:**

Ephedraceae.

### **Synonym:**

- (a) *Ephedra ma-huang* Tang S.Liu
- (b) *Ephedra flava* F.P.Sm.

### **Common names:**

Mahuang, Shrubby, Horsetail, Ephedra, Chinese joint-fir, Chinese ephedra (E). Ephedra (F).



### **African names:**

- (a) Arabic: الأديم
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Shrub of 4 to 1 m high with stalks made up of more or less internodes, leaves are rudimentary and reduced to small membranous scales at the nodes; with spikelike male inflorescences, female inflorescences in compact clusters; fruits drupaceous.

### **Geographical distribution:**

Mediterranean coastal regions.

### **Part used:**

Herb (green stem with its scaly leaves).

### **Names of drug:**

Herba Ephedrae Sinicae. *Ephedra sinica* Stapf. herb.

### **Definition:**

It is the dried herb of *Ephedra sinica* Stapf. (family, Ephedraceae) containing not more than 1 per cent of foreign organic matter and yielding not less than 1 per cent of total alkaloids calculated as ephedrine.

### **Description:**

Odourless and has a faint bitter taste.

**Macroscopic:** Stem, erect and branched with swollen nodes and long internodes, branching confined to the lower 2 or 3 internodes, bluish green in colour with rubbed surface. Old stems yellowish brown in colour, internally solid. Scaly leaf, opposite, decussate, usually 2, rarely 3 at each node; greyish-white with reddish-brown bases, elongated with subulate and recurved apices and entire or finely toothed margin, 2 to 4 mm long, the membranous sheath, greyish-white in colour up to 2 mm height, loosely surrounded the node, 1 to 2mm in height. Female strobilus, usually single or rarely arranged in small groups; shortly stalked, greenish in colour, oval, consisting of 4-5 pairs or scaly bracts, the apical pair subtends 2 ovules. Male strobilus, rare, single, usually sessile, yellowish in colour, oval, consisting of 4-5 pairs of scaly bracts, staminal column, unbranched, carrying 6-8 anthers opening by apical pores. Fruit, fleshy oval to rounded,

reddish-brown in colour, with 3-4 pairs of bracts, usually 2-seeded; seed, glabrous, dark brown, oval in shape, with pointed apex and rounded base, albuminous, triangular with plano-convex sides.

**Microscopical:** The epidermal cells of the stem are covered with a moderately thick granular cuticle and consists of polygonal or subrectangular, axially elongated cells, having straight anticlinal walls. The stomata are few of ranunculaceous type with lignified appendages. The epidermis of the scaly leaf is covered with smooth (upper) or warty (lower) cuticle and consists of sub rectangular to polygonal cells, having straight, sometimes slightly beaded anticlinal walls, few stomata are present resembling those of stem. The epidermis of the apical and marginal regions of the scaly leaf show short papillae-like outgrowths. Chlorenchymatous palisade-like cells form the outer zone of the cortex as well as rounded ordinary parenchymatous cells of the inner zone of the cortex. Cortical parenchyma and pith cells containing amorphous reddish-brown substance.

Non-lignified or lignified hypodermal and pericyclic fibres, which have thick walls, bearing slit-like pits and blunt, slightly tapering, occasionally forked ends. The vessels of the secondary xylem of the stem are lignified with bordered pits, having rounded or oval apertures. The vessels

segments have much inclined end walls, bearing foraminate perforation plates. The xylem consists of reticulate and spirally thickened vessels and tracheids. The tracheids and fibrous tracheids of secondary xylem of stem are lignified with bordered pits having oval or slit-like aperture. The fibres of the scaly leaf are lignified usually irregular or nearly straight, having moderately thick walls and blunt or sometimes forked ends. The pith cells of the stem are rounded or subrectangular, axially elongated with thin, non-lignified or lignified simply pitted walls. Few, small rounded, simple and compound starch granules with indistinct hilum, are present in cortical parenchyma, pith and medullary ray cells. Few, small prisms of calcium oxalate are present in the cortical parenchyma.

**Powder:** Powder of the green stem and leaf is greyish green in colour, having faint odour and slight bitter astringent taste.

**Chemical constituents:**

Alkaloids, mainly *Il*-ephedrine, d-pseudo-ephedrine.

**Test for identity:**

- (a) Mix the powder with NH<sub>4</sub>OH and sodium carbonate, then percolate with CHCl<sub>3</sub>: ether (1:3) mixture, then with ether alone. The percolate extracted with dil. HCl and few drops of Mayer's reagent added, a white precipitate is obtained, indicating the presence of alkaloids.
- (b) Total ash: not more than 9%; Acid-insoluble ash: not more than 2%; Moisture: not more than 9%

**Assay:**

Weigh about 20 g of powdered drug (No. 40 mesh size) accurately mixed with 4 g of calcium oxide and shake with 200 ml of ether-chloroform mixture (3:1). Add 20 ml of dilute ammonia and shake the mixture at frequent intervals for 3 hours, and allow to stand overnight. Transfer to a percolator, and percolate first with 100 ml of ether-chloroform mixture, then with ether alone, until complete exhaustion of alkaloids is effected. To the

percolate add 120 ml of N/3 hydrochloric acid, and distill off the ether-chloroform mixture on a water-bath.

Filter the acid solution through a small filter paper previously moistened with N/3 hydrochloric acid, wash the filter paper twice with small portions of N/3 HCl and add the washings to the filtrate. The combined filtrate and washings are then rendered slightly acidic with N/1 sodium hydroxide solution. Add 10 g of anhydrous sodium carbonate and sufficient sodium chloride to saturate the liquid. Then extract alkaline liquid with 4 successive portions of 40, 30, 30 and 20 ml of ether respectively, then with 20 ml portions until complete extraction of alkaloids takes place. The combined ether extracts are then washed with 10 ml of saturated solution of sodium chloride, the sodium chloride solution extracted with 10 ml of ether, and this ether added to the main bulk. To the combined ether extracts and washings add 25 ml of N/10 sulphuric acid and 20 ml of distilled water, the ether is then distilled off on a water-bath and excess acid titrated back against N/10 sodium hydroxide solution. Each ml N/10 sulphuric acid = 0.0165 g ephedrine. It contains not less than 1 per cent of total alkaloid calculated as ephedrine.

**Uses:**

It raises the blood pressure and is used to relieve asthma and hay fever.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Eucalyptus globulus** Labill.

### **Family name:**

Myrtaceae.

### **Synonyms:**

- (a) *Eucalyptus cordata* Miq.,
- (b) *E. diversifolia* Miq.,
- (c) *E. gigantea* Dehn.,
- (d) *E. glauca* D.C.,
- (e) *E. globulus* St Lag.,
- (f) *E. pulverulenta* Link



### **Common names:**

Eucalyptus leaf. Blue gum tree,  
Stringy Bark Tree (E). Eucalyptus, Feuilles  
d'eucalyptus (F).

### **African names:**

- (a) Arabic: أوكاليفتوس أو كافور
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Mti-ulaya, Mkafuri
- (f) Yoruba: N/A

### **Brief description of the plant:**

Very tall tree that can attain 100 m in height; orbicular leaves that exude a fragrance when crushed; inflorescence umbellate with white flowers. Fruits capsular.

### **Geographical distribution:**

Originates from Australia and introduced into all tropical subtropical and Mediterranean regions.

### **Part used:**

Leaf.

### **Names of drug:**

Eucalyptus leaf. Folium Eucalypti.

### **Definition:**

Eucalyptus consists of the dried leaves of the blue gum tree, *Eucalyptus globulus* Labill. (family, Myrtaceae).

### **Description:**

Odour is agreeable and aromatic, and the taste is aromatic, pungent and slightly bitter.

**Macroscopical:** The leaves measure about 30 cm in length and 4 cm in width, they are eusiform, acute, entire, coriaceous, brittle and punctate; both surfaces are pale green, with minute, brown, cork spots; the petiole is short, flattened and twisted; the lateral veins anastomose to form a continuous line near the margin and parallel to it.

**Microscopical:** The diagnostic characters are the isobilateral mesophyll; a midrib, which shows in transverse section one large crescent-shape meristele, surmounted by two smaller vascular strands lying side by side, the whole group being surrounded by sclerenchymatous fibres; on both surfaces, numerous stomata surrounded by straight-walled polygonal cells, which have a thick cuticle; the palisade three to four cell deep on

both sides; the mesophyll, which contains numerous large, sub-spherical, schizolysigenous oil glands, some of which have voided their contents through the epidermis and have become lined with a layer of periderm; prismatic and cluster-crystals of calcium oxalate.

**Powder:** Powdered Eucalyptus leaf is light green; characterised by straightwalled polygonal epidermal cells with ranunculaceous stomata; fragments of palisade cells; fragments of schizolysigenous oil glands; prismatic and cluster crystals of calcium oxalate; fragments of vessels and fibres.

**Chemical constituents:**

Eucalyptus contains 1 to 3 per cent of volatile oil, the major constituents of which is cineole, together with tannin, a bitter principle, and resin, (+) a-pinene, phellandrene and other terpenes.

**Test for identity:**

Carry out the test for cineole in volume 2 on the leaf extract or the oil from it.

**Test for purity:**

*Foreign organic matter:* Eucalyptus contains not more than 1 per cent of fruits, and not more than 2 per cent of stems or other foreign organic matter.

*Total ash:* Not more than 6% (2, 3).

*Acid-insoluble ash:* Not more than 0.2% (8).

*Moisture:* Not more than 10%

**Assay:**

(a) Carry out the determination of the volatile oil as described in vol. 2. Dried leaves contain 1–3% (v/w) essential oil (fresh leaves contain 0.4–1.6%),

(b) *Assay for cineole content:* Place 10 ml of Eucalyptus oil, accurately measured at 25°C, in small evaporating dish, measured about 5 ml of phosphoric acid in a small measure, and cool both in a freezing mixture. When sufficiently cooled, add the phosphoric acid gradually to the oil, stirring continuously, until the oil is converted into a solid mass. Transfer to a piece of Calico, fold well, and wrap in two sheets of filter paper; press strongly for about 5 minutes, remove from the press, change the filter paper and press again for 2 minutes. Break the pressed mass into small pieces and introduce it into a well cleaned flask of about 150 cc capacity, having a neck of about 16 cm in length and about 8 mm in diameter which is graduated in tenths of a cubic centimetre. Add warm water to raise the oily layer in the graduated portion of the neck of the flask. Cool to 25°C and note the volume of the oily layer which should not be less than 7 cc, corresponding to not less than 70 per cent v/v of cineol.

© Mix 1 ml with 2 ml of glacial acetic acid and 5 ml of petroleum spirit (boiling range, 40 to 60°C), add 2 ml of a saturated solution of sodium nitrite and shake gently; no crystalline precipitate forms in the upper layer within one hour (Phellanthrene).

**Pharmaceutical preparations:**

Tinctura Eucalyptus (Tinct. Eucalyp.).

Tincture of Eucalyptus 1 in 5.

Menthol and Eucalyptus Inhalation.

**Uses:**

Eucalyptus leaves are used as astringent; they have also been employed in the form of a cigarette for asthma. The volatile oil has antiseptic properties.

Dose 0.05 to 2 ml. Oily solution of this oil should not be used as nasal drops.

***Storage:***

Store in a cool dry place away from light.

## **Euphorbia hirta L.**

### **Family name:**

Euphorbiaceae.

### **Synonyms:**

- (a) *Euphorbia pilulifera* Chev.
- (b) *Euphorbia bancana* Miq.
- (c) *E. capitata* Lam.
- (d) *Euphorbia chrysochaeta* W.Fitzg.
- (e) *Euphorbia gemella* Lag.
- (f) *Euphorbia globulifera* Kunth
- (g) *Euphorbia hirta* L. var. *typica* L.C. Wheel
- (h) *Euphorbia karwinskyi* Boiss.
- (i) *Euphorbia obliterata* Jacq.
- (j) *Euphorbia nodiflora* Steud
- (k) *Chamaesyce hirta* (L.) Millsp
- (l) *Chamaesyce gemella* (Lag.) Small
- (m) *Chamaesyce karwinskyi* (Boiss.) Millsp.
- (n) *Chamaesyce rosei* Millsp.
- (o) *Ditritea hirta* (L.) Raf.
- (p) *Desmonema hirta* (L.) Raf.



### **Common names:**

Australian Asthma herb. Queensland Asthma weed.  
Pills bearing Spurge, Asthma herb,  
Cat's hair. Hairy spurge.(E)  
Petite euphorbe, Euphorbe herissee, Malnommee (F)

### **African names:**

- (a) Arabic: فريون
- (b) Bambara: Dada dable, Dabadaba bileni
- (c) Hausa: Noonon kurchiyaa, Oegendagar
- (d) Peuhl:
- (e) Swahili: Mwache, Mziwaziwa
- (f) Yoruba: E gele, Ege ile, Emi-ile, Loloaikuku, Bije, Oro-satipo, Adindin, Oro-onigunmeta, Urokoju, Iroko-iju, Oro-elewe, Irawo ile

### **Brief description of the plant:**

Herbaceous shrub with annual stems reaching 40 cm in height, erect or prostrated, covered with yellowish bristly hairs especially in the young parts. The older parts have reddish-purple patches.

The leaves oppositely arranged are oblong-lanceolate 2 to 5 cm long, minutely dentate or serrulate and asymmetrical inflorescence in compact axillary tufts with small yellow fruits in downy capsules.

### **Geographical distribution:**

All intertropical regions.

### **Part used:**

Whole herb.

**Name of drug:**

Asthma herb.

**Definition:**

Asthma herb is the dried aerial parts of *Euphorbia hirta* L. (family, Euphorbiaceae). It is cropped when the flower and fruits are dry.

**Description:**

Odour slight, taste numb.

**Macroscopical:** The plant is slender, erect or ascending, 30-60 cm high, often growing close to the ground. The stem is cylindrical often reddish or white with a milky juice, covered with yellowish bristly hair especially in the younger upper parts while the older parts have reddish-purple patches. The leaves are oppositely arranged, oblong-lanceolate, 2-5 cm long, shortly petiolate, minutely dentate, asymmetrical with round base and is dark green in colour, hairy on both surfaces.

Flowers in axils of the leaf as dense round cluster or terminal cymes about 1 cm in diameter, acuminate apex. Fruit is minute yellow three-celled capsule with each carpel containing a single reddish four-sided transversely wrinkled seed.

**Microscopical:** The transverse section of *E. hirta* L. shows a bifacial structure with smooth cuticle. The lower epidermal cells have wavy walls and the upper epidermis are almost straight walled. Anomocytic stomata are present on both surfaces but greater in lower epidermis, also the lower epidermis has stomata which are of the anisocytic type. Hairs scattered all over the leaf are uniseriate, slightly curved with thin warty walls. A layer of modified parenchyma immediately surrounding each vascular bundle is a peculiar characteristic of the leaves of *E. hirta*.

Palisade ration is 3.3 to 4.38 to 5.5.

Stomatal index is 8.3 to 22.6 - Upper epidermis.

18.8 to 25.0 - Lower epidermis.

Stomatal number is 100-250-400 Upper epidermis.

300-317-400 Lower epidermis.

**Powder:** Diagnostic features include anomocytic/anisocytic stomata; unicellular warty, uniseriate hairs, some in fragments; epidermal cells with wavy and straight anticlinal walls;fragments of vascular elements.

**Chemical constituents**

Stem - taraxerol, friedelin, ellagic acid, myricyl alcohol, hentriacontane sitosterol.

Latex - alkaloid (xanthorrhannine) I-inositol, pyrogallic and catechol tannins.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions.
- (b) Microchemical tests for the presence of alkaloids, with Dragendorff's, Mayer's reagents
- (c) Thin-layer chromatographic examination of an extract of the specimen to confirm the presence of xanthorrhannine.

**Test for purity:**

(a) Total ash not more than 13.6 per cent.

Acid-insoluble ash not more than 3.0 per cent.

Water-soluble ash not less than 3.0 per cent.

(b) Water-soluble extractive (Coarse powder) not less than 17.0 per cent.

Alcohol-soluble extractive (Coarse powder) not less than 11.50 per cent.

***Uses:***

In asthma, as bronchial sedative, in amoebic dysentery and as decoction (fresh plants) for acute enteritis and dysentery.

***Storage:***

Store in a cool dry place protected from light.

## **Erythrina senegalensis DC.**

### **Family name:**

Fabaceae

### **Synonyms:**

- (a) *Erythrina latifolia* Schumach. and Thonn.
- (b) *Erythrina guineensis* G.Don

### **Common names:**

- (a) Coral tree, coral flower (E)
- (b) Arbre corail, érythrine, érythrine du Sénégal (F)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N'den
- (c) Hausa: Murjiya, Showoh or Ankai, Idon-sakaraa, Jinjinriya, Majiriya, Minjiriya,
- (d) Peuhl: Mototay
- (e) Swahili: Mjafari = *E. abyssinica*
- (f) Yoruba: Ologun sheshe, Ologbosere, Lakale, Okiki Ogigbon, Ologbonsese, Olugunsese

### **Brief description of the plant:**

A tree to 15 m high, usually much less, trunk with corky bark bearing recurved prickles arising from a woody base, of savanna country and present in all territories of the Region, and into Eastern Cameroun. The tree bears conspicuous large red flowers in lax ter

### **Geographical distribution:**

Native to Senegal, Gambia, Guinea, Guinea-Bissau, Sierra Leone, Liberia, Mali, Burkina Faso, Ivory Coast, Niger, Ghana, Togo, Benin, Nigeria and Cameroon

### **Part used:**

Barks, Roots, Leaves, Wood.

### **Name of drug:**

Coral tree bark.

### **Definition:**

Coral tree bark is the dried bark of the stem of *Erythrina senegalensis* DC. (family, Fabaceae).

### **Description:**

**Macroscopic:** A tree growing up to 7 m tall, rarely to 15 m, with deeply fissured, corky bark. The branches and bark are armed with slightly hooked spines up to 10 mm long. The leaves are composed of three leaflets, each measuring 5-15 × 4-10 cm and having a thorny stalk. The flowers appear in large groups at the end of the branches, when the tree is leafless (in the first half of the dry season). The flowers are bright red and 4-5 cm long. The fruit is a bent, twisted and slightly hairy pod, 7-15 × 1 cm. It is constricted between the seeds, which are bright red.

Reproduction is by seed, but farmers also propagate the tree by taking cuttings. There are no known varieties or subspecies. The corky bark enables the tree to withstand the fires which regularly pass over the West African savanna.

### ***Chemical constituents***

Isoflavonoids, neobavaisoflavone, sigmoidin H and a pterocarpan that is a special type of isoflavonoid, isoneorautenol were reported present in the plant. One new pterocarpan (named erybraedin F) along with seven known prenylated flavonoids were isolated from the stem and root bark. prenylflavonoids, 8-prenylleutone, auriculatin, erysenegalensein O, erysenegalensein D, erysenegalensein N, derrone, alpinumisoflavone and 6,8-diprenylgenistein. Also Dichloro methane extracts yielded: 8-prenylluteone, auriculatin, erysenegalensein O, erysenegalensein D, erysenegalensein N, derrone, alpinumisoflavone and 6,8-diprenylgenistein. More prenylated flavonoids were isolated for bioactivity tests. The flavonoids were alpinumisoflavone. Also erysenegalensein D and erysenegalensein N. Known Compounds senegalensin, lupinifolin, erythrisenegalone, and auriculatin, Two new isoflavones named erysenegalensein H and erysenegalensein I were isolated from the dichloromethane extract of the stem bark. 2,3-Dihydroauriculatin, was also isolated.

### ***Tests for identity***

- (a) Macroscopical examination of the specimen and its source to ensure compliance with the descriptions given above.
- (b) It gives a positive reaction in the test for flavonoids as described in volume 2

### ***Tests for purity:***

N/A

### ***Pharmaceutical preparations:***

N/A

### ***Uses:***

Cyotoxicity, obesity, anti-HIV, antibacterial, antimalarial, analgesic, anti-inflammatory,

### ***Storage:***

In a cool dry place.

## **Erythrophleum guineense G. Don**

### **Family name:**

Fabaceae

### **Synonyms:**

*Erythrophleum suaveolens* (Guill. & Perr.)  
Brenan

### **Common names:**

Sassy bark, Redwater tree, Sasswood (tree), ordeal tree, Mancona Bark ,Doom Bark, Ordeal Bark ,Casca Bark ,Saucy Bark ,Red Water Bark (E)  
Bois rouge; Poison d'épreuve (F)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: teli tali
- (c) Hausa: Gwaska, Makawa, Ircin-gwaska, Samberu
- (d) Peuhl: Pelli = *E africanum*
- (e) Swahili: muavi
- (f) Yoruba: erun-obo, olu-obo

### **Brief description of the plant:**

Large tree, with spreading crown, to 100 ft. high; flowers small, very fragrant, crowded in spike-like racemes; pods opening without scattering the seeds . Sassy bark collected from the tree varies from the age of the tree. The bark is usually hard, curved or flat of about 8 to 10 cm long and 4 to 7 cm wide. The outer surface of bark is dull grey tinted and sometimes it appears black having reddish spots. The bark collected is eventually bumpy, elevated and rugged coarsely.

### **Geographical distribution:**

Widespread in tropical Africa.

### **Part used:**

Bark .

### **Name of drug:**

Sassy bark.

### **Definition:**

Sassy bark is the dried stem bark of *Erythrophleum guineense* G. Don (family, Fabaceae)

### **Description:**

**Macroscopical:** Tree up to 30 m high; bark dark brown, very rough. Young branches and leaf rachides glabrous to shortly pubescent. Leaves: petiole and rachis together (6)11–35 cm long; pinnae 2–4(5) pairs; pinna rachis 8–20 cm long; leaflets (6)9–13(15) per pinna, (3)4.5–7(9) × (1.5)2.2–4.5(5.3) cm, obliquely ovate to elliptic, the base asymmetrical (except the terminal leaflet), the apex bluntly acuminate, i.e. drawn out into a short 'drip-tip'; the surfaces glabrous except on the midrib beneath which is usually strongly pubescent; petiolules 2–4.5(5) mm long. Racemes 2.5–8(11) cm long including a peduncle 0.7–1.5 cm long, the axis and peduncle densely puberulous to pubescent with short, crisped, appressed, rusty-brown hairs. Flowers 6–8(9) mm long from base of pedicel to anthers, cream or lemon-yellow to greenish-yellow; pedicel 0.6–1 mm long at

anthesis. Calyx 1–2(2.5) mm long, fused for almost half its length, rusty-brown pubescent like the inflorescence axis. Petals 2–3.5 mm long, greyish-brown pubescent. Stamen filaments glabrous. Pods (7)10–14(17) × 3–4.5(5.3) cm excluding the stipe, oblong or somewhat curved, rounded at both ends, often somewhat woody, dehiscing along one margin only; stipe (1)1.5–2(2.5) cm long, inserted ± asymmetrically; seeds (4)6–9 × 10–12 × 4–7 mm, oblong-ellipsoid, on a funicle 7–10 mm long.

**Chemical constituents:**

Sassy bark contains toxic alkaloids erythrophloeine, erythrophleguine, resin, and tannin, small quantity of fatty acid, ipuranol and luteolin.

**Tests for identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions
- (b) Extract the powdered bark with ammoniated chloroform. Shake the alkaloidal extract with dilute hydrochloric acid. To the acidic fraction, add a few drops of Mayer's. Dragendorff's or Wagner's reagent a precipitate is obtained indicating the presence of alkaloids
- (c) Evaporate a portion of the chloroform extract to low volume and examine it by thin-layer chromatography for the presence of erythrophleguine by co-chromatography

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antifungal, dental surgeries, narcotic, astringent, anodyne, laxative. The bark is poisonous because of its poisonous alkaloids.

**Storage:**

In a cool dry place.

## **Erythroxylon coca Lam.**

### **Family name:**

Erythroxylaceae

### **Synonyms:**

(a) *Erythroxylum coca* var. *novo-granatense*

D. Morris

(b) *Erythroxylum coca* Lam

### **Common names:**

Coca; Cocaine plant; Coca leaf, Amazonian coca, Bolivian coca, Huanuco coca (E)

### **African names:**

(a) Arabic: N/A

(b) Bambara: N/A

(c) Hausa: N/A

(d) Peuhl: N/A

(e) Swahili: N/A

(f) Yoruba: N/A



### **Brief description of the plant:**

The plant grows to about 2.4 meters tall (~8 feet) and possesses small flowers, with yellowish-white petals, that grow in little clusters on short stalks. The leaves of the coca contain many alkaloids, one of which is cocaine.

### **Geographical distribution:**

The coca plant now grows throughout the tropical regions of the Andes, mainly Bolivia, Ecuador and Peru. It has also spread to regions in Chile, Colombia, East and West Indies, Ceylon, India, Taiwan and some parts of Africa, Mexico, Indonesia and Formosa

### **Part Used:**

Leaves.

### **Name of drug:**

Coca leaf.

### **Definition:**

Coca leaf is the dried leaves of *Erythroxylon coca* Lam. (Bolivian or Huanuco) or *E. truxillense* (Peruvian or Truxillo) (family, Erythroxylaceae).

### **Description:**

**Macroscopical:** *Erythroxylum coca* is a high altitudes S. American small evergreen shrubs with reddish bark whose leaves are the sources of cocaine. They have many small branchlets with leaves that measure 4-7 cm long and 3-4 in width. The plants have small yellowish-green flowers that grow on them and develop into red drupes. Leaves grown in Columbia tend to be smaller and less pointy than those grown in other locations. The leaves are "chewed" (held in the cheek) in combination with mineral lime to provide physical and mental stimulation and reduction in altitude sickness. It has a long history of human use.

The coca plant resembles a blackthorn bush, and grows to a height of 2–3 m (7–10 ft). The branches are straight, and the leaves, which have a green tint, are thin, opaque, oval, and taper at the extremities. A marked characteristic of the leaf is an areolated portion

bounded by two longitudinal curved lines, one line on each side of the midrib, and more conspicuous on the under face of the leaf.

The flowers are small, and disposed in little clusters on short stalks; the corolla is composed of five yellowish-white petals, the anthers are heart-shaped, and the pistil consists of three carpels united to form a three-chambered ovary. The flowers mature into red berries.

The leaves are sometimes eaten by the larvae of the moth *Eloria noyesi*.

Coca is grown from seed. When the drupes are ripe, women tend to go around and collect them. The pulp is washed away and the seeds are allowed to dry in the sun. The seeds are then placed in seed beds and germinate in approximately 24 days. When the plants reach a height of about 30-40 cm, they are transplanted to prepared fields. This is done during the rainy season and after three years the plants may produce a small harvest of leaves. In the ensuing years, leaves are harvested three or four times per year from the plant. Insects known as mounga burrow into the trunk of the plant and can destroy the plant and taja, a fungus, tends to grow on the leaves and branchlets of the coca plant.

**Microscopical:** A transverse section of coca leaf shows upper epidermis, palisade parenchyma containing prisms of calcium oxalate, spongy parenchyma and a very characteristic lower pappilose epidermis with numerous stomata. The midrib is partly surrounded by an arc of pericyclic fibres, above and below which is a considerable amount of collenchymas. A surface preparation of the lower epidermis shows the papillae as well-marked circles, numerous stomata, each with four subsidiary cells two of which have their long axis parallel to the pore.

#### **Chemical constituents:**

Coca leaves contain the alkaloids Cocaine, Cinnamyl Cocaine, and Truxilline or Cocamine. As a rule the Truxillo or Peruvian leaves contain more alkaloid than the Bolivian, though the latter are preferred for medicinal purposes. Java Coca contains tropococaine and four yellow crystalline glucosides in addition to the other constituents.

#### **Tests of Identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- b) Extract the alkaloids with acidulated water. Filter and add a drop of Meyer's, Dragendorff's or Wagner's reagent to the extract. A precipitate is produced with the reagent.
- c) Basify the acid extract with ammonia and extract the mixture with chloroform. Concentrate chloroform extract and confirm the presence of cocaine and cinnamyl cocaine by thin-layer co-chromatography.

#### **Tests of Purity:**

N/A

#### **Pharmaceutical preparations:**

Elixir Coca, B.P.C., .

Extract of Coca, B.P.C.

Liquid extract of Coca, B.P.

Fluid extract of Coca, U.S.P.,

Tincture of Coca, B.P.C.

Coca Wine, B.P.C.

Wine of Coca,, U.S.P.  
Cocaine, P.B.

***Uses:***

Anaesthetic.

***Storage:***

In a cool dry place.

## **Eupatorium odoratum L.**

### **Family name:**

Asteraceae

### **Synonyms:**

- (a) *Chromolaena odorata* (L.) R.M. King & H.Robins.
- (b) *Eupatorium conyzoides* Vahl,
- (c) *Eupatorium brachiatum* Sw. ex Wikstr.,
- (d) *Eupatorium atriplicifolium* Vahl,
- (e) *Eupatorium stigmatosum* Meyen & Walp.
- (f) *Eupatorium clematitis* DC.
- (g) *Eupatorium sabeanum* Buckley
- (h) *Eupatorium divergens* Less.
- (i) *Eupatorium odoratum* L.
- (j) *Eupatorium affine* Hook. & Arn.
- (k) *Eupatorium floribundum* Kunth
- (l) *Eupatorium dichotomum* Sch. Bip.
- (m) *Osmia odorata* (L.) Sch. Bip.
- (n) *Chrysocoma volubilis* Vell. Conc.



### **Common names:**

- (a) Bitter Bush, Tonka Bean, Triffid Weed , Jack in the bush  
Common floss flower, Siam Weed, Christmas Bush (E)
- (b) Herbe du Laos (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara N/A
- (c) Hausa: Shuwaka balaga
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Akintola-taku, Ewe Awolowo, Ewe Akintola

### **Brief description of the plant:**

*Eupatorium odoratum* is a woody herbaceous perennial growing as a climbing shrub to 3 meters in height, typically shorter. The leaves are arranged oppositely, to 15 cm in length, triangular to ovate with an acuminate leaf apex and dentate leaf margin with large teeth. The vegetative structures are covered with articulate hairs throughout.

The actinomorphic flowers are arranged in corymbs of heads subtended an involucle made of 4 series of phyllaries. The calyx is modified as hairs forming a pappus. The corolla has 5 fused white to lavender petals. There are 5 stamens fused to the base of the corolla. The ovary is inferior with a single locule. The fruit is an achene at maturity that retains the modified calyx (pappus).

### **Geographical distribution:**

It is native to North America, from Florida and Texas to Mexico and the Caribbean, and has been introduced to tropical Asia, West Africa, and parts of Australia

### **Part Used:**

Leaf.

**Name of drug:**

Tonka bean. Siam weed. Christmas bush.

**Definition**

Siam weed is the fresh or dried leaf of *Chromolaena odorata* (Linn) King and Robinson, (family, Asteraceae).

**Description:**

**Macroscopical:** A scrambling shrub. It may reach 1 m or more as a free standing shrub and 4 m or more when climbing into trees or shrubs. Stems reach 2 cm in diameter. The plants are maintained by a system of abundant, yellowish, fine lateral roots. Multiple sprouts arise from the root crown and lower stems. The individual branches are long with relatively few branches. Foliage occurs only on recent growth. The opposite, three-nerved leaves are deltoid to ovate-lanciolate, usually with a dentate margin and a long pointed tip. The leaves are aromatic when crushed. The inflorescences are corymbs of cylindrical heads located on the terminals of lateral branches. There are 15 to 25 tubular florets per head, white, lavender, pink, or blue in color. The seeds are a brownish gray to black achene that is 4mm long with a pale brown pappus 5 or 6 mm long.

**Microscopical:** The leaf is generally dorsiventral, epidermis of silicified cells, stomata variously distributed, mostly anomocytic, but also anisocytic and variable mesophyll. Vascular bundles of the veins possess distinct sheath of parenchyma. Upper epidermal cells are slightly wavy with few unicellular, glandular trichomes. The covering trichomes are uniseriate, 3-4 celled and devoid of oil glands. The lower surface consists of wavy epidermal cells, smaller than those on the upper surface but containing similar stomata types, numerous uniseriate covering trichomes, 4-9 celled, with a whip-like terminal cell- numerous oil glands are visible in the surface view. The transverse section is composed of four separate collateral vascular bundles, the xylem and phloem, consisting of two portions. When cut through the midrib, the transverse section shows the presence of trichomes with 4-9 uniseriate cells, which are present in both surfaces at the mid vein only. There is a row of palisade cells under the upper portion which does not run through the midrib. The oil glands in the transverse section of the lamina possess many cells indicating a schizogenously formed oil gland. Stomatal index: 0.059-0.12-0.22 (lower epidermis); Palisade ratio: 6-7.1-8.5; Vein-islet number: 0.0-0-1.0; Veinlet termination number: 12.0-19.3-28.0

**Powder:** Fragments of slightly wavy epidermal cells, numerous stomata- anomocytic and anisocytic types. There are numerous fragments of covering trichomes but few glandular trichomes. Xylem with phloem cell elements and isolated glands are visible in the field of view. Taste is bitter, odour characteristic and colour is light green.

**Chemical constituents:**

Odoratin, salvingenin, (a flavone), isisakuranetin and quercetin (flavonoids), triterpene alcohol, lupeol and B-amyrin have been isolated from the plant. The leaf volatile oil gave saligenin, sesquiterpene, acetylenic compounds as well as alkaloids of pyridine nucleus. The essential oil also gave a-pinene (19.3 per cent.), camphor (15.5 per cent.), limonene (10.2 per cent.), citronella, p-cymene, cadinene, oxygenated sesquiterpenoids and geraniol. Tannins also present.

***Tests of Identity***

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Microchemical tests for the presence of flavonoids, and the terpenoids: citronella, citral or geraniol
- (c) Thin-layer or gas chromatographic examination to confirm the presence of the terpenoids,

***Tests of Purity***

Moisture: Not more than 57 per cent.

Ash: Not more than 13 per cent.

Acid-insoluble ash: Not more than 6 per cent.

Water-soluble ash: Not less than 1 per cent.

Alcohol-soluble extractive: Not less than 28 per cent.

Water-soluble extractive: Not less than 22 per cent.

***Pharmaceutical preparations***

N/A

***Uses:***

Siam weed is used to treat burns, skin diseases and wounds.

***Storage:***

In a cool, dry place away from light and moisture.

## **Euphorbia tirucalli L.**

### **Family name:**

Euphorbiaceae

### **Synonyms:**

- (a) *Tirucalia indica* Raf.
- (b) *Tirucalia tirucalli* (L.) P.V.Heath
- (c) *Euphorbia viminalis* Mill.
- (d) *E. geayi* Costantin & Gallaud
- (e) *E. laro* Drake
- (f) *E. media* N.E.Br.
- (g) *E. rhipsaloides* Lem.
- (h) *E. scoparia* N.E.Br.
- (i) *E. suareziana* Croizat
- (j) *Arthrohamnus ecklonii* Klotzsch & Garcke
- (k) *Arthrohamnus tirucalli* (L.) Klotzsch & Garcke



### **Common names:**

Pencil plant, rubber-hedge euphorbia, Firestick Plants, Indian Tree Spurge, Naked Lady, Sticks on Fire, Milk Bush (E) Arbre de Saint Sébastien, Euphorbe effile euphorbe, Garde maison, Ttirucalli (F)

### **African names:**

- (a) Arabic: injil, azfur zukkum
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Mtupa mwitu, Mwasi, Utupa
- (f) Yoruba: N/A

### **Brief description of the plant:**

The rubber-hedge euphorbia is a many-branched, succulent plant, usually 3-5 m but may reach 10 m on occasion. The bark of very old specimens is grey and rough with longitudinal dents and ridges that break up into very small fragments. There are sometimes conspicuous, small protuberances, such as a bulge, knob, or swelling, on the bark, and occasionally black, rough, crosswise bands. The branches are cylindrical, smooth and glabrous-green, 5-8 mm in diameter, forming brush-like masses that are the best known feature of this species. Plants are without spines. The leaves are small and slender, up to 12 x 1.5 mm, rarely seen, as they fall very early. Leaf scars on young twigs form conspicuous dents which contract until they are no more than grey dots on older branchlets and can even be seen on fairly thick green stems. The thin twigs are pendant (hanging down), pale green and occur opposite each other, alternate or in groups on the branchlets which gives a rather untidy and rounded appearance to the crowns.

The flowers are yellow, inconspicuous, and carried in clusters at the apex of the short branches or in the angles of branches. They appear in September to December. Fruits are tripartite capsules (divided into three parts), about 12 mm in diameter, longitudinally very slightly lobed, short-stalked (8 mm), pale green, with a pink tinge and conspicuously pubescent (clothed with soft hairs). As with other members, the capsules dehisce while

still on the tree. The fruits appear from November to December. Generally the stalks are bent at an angle. The seeds are oval, about 4 x 3 mm, glabrous, smooth and dark brown with a white line around the small white caruncle (fleshy wart near the hilum of the seed). This spineless species contains large quantities of latex which is freely exuded by the twigs and branchlets at the slightest injury

**Geographical distribution:**

It has a wide distribution in Africa, being prominently present in northeastern, central and southern Africa.

**Parts Used:**

Latex, Branches, Roots

**Name of drug:**

Pencil plant latex

**Definition:**

Pencil plant latex is the dried latex obtained from the branches and roots of *Euphorbia tirucalli* L. (family, Euphorbiaceae)

**Description:**

**Macroscopical:** Spineless succulent densely branched often apparently dioecious shrubs to 4 m or trees to 7 m high, with a copious irritant white to yellowish latex. Branchlets brittle terete succulent, c. 7 mm thick, often produced in whorls, green with longitudinal fine striations and very small leaf scars, the extreme tips of young leafy branchlets sparsely tomentose with curled brown hairs. Leaves few, present only at the tips of young branchlets and quickly deciduous, subsessile; stipules glandular, minute, dark brown; lamina fleshy to 15 x 2 mm, linear-lanceolate. Cymes congested, 2–6 at the branchlet apices, each forking 2–4 times, with rays less than 1 mm long, producing a dense cluster of cyathia developing only male flowers, or occasionally a few female flowers also present, or cyathia fewer and only female flowers developing, the whole cyme ± glabrous, or tomentose with curled brown hairs especially on the involucres and lobes; bracts c. 2 x 1.5 mm, rounded, ± sharply keeled, usually glabrous except on the margin. Cyathia subsessile, c. 3 x 4 mm, with cup-shaped involucres; glands 5, 0.5 mm in diameter subcircular to 1.5 x 2 mm transversely elliptic, bright yellow; lobes c. 0.5 mm long, triangular. Male involucres: bracteoles linear with plumose apices; stamens 4.5 mm long; an aborted female flower is occasionally present. Female involucres: bracteoles present and occasionally also a few male flowers; female perianth distinctly 3-lobed below the tomentose ovary, with lobes 0.5 mm long; styles 2 mm long, joined at the base, with thickened deeply bifid recurved apices. Capsule glabrescent, c. 8 x 8.5 mm, subglobose, exserted on a tomentose pedicel to 10 mm long. Seeds 3.5 x 2.8 mm, ovoid, smooth, buff speckled with brown and with a dark brown ventral line; caruncle 1 mm across.

**Chemical constituents:**

*E. tirucalli* contains 4-deoxyphorbol ester, beta-sitosterol, caoutchouc, casuariin, corilagin, cycloeuphordenol, cyclotirucanenol, ellagic acids, euphorbins, euphol, euphorone, euphorcinol, gallic acids, glucosides, hentriacontane, hentriacontanol, ingenol, isoeuphoral, kaempferol, pedunculagin, phenols, phorbol esters, proteases, putranjivain A-B, sapogenin acetates, succinic-acid, taraxasterol, taraxerin, tirucallol, and tirucallin A-B.

diterpene esters of the tigliane, ingenane and daphnane types, based on the parent alcohols ingenol, phorbol, resiniferonol, 12-deoxyphorbol and the rare 4-deoxyphorbol and 12-deoxy-4 $\beta$ -hydroxyphorbol. The latex is an emulsion of about 30% terpenes in water.

Other terpenes isolated from latex of different origins are the diterpenes euphol and its stereoisomer tirucallol, the highly toxic daphnane diterpene ester tinyatoxin, the triterpenoids euphorbinol, cycloeuphorbinol, euphorone and the 31-nortriterpene cycloeuphordenol and the macrocyclic diterpene tirucalicine. The latex also contains an isoquinoline alkaloid as well as the sterols taraxasterol, phorbosterol, euphorbosterol,  $\alpha$ -amyrine and cycloartenol. Four trypsin-like proteolytic enzymes, euphorbains t1–t4, have also been isolated. The twigs have yielded taraxasterol,  $\beta$ -sitosterol, ellagic acid, kaempferol, glucose and the hydrocarbon hentriaccontane, as well as an alcoholic analogue. The whole plant contains 7.4% citric acid with some malonic and succinic acid. The stem bark yielded the following compounds: cycloartenol, 24-methylene cycloartenol,  $\beta$ -sitosterol,  $\alpha$ -taraxerol, euphorbol, euphorbol-hexacosonoate, taraxerone as well as diterpene esters, including ingenol triacetate, the pentacyclic triterpene euphorcinol and the taraxerane type triterpene euphorginol. Several diterpene esters, tiglianes and daphnanes have been isolated from the roots, based on 12-deoxyphorbol, 12-deoxy-16-hydroxyphorbol and resiniferol, including tinyatoxin and candletoxin A. Two anthocyanins were also isolated from the roots.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to comply with the descriptions given above.
- (b) Thin-layer chromatographic examination of the extract to confirm the presence of ellagic acid, kaempferol or euphol by co-chromatography

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Gastric healing, anti-inflammatory, wound healing, anticancer,

**Storage:**

In a cool dry place.

## **Ferula assa-foetida L.**

### **Ferula foetida (Bunge) Regel**

#### **Family name:**

Apiaceae

#### **Synonyms:**

- (a) *Ferula scorodosma* Bent et Trim. = *F. foetida* Regel
- (b) *Scorodosma foetidum* Bunge. = *F. assa-foetida* L.

#### **Common name:**

Asafoetida (E). Ferula perisque (F)

#### **African names:**

- (a) Arabic: الحلبيت أو صمغ الأنجدان
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Mvuje
- (f) Yoruba: N/A



#### **Brief description of the plant:**

Tall perennial herbaceous plant with petiolated radical leaves of 50 cm, while the caudine leaves are widely sheathing, leaves denticulated into oblong lanceolate round segments of 2.0 to 5 cm long. Flower bearing stem reaches 2 m and produces yellowish white flowers on stalked umbels.

Fruits: compressed almost flat ovoid achenes.

#### **Geographical distribution:**

Subtropical Africa.

#### **Part used:**

Gum-resin.

#### **Names of drug:**

Gummi Resina Asafoetida. Asafetida. Ase Fetide.

#### **Definition:**

Asafoetida is an oleo-gum resin, obtained by incision from the living rhizome and roots of *Ferula foetida* Regel, *Ferula rubricaulis* Boiss or certain other species of *Ferula*.

#### **Description:**

Asafoetida occurs in irregular lumps formed of tears embedded in a yellowish-brown or dark-brown matrix, in masses, agglutinated tears or in separate ovoid, rounded or flattened tears; from 1 to 4 cm in diameter; more or less tough at ordinary temperature, becoming hard and occasionally brittle on drying; externally, greyish-white to dull yellow or reddishbrown;

internally, milky-white and opaque gradually 'passing through a very characteristic change of colour on exposure to air or light, becoming at first pink, then reddish-purple, and finally reddish-brown; odour, strong, persistent and alliaceous; taste, bitter alliaceous and acrid.

**Chemical constituents:**

Asafoetida consists principally of volatile oil, resin and gum. Good samples yield from 10 to 17 per cent of volatile oil, from 40 to 67 per cent of resin, about 25 per cent of gum and 1.5 to 10 per cent of ash. The volatile oil contains pinene together with various disulphides. The percentage of sulphur varies from 17 to 38 per cent. Asafoetida contains no free umbelliferone.

**Test for identity:**

Place a drop of sulfuric acid on the freshly fractured surface of a tear of Asafoetida; a bright red or reddish-brown colour is produced, changing to violet on washing with water. Boil about 1 g of Asafoetida with 20 cc of equal volumes of hydrochloric acid and water, filter into water made

strongly alkaline with strong solution of ammonium hydroxide; a blue fluorescence is produced,

**Tests for purity:**

- (a) Alcohol-insoluble residue, not more than 50 per cent.
- (b) Thoroughly triturate about 0.5 g of Asafoetida with 2 g of sand, in moderately coarse powder, and boil with 5 cc of alcohol (90 per cent) in a test-tube for 1 to 2 minutes, then cool and filter into 5 ml alcohol (90 per cent) to which 0.5 ml of strong solution of ammonium hydroxide has been added, no blue fluorescence is produced (Galbanum).
- (c) Triturate about 1 g of Asafoetida with 10 cc of water. To the milky-white emulsion obtained, add a few drops of choralin soda T.S.; no deep orange red colour is produced (Armoniacum).
- (d) Asafoetida leaves on ignition not more than 20 per cent, of ash; acid-insoluble ash, not more than 15 per cent.

**Pharmaceutical preparation:**

Tinctura Asafoetida

**Uses:**

Preparations containing Asafoetida are unsuitable for children under one year old

**Storage:**

In a cool dry place.

## **Flueggea virosa (Roxb. ex Willd.) Royle**

### **Family name:**

Euphorbiaceae.

### **Synonyms:**

- (a) *Securinega virosa (Roxb. ex Willd.) Baill.*
- (b) *Securinega obovata Muell.-Arg.*
- (c) *Flueggea microcarpa Blume*
- (d) *Flueggea virosa (Roxb. ex Willd.) Royle*
- (e) *Securinega abyssinica A. Rich*
- (f) *Acidotom virosus (Roxb. ex Willd.) Kuntze*
- (g) *Phyllanthus virosus Roxb. ex Willd.*



### **Common names:**

- (a) Chinese waterberry; Common bushweed;
- (b) Simple leaf bush weed; Snowberry tree; White berry bush (E). Balan des savanes (F)

### **African names:**

- (a) Arabic: Kartié kartié, Kartjé-kartjé, Dabalab, Kartjik-artij, L'emleise
- (b) Bambara: Balamanantièn, Baram baram, Diéné, Karam karam, Nkoloninge, Nkoloninge, Surku maéné, Tiéné.
- (c) Hausa: Tsa, Gwiwar kare, Tswa, Gussu, Tsugawun kare, Itachen-gado, Tsúwààwún karee.
- (d) Peuhl: Tiambel gore.
- (e) Swahili: N/A
- (f) Yoruba: Ìranjé, Awewe.

### **Brief description of the plant:**

*Securinega virosa* is a deciduous, smooth, graceful, small to large shrub. Leaves are extremely variable in shape, elliptic-ovate, obovate or orbicular, 2.5 to 10 centimeters in length, rather glaucous beneath, and rounded, obtuse or pointed at the tip. Flowers are usually borne on axillary fascicles. Fruit is mostly small, black or white, dry, and about 3 to 5 millimeters in diameter.

### **Geographical distribution :**

Widespread in tropical Africa, S. Africa, the Mascarene Islands, tropical and subtropical Asia

### **Part used:**

Roots, leaves, wood, juice.

### **Name of drug:**

Common bushweed bark.

### **Definition:**

Common bushweed bark is the dried bark of *Securinega virosa* (Roxb. ex Willd.) Baill. (family, Euphorbiaceae)

### **Description:**

**Macroscopical:** A shrub or small tree to 4 m high with numerous branches arising from the base and spirally arranged upwards, somewhat angular, of wooded savanna and transition-forest, throughout the Region from Senegal to S Nigeria, and widespread

across tropical Africa to India and Australasia. The plant has attractive foliage and white waxy berries.

***Chemical constituents:***

Bark contains 10% tannic acid and an alkaloid.

- (a) Phytochemical screening yielded reducing sugars, cardiac glycosides, resin, tannins, saponins, glycosides, flavonoids, glycerin carbohydrate, anthraguine and steroids.
- (b) Phytochemical screening of aqueous extract of dried root yielded saponins, tannins, cardiac glycosides, and steroids.

***Tests for identity:***

Macrochemical examination of the specimen to ensure the compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antipsychotic, central depressant, antioxidant, antimalarial, antimicrobial, trypanocidal, antiarrhythmic.

***Storage:***

In a cool dry place.

## **Foeniculum vulgare Mill.**

### **Family name:**

Apiaceae

### **Synonyms:**

- (a) *Anethum foeniculum* L.
- (b) *Foeniculum foeniculum* (L.) Karst.
- (c) *Foeniculum officinale* All.
- (d) *Foeniculum rapillaceum* Gilib.

### **Common names:**

- Fennel, Sweet fennel, Sweet cumin (E)
- Fenouil. Queue de pourceau. Anis doux (F).



### **African names:**

- (a) Arabic: الشمر الحلو أو الشمر السكري
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Shamari
- (g) Yoruba: N/A

### **Brief description of plant:**

Plant with perennial stump and annual growth; filiform pinnatisected, sweet-smelling leaves; terminal umbels of small yellow leaves; dry small fruits ovoid and oblong of 5 mm.

### **Geographical distribution:**

Cultivated in Mediterranean and temperate regions of Africa.

### **Part used:**

Fruits.

### **Names of drug:**

Fennel; *Fructus Foeniculi*, Fennel, Fenouil.

### **Definition:**

Fennel is the dried ripe fruits of *Foeniculum vulgare* Mill. (family, Apiaceae).

Fennel contains not more than 4 per cent of foreign organic matter, and yields not less than 1.4 per cent v/w of volatile oil.

### **Description:**

Odour, sweet and aromatic; taste, sweet, agreeable and aromatic.

**Macroscopical:** Fruit, cremocarp, often entire, cylindrical or nearly so, attached to a slender pedicel, 2 to 10 mm, long, sometimes separated into its two mericarps. Mericarp, elliptical, tapering slightly towards both ends, 5-sided, the commissural side being the wider and more or less undulating, 4 to 12 mm long and up to 4 mm broad, crowned with a short conical stylopod, yellowish-green to yellowish-brown; externally, glabrous (distinction from Anise), and marked with 5 paler, prominent primary ridges; commissural side, flat and shows 3 narrow pale brown, longitudinal areas, separated by 2 dark brownish areas over the vittae; internally, mericarp shows a pericarp containing

usually 6 brown vittae, 4 in the dorsal side and 2, occasionally 3 to 4, in the commissural side, large oily, orthospermous endosperm and a small apical embryo.

**Microscopical:** Outer epidermis of the pericarp consists of thick-walled, rectangular, polygonal, colourless cells, with smooth, not striated cuticle (distinction from Caraway), few stomata and no hairs. Mesocarp consists of rather thick-walled, somewhat brownish, parenchyma, traversed longitudinally by 6 large schizogenous vittae, appearing elliptical in transverse sections and possessing brown epithelial cells, and in the ridges, by vascular bundles, each having one inner xylem strand and two lateral phloem strands, and accompanied by strongly lignified fibres; some of the cells of the mesocarp, especially in the neighbourhood of the vascular bundles, possess lignified, reticulate thickened walls. Endocarp, composed of very narrow, thin-walled cells, mostly 4 to 6  $\mu$  thick, arranged parallel to one another in groups of 5 to 7, many of these groups being variously oriented. Endosperm, formed of somewhat thick-walled polygonal cellulosic parenchyma containing much fixed oil, and several aleurone grains, up to 6  $\mu$  in diameter, enclosing a globoid, and one or more micro-rosette crystals of calcium oxalate, about 3  $\mu$  in diameter. Carpophore, often not split, with very thick-walled sclerenchyma in 2 strands.

**Powder** Powdered Fennel is yellowish-brown to greenish-brown; characterized by colourless fragments of thick-walled polygonal endosperm cells containing globules of fixed oil and aleurone grains containing microrosette crystals of the calcium oxalate; fragments of epidermal cells of the pericarp, usually polygonal with smooth cuticle and very few stomata; few fragments with yellowish-brown vittae, 100 to 200  $\mu$  wide, generally crossed by the cells of the endocarp; the ratio of the width of these cells to that of the vittae is from 1: 30 to 1:25; occasional parenchymatous cells of the mesocarp with lignified reticulate thickening generally accompanied by narrow fibres with numerous oblique simple pits; hairs and starch granules, absent.

**Chemical constituents:**

Volatile oil (0.8-4 per cent) containing anethole (50-60 per cent) and fenchone (18-20 per cent). The fruit also contains 20 per cent proteins and 12-18 per cent of fixed oil.

**Tests for purity:**

- (a) Powdered Fennel contains no starch granules over 10  $\mu$  in diameter (distinction from cereals, etc.), no large amount of fibres or vessels more than 20  $\mu$  in diameter (absence of stalks).
- (b) Ash, not more than 12 per cent; acid-insoluble ash, not more than 1.5 per cent.; Moisture, not more than 8 per cent.

**Assay:**

Carry out the assay as directed under "Determination of volatile oils, in drugs" as described in vol. 2 using about 10g of powdered Fennel, module No. 24, accurately weighed.

**Pharmaceutical preparation:**

Pulvis Glycrrhizae Compositus.

**Uses:**

Flavouring agent, Carminative.

**Storage:**

In well-closed containers, in a dry cool place, protected from light.

## **Gentiana lutea L.**

### **Family name:**

Gentianaceae

### **Synonym:**

- (a) *Asterias lutea* Bork.
- (b) *Swertia lutea* Vest

### **Common names:**

Gentian root, Yellow gentian, Bitterwort (E).  
Gentiane jaune. Gentis. Quinquina du pauvre (F).

### **African names:**

- (a) Arabic: حنطليبا
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Tall perennial herbaceous plant with multi-rooted stump, and a strong erect aerial branchless stem that can reach 1.5 m in height; opposite leaves with ovate lamina 30 cm by 15 cm; flowers golden yellow in colour and grow in whorls at the axis of top leaves.



### **Geographical distribution:**

Mountain plant of Europe and Asia Minor presence signalled in Egypt. Though not a typically African plant, it has been noted in Egypt.

### **Part used:**

Roots.

### **Names of drug:**

Gentian. Gentiane. Radice de Gentiana. Enzianwurzel. Radix Gentianae Luteae.

### **Definition:**

Gentian is the dried fermented root and rhizome of *Gentiana lutea* L. (family, Gentianaceae) Gentian contains not more than 2 per. cent of foreign organic matter.

### **Description:**

Odour, characteristic; taste, at first sweet but afterwards persistently bitter.

**Macroscopical:** 3 to 15 cm long 0.5 to 2.5 cm rarely up to 4 cm thick, occasionally reaching 4 to 8 cm at the crown; externally, yellowish-brown to dark brown. Root, longitudinally wrinkled and furrowed, sometimes twisted with a few scars of lateral rootlets. Rhizome, erect, with numerous transverse annulations of encircling leaf-scars, occasional scars of rootlets, frequently terminates in a bud and occasionally branched. Fracture, short when dry but tough and flexible when moist, internally, reddish-yellow, showing a somewhat yellowish to reddish-brown bark, a well-marked dark, wavy cambium ring, and a large yellowish-brown, mainly parenchymatous xylem. Pith present only in rhizome.

**Microscopical:** Cork, yellowish-brown, formed of few layers of polygonal tabular cells with slightly wavy walls; cortex, of phellogen in root, of several layers, the outer, collenchymatous, with thick-walled cells, sometimes containing oily globules and minute

acicular crystals of calcium oxalate, the inner, of tangentially elongated parenchyma, the cells being more or less collapsed and separated by large intercellular spaces, and each containing a distinct nucleus and minute needle shaped crystals of calcium oxalate; phloem, consisting of polygonal parenchyma and numerous scattered groups of thin-walled sieve-tubes with companion cells; xylem, formed principally of thin-walled parenchyma containing minute crystals of calcium oxalate and oily globules; vessels, large, slightly lignified, reticulate or scleriform, scattered, singly or in small groups, with tendency to a radial arrangement near the cambium, and small groups of collapsed tissue of interxylary phloem; primary xylem, 3-arch and may be found at the centre. Very occasional small oval starch granules present in parenchyma. Medullary rays, parenchymatous and not clearly marked. Parenchymatous pith with anastomosing vascular strands, in rhizome only.

**Powder:** Powdered Gentian; light brown to yellowish-brown; characterized by abundant fragments of thin or thick-walled parenchyma with minute acicular crystals of calcium oxalate, and oily globules; fragments of yellowish-brown cork cells; few reticulate and scalariform vessels, slightly lignified; numerous minute acicular crystals of calcium oxalate, 3 to 6  $\mu$  long, 0.5 to 1  $\mu$  wide; sometimes very occasional small starch granules; sclereids and fibres, absent.

**Chemical constituents:**

The bitter crystalline glucoside, gentiopicrin, some of which disappears during the curing of the drug; the glucosides gentiamarin (amorphous) and gentiarin (crystalline); gentisin, gentianose, glucose, pectin, etc.

**Test for identity:**

On micro-sublimation, powdered Gentian gives pale yellow almost straight crystals, isolated or in groups, insoluble in water, in alcohol, and in ether, but is soluble in chloral hydrate T.S. and in potassium hydroxide T.S., giving a yellow but not red solution (distinction from Rumex).

**Tests for purity:**

- (a) Powdered Gentian contains no sclereids, and no fibres (distinction from Rumex species, Coco nut shell, or stems of Gentian); no starch granules over 20  $\mu$  in diameter (foreign starches).
- (b) Water-soluble extractives, not less than 30 per cent.
- (c) Powdered Gentian loses, when dried at 100°C, not more than 10 per cent of its weight.
- (d) Ash, not more than 6 per cent; acid-insoluble ash, not more than 3 per cent.

**Pharmaceutical preparations:**

Extraction Gentianae.

Tinctura Gentianae Composita.

Alkaline Gentian mixture (Mistura Gentianae Cum Soda).

**Uses:**

Bitter stomachic.

**Storage:**

In well-closed containers, protected from light.

## Glycine soja Sieb et Zucco

### Family name:

Fabaceae

### Synonyms:

- (a) *Glycine max* (L.) Merr.
- (b) *Soja hispida* Moench.
- (c) *Dolichos Soja* L.

### Common names:

Soja bean. Soya bean. Soy (E). Soja (F).

### African names:

- (a) Arabic: فول الصويا
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ewa



### Brief description of plant:

Annual plant of 30 cm to 1 m high, with an erect stem that branches out right from the base. Leaves of three petiolated leaflets, ovate lanceolate and equipped with stipule flowers; violet on short pedicels and blossom in small axillary clusters villous and lippid straight pods that enclose 2 to 4 seeds.

### Geographical distribution:

Cultivated in intertropical Africa.

### Part used:

Ripe Seeds.

### Names of drug:

Semin *Glycine soja*. *Glycine soja* Seeds. Graines de soja. Soya bean.

### Definition:

Soya consists of the dried ripe seeds of *Glycine soja* Sieb & Zucco. (family, Fabaceae).

### Description:

The seeds are without odour, and the taste is bland and oily.

**Macroscopical:** The seeds are usually pale yellow in colour although brown or black varieties also occur. They are rounded ovoid in shape, measuring on the average 8 mm long, 7 mm wide and 6 mm thick. The hilum is 3 to 4 mm long and is found in the middle of one of the longer edges of the seed. The leathery and somewhat translucent seed coat surrounds two plano-convex cotyledons which enclose a small radicle and plumule.

**Microscopical:** Testa, with an epidermis of palisade-like cells, covered with thick cuticle and have thick-lamellated walls, the lumen being conical at the upper extremity and rounded at the base, subepidermal layer of basket-like cells varying in length; the cells of the cotyledons are filled with closely packed aleurone grains, and droplets of fixed oil; occasional cells containing prismatic crystals of calcium oxalate.

**Powder:** Powdered soya bean is yellowish-white, characterised by fragments of testa showing the palisade-like epidermal cells, the basket-like cells of the subepidermal layer; fragments of the cotyledons with parenchymatous cells containing fixed oil and aleurone

grains; the occasional cells containing prismatic crystals of calcium oxalate. Starch is absent.

***Chemical constituents:***

Fixed oil (about 18 per cent), proteins (about 40 per cent), carbohydrates (about 22 per cent) and the enzyme urease.

***Test for identity:***

Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

***Test for purity:***

Ash, not more than 5 per cent.

***Pharmaceutical preparations:***

N/A

***Uses:***

Soya is used chiefly for the production of soya oil. It is sometimes used in the manufacture of food products, and soya cake is used as a fertilizer and for cattle food. Soya is also used for the determination of urea.

***Storage:***

In well-closed containers, protected from light.

## **Glycyrrhiza glabra L.**

### **Family name:**

Fabaceae

### **Synonyms:**

- (a) *Glycyrrhiza glabra L. var. typica* Regel et Herd.
- (b) *Liquiritia officinalis* Moench.

### **Common names:**

Liquorice (E). Reglisse, Bois doux. Racine douce. Herbe aux tanneurs (F).

### **African names:**

- (a) Arabic: Irksos
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: NA



### **Brief description of plant:**

Under shrubs of highly developed stoloniferous roots; leaves-compound alternate imparipinnate from 9 to 17 leaflets; flat pods of 2 cm x 6 mm.

### **Geographical distribution:**

Cultivated in the arid regions around the Mediterranean basin.

### **Part used:**

Roots and Rhizomes.

### **Names of drug:**

Radix Glycyrrhizae, Liquorice root, Reglisse.

### **Definition:**

Liquorice consists of the roots and rhizomes of *Glycyrrhiza glabra* var. *typica* Regel et Herd, known as Spanish Liquorice or *Glycyrrhiza glabra* var. *glandulifera* (Wald et Kit) Regel et Herder, known as Russian Liquorice or of other varieties of *Glycyrrhiza glabra* L.

### **Description:**

Odour, faint and characteristic; taste very sweet, almost free from bitterness and acridity.

**Macroscopical:** SPANISH LIQUORICE: Consists generally of roots and rhizomes, in nearly cylindrical pieces, 11 to 20 cm or more long and 5 to 20 mm in diameter; externally, the unpeeled dark-brown or reddishbrown, longitudinally wrinkled, occasionally bearing small dark buds in rhizomes or small circular or transverse rootlet-scars in roots. The peeled, yellow, smooth, fibrous, finely striated; fracture, fibrous in the bark and splintery in the wood; internally, bright-yellow. Showing a distinct cambium ring separating the yellowish-grey bark from the finely radiate yellow wood; central pith, only in rhizomes.

RUSSIAN LIQUORICE: Consists mainly of roots, in cylindrical pieces somewhat tapering sometimes longitudinally split; 15 to 40 cm long, 1 to 5 cm in diameter the

enlarged crown of the root may attain up to 10 cm in diameter; externally, the unpeeled, purplish-brown, somewhat scaly, with stem scars at the top; the peeled, yellowish, coarsely striated; fracture as

Spanish; internally, yellow, radiating.

**Microscopical:** Cork, thick, brown or purplish-brown, formed of several layers of flattened polygonal thin walled cells, cortex of phellogerm in root somewhat narrow yellow of parenchyma cells containing isolated prisms of calcium oxalate, phloem, wide, yellow, traversed by numerous wavy parenchymatous medullary rays, 1 to 8 cells wide and consisting of numerous radial groups of fibres, each surrounded by a sheath or parenchyma cells, each usually containing a prism of calcium oxalate, and alternating with layers of parenchyma and sieve tissue the latter occasionally obliterated, appearing as refractive irregular structures; phloem fibres, very long, with very narrow lumen and strongly thickened stratified walls which are cellulosic in the inner part of the phloem and slightly lignified in the outer; xylem, yellow, distinctly radiate; the rays of xylem, consists of a little pale yellow parenchyma, groups of fibres similar to those of the phloem but more lignified, and surrounded by crystal-sheath, tracheids and large wide lumen vessels, 80 to 200  $\mu$  in diameter, with thick yellow reticulate walls or with numerous oval bordered pits with slit-shape openings.

Other parenchyma cells contain small round or oval starch granules.

Pith, only in rhizome, dark yellow, parenchymatous. Root, with 4-arch primary xylem, with no pith and shows 4 broad primary medullary rays, radiating from the centre at right angles to one another. In the peeled Liquorice; the cork, cortex, and sometimes part of the phloem, absent.

**Powder:** Powdered Liquorice, light yellow in the peeled or brownish yellow or purplish-brown in the unpeeled; characterised by the numerous fragments of the fibres accompanied by crystal-sheath the fibres being 8 to 25  $\mu$ , mostly 10 to 15  $\mu$  in diameter; dark yellow fragments of vessels, 80 to 200  $\mu$  in diameter prismatic crystals of calcium oxalate, free or in cells 10 to 35  $\mu$ , mostly 15 to 25  $\mu$ , long; numerous starch granules. Free or in parenchyma cells, mostly simple oval, round or fusiform, with no striation but occasionally showing hilum, 2 to 20  $\mu$ , mostly about 10  $\mu$  in diameter cork may be present.

#### **Chemical constituents:**

5 to 8 per cent of glycyrrhizin, an intensely sweet, water-soluble principle consisting of the potassium and calcium salts of glycyrrhizic acid, glycyramarin; a bitter principle occurring mostly in the bark; mannite, a yellow colouring matter; volatile oil, resin, starch, sucrose, glucose and calcium oxalate.

#### **Tests for identity:**

- Mix a little of powdered Liquorice with 1 or 2 drops of sulfuric acid (80 per cent); an orange-red colour is produced.
- Shake the aqueous decoction of Liquorice, a voluminous froth is produced.

#### **Tests for purity:**

- Powdered Liquorice contains no foreign starch granules (Flour); no yellow masses (Curcuma); no sclereids (Olive Stones).
- Water-soluble extractive, not less than 25 per cent.

(c) Ash, not more than 6.5 per cent for the peeled, and not more than 10 per cent for the unpeeled. Acid-insoluble ash not more than 1 per cent, for the peeled, and not more than 2.5 per cent for the unpeeled.

**Assay:**

This method is based on the hydrolysis of glycyrrhizin, to its aglycone glycyrrhetic acid and the extraction of the aglycone with chloroform. The chloroform extract gives with 80 per cent sulphuric acid, ethanol and alcoholic solution of vanillin a red colour, the intensity of which depends on the amount of aglycone and is found to obey Beer's law at a concentration up to 250 ug in which the developed colour was stable for at least one hour.

**PREPARATION OF STANDARD CURVE:**

100 mg of authentic glycyrrhetic acid should be accurately weighed into a 100 ml volumetric flask dissolved in chloroform and diluted to the mark with the same solvent. 5 ml of this solution is diluted to 100 ml with chloroform. Appropriate volumes of the diluted solution viz; 1.0, 3.0, 4.0 and 5ml corresponding to 50, 100, 150, 200 and 250 ug of glycyrrhetic acid respectively are pipetted into separate test tubes and the volume in each tube adjusted to 5 ml with chloroform. Meanwhile, 5 ml of pure solvent is used as a blank. The chloroform is evaporated to dryness on boiling water-bath, 5 ml of 80 per cent sulfuric acid added to the

tubes heated on boiling water bath, for 10 minutes and then cooled in ice bath. 5 ml of ethanol is added by allowing it to run down the side of the tube to form a layer over the sulphuric acid.

Similarly, 0.5 ml of 1 per cent vanillin solution is added carefully without mixing. The tubes are successively mixed and immediately placed in water bath at 65°C. The tubes are left in the bath for 5 minutes to develop maximum colour, and then cooled to room temperature. Measure the colour at wave length 545 nm by means of a spectrophotometer at 100 per cent transmittance with the blank solution. The absorbances of different concentrations of glycyrrhetic acid are recorded in Table I.

Table I: *The Absorbances of different concentrations of glycyrrhetic acid for the calibration curve*

Volume taken of the glycyrrhetic acid solution	Glycyrrhetic acid content	Absorbance at 545 nm.
1 ml	50 µg	0.11
2 ml	100 µg	0.24
3 ml	150 µg	0.35
4 ml	200 µg	0.48
5 ml	250 µg	0.65

The absorbance versus concentrations is then plotted. Each value represents the mean of two experiments.

**HYDROLYSIS PROCEDURE:**

24 and 30 mg of ammonium glycyrrhizinate is accurately weighed into a 250 ml quickfit flask. 20 ml of each of 50 per cent dioxan and 12N sulphuric acid are successively added.

The mixture is refluxed vigorously for one hour to hydrolyse the glycyrrhizin. Add 70 ml of water and 100 ml of chloroform through the top of the condenser.

Reflux the mixture for additional 15 minutes and then cool. Transfer the contents of the flask to a 250 ml separating funnel, shake vigorously and let it separate into 2 liquids. The chloroform layer is then drawn into a second separating funnel containing 100 ml of 2 per cent sodium bicarbonate solution. Shake the mixture vigorously to remove flavonoid aglycones. Allow the chloroform to separate and transfer it to an extraction flask containing 5 g anhydrous sodium sulphate, and then filtered into a 260 ml volumetric flask.

The mother liquor in the first separating funnel is then successively shaken with 75 ml and 25 ml of chloroform, washing the chloroform extract with the same solution of sodium bicarbonate and drying with the same solution of sodium sulphate. Mix the chloroformic extracts and adjust the

volume to 200 ml with chloroform. Pipette 4 ml of the chloroformic solution into a test-tube and 4 ml of pure chloroform is to be used in a second test-tube to serve as a blank. Evaporate the chloroform to dryness in a boiling water-bath and continue as mentioned in the preparation of standard curve.

$$\text{Per cent of glycyrrhizin} = \frac{\mu\text{g from the curve} \times 200 \times 100}{\text{mg of sample} \times 1000 \times 41.75} \times 1.75$$

= factor of conversion of glycone (glycyrrhetic acid) to glycyrrhizin.

#### ***Pharmaceutical preparations:***

Extractum Glycyrrhiza.

Extractum Glycyrrhiza Fluidum.

Pulvis Glycyrrhiza Compositus.

#### ***Uses:***

Liquorice root is a demulcent and expectorant. The liquid extract is often employed to mask the taste of nauseous medicines. It is used for gastric and duodenal ulcers.

#### ***Storage:***

In well-closed containers, protected from light.

N. B. Powder from unpeeled Liquorice must be expressly named.

## **Grewia bicolor Juss.**

### **Family name:**

Tiliaceae

### **Synonyms:**

- (a) *Grewia grisea* N.E.Br,
- (b) *Grewia kwebensis* N. E. Br.,
- (c) *Grewia miniata* Mast. Ex Hiern,
- (d) *Grewia mossambicensis* Burret

### **Common names:**

White-leaved raisin, False brandy bush, Bastard brandy bush, Donkey berry, Two-coloured grewia, Grey Raisin, Asegaa Wood (E).

Nogo blanc, Greuvier (F)



### **African names:**

- (a) Arabic: العرقسوس أو أصل السوس
- (b) Bambara: Nogo nogo
- (c) Hausa: Marken-duutsee
- (d) Peuhl: Kelli
- (e) Swahili: mfukufuku, mkone
- (f) Yoruba:

### **Brief description of the plant:**

*Grewia bicolor* is usually a many-stemmed shrub, occasionally small tree up to 7 m in height; bark dark grey, deeply fissured and peeling away in strips in older specimens, grey to reddish-grey, and smooth when young. Leaves elliptic to elliptic-oblong or lanceolate, 1.5-7 x 1-3.2 cm, dark, dull green above, almost silvery white with fine hairs below; the leaves are held horizontally or slightly drooping; apex tapering to rounded; base broadly tapering to rounded, asymmetric, or almost symmetric; margin finely toothed, occasionally almost entire; petiole very short. Flowers yellow, 1.5 cm in diameter, axillary, often produced in profusion; the central mass of stamens characteristic of the genus. Fruit single, or 2-lobed, each lobe about 6 mm in diameter, reddish-brown when mature, edible, sweetish but astringent. Fruits are often parasitized and develop a shaggy appearance.

### **Geographical distribution:**

Widespread from Swaziland, Zululand, Transvaal and South West Africa/Namibia to Ethiopia and West Africa;

### **Parts used:**

Bark, wood, leaves, fruit, roots.

### **Name of drug:**

Grewia seed

### **Definition:**

Grewia seed is the dried ripe seeds of *Grewia bicolor* (family, Tiliaceae).

**Description:**

**Macroscopical:** The bicoloured-leaved *Grewia bicolor* has beautiful, bright yellow flowers. It is a frost-resistant, hardy shrub or small tree that is adaptable to all soils, from clay to sand, and does not require much water.

*Grewia bicolor* is a multi-stemmed shrub or small tree, up to 9 m high. Its bark is smooth, grey, becoming dark grey and deeply fissured and peeling away in straps with age. The young branchlets are velvety grey or brown.

The leaves are alternate, simple and elliptic to slightly ovate, 15–80 x 10–32 mm, with a broadly tapering to rounded apex. They are 3-veined from the asymmetrically lobed base, rounded to slightly cordate, held horizontally or drooping, glossy green above, almost white and silvery hairy below, while the margins are entire to slightly serrated. The petiole (leaf stalk) is about 1–8 mm long.

The flowers are small, bright yellow, born in axillary clusters at the end of branches. They are often borne in profusion, with sepals up to 12 mm long and petals shorter. The flowering time: October–March. The fruits are round and fleshy drupes (fruits such as plums), reddish brown or orange and black when ripe, entire or deeply 2- lobed, up to 6 mm in diameter.

**Chemical constituents:**

Per 100 g dry matter the leaves contain: crude protein 16.7 g, fat 4.7 g, nitrogen-free extract 48.4 g, crude fibre 21.5 g. Per 100 g dry matter the fruit contains: crude protein 4.9 g, fat 3.5 g, carbohydrate 74.3 g, crude fibre 13.0 g, Ca 920 mg, Mg 200 mg and P 144 mg (Baumer, 1983). The fruits are sweet but astringent.

The bark and other plant parts contain farnesol, which has sedative activity and is antagonistic to the stimulant effect of caffeine; farnesol also enhances the effects of barbiturates. A petroleum ether extract of the root contained the triterpenes lupeol and betulin, and triterpene esters. A methanol extract yielded the alkaloids harman, 6-methoxyharman and 6-hydroxyharman.

**Tests for identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above
- (b) Carry out thin-layer chromatographical examination of an extract to confirm the presence of farnesol by co-chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Tranquilizer, antimicrobial, sedative.

**Storage:**

In a cool dry place

## **Guaiacum officinale L.**

### **Family name:**

Zygophyllaceae

### **Synonyms:**

*Guajacum officinale* L.

### **Common names:**

Guaiacum, Gum guaiacum, Lignum-vitae, Tree of Life, Guaiac, Pockwood, Wood of life, Lignum Vine, Lignum vitae (E), Gaiac, Arbre de vie,, Bois saint, Gaiac bâtard, Ggaïac franc, Gaiac mâle, Gaiac officinale (F)

### **African names:**

- (a) Arabic: الجياك المخزني أو عود الأنبياء أو خشب النبي
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

An ornamental evergreen tree with pretty rich blue flowers, the trunk is a greenish-brown colour, the wood of slow growth but attains a height of 40 to 60 feet, stem almost always crooked, bark furrowed; the wood is extraordinarily heavy, solid and dense, fibres cross-grained; pinnate leaves, oval obtuse; fruit obcordate capsule; seeds solitary, hard, oblong. The old heart wood is dark green, the sap wood little in quantity and of a much lighter yellowish colour

### **Geographical distribution:**

Native : Antigua and Barbuda, Bahamas, Barbados, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago, United States of America, Venezuela, Virgin Islands (US)

Exotic : Ghana, India

### **Part used:**

Resin, bark, wood.

### **Name of drug:**

Guaiacum resin.

### **Definition:**

Guaiacum is the dried resin obtained from the wood and stem bark of *Guaiacum officinale* L., (family, Zygophyllaceae)

### **Description:**

**Macroscopical:** *Guaiacum officinale* grows to a height of 9-12 m. Stem is generally crooked wood intensely hard, the branches knotty and bark deeply furrowed. The dense crown of close-growing foliage gives the tree a rounded, compact, net appearance. Each leaf is composed of 2 or 3 pairs of smooth, stalkless leaflets arranged on a slender midrib. The leaflets are 6-13 cm in length. There is much irregularity both in their size and

shape: some are broadest above the middle (obovate), some almost blunt (obtuse). Beautiful blue flowers grow in great profusion and almost cover the tree and remain for a long time. As the older blooms fade from deep blue to paler shades, some becoming almost white, a striking variegation of colour is produced. The flowers grow in clusters at the ends of the branches. Each flower has 5 petals cupped in a small, finely hairy calyx, supported on a slender stalk. There are 10 stamens bearing golden yellow anthers. The fruit appears as small, round, compressed, yellow capsules, containing 5 cells; occasionally there are fewer. Each cell encloses a single seed.

It has a slight acrid taste and is odourless, unless heated, when it emits an agreeable scent. The bark yields 1 per cent volatile oil of delicious fragrance

***Chemical constituents:***

Fragrant volatile oil (1% from bark of tree). Lignum vitae contains lignans (such as furoguaiacidin and guaiacin), 18-25% resin, vanillin, and terpenes.

***Tests for identity:***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above
- (b) Gas chromatographic examination of an extract to confirm the presence of vanillin.

***Tests for purity:***

- (a) Lignum Vitae is the heaviest and densest wood in the world and will rapidly sink to the bottom when placed in water
- (b) It has a slight acrid taste and is odourless,
- (c) When heated, it emits an agreeable scent.
- (d) The bark yields 1 per cent volatile oil of delicious fragrance

***Pharmaceutical preparations:***

N/A

***Uses:***

Anti-inflammatory, antimicrobial, molluscicidal,

***Storage:***

In a cool dry place.

## **Guibourtia copallifera Benn.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Copaifera copallifera* (Benn.) Milne-Redh.
- (b) *Copaifera guibourtiana* Benth.
- (c) *Guibourtia vuilletiana* (A. Chev.) A. Chev.
- (d) *Guibourtia vuilletii* (A. Chev.) A. Chev.



### **Common names:**

Sierra Leone gum-copal; gum-copal; true gum-copal; red gum; yellow gum; 'gun copper, kobo tree (E)  
Copalier; Copalier de Guinea (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Kobo tree can be a shrub or tree growing up to 25 metres tall.

A large tree to 25 m high, bole 75 cm in diameter, straight, cylindrical, plank-butressed at base to 2 m height (2, 3, 9), or, as in Sierra Leone, bole swollen at base with short sharp buttresses extending upwards as fluting (12), of the dense forest

### **Geographical distribution:**

Guinea, Guinea Bissau, Mali, Nigeria, Sierra Leone, Cote D'Ivoire;

### **Part Used:**

Leaves, roots, fruits, stem exudate.

### **Name of drug:**

Copal.

### **Definition:**

Copal is a hard resin, obtained from *Guibourtia copallifera* Benn. (family, Fabaceae) and various tropical trees, which is used to make varnish.

### **Description:**

**Macroscopic:** Tree; extremities rather stout sinuous rugulose, giving off numerous ascending branches, puberulous or obsoletely pubescent at first. Leaflets 1-jugate, coriaceous, broadly semi-elliptical or -ovate, obtusely acuminate, 3–4-nerved with subprominent reticulation, 2 1/2–3 1/2 in. long, 1–1 1/3 in. broad, sessile; petiole 2 lines. Flowers numerous, sessile in panicled ascending spikes, overtopping the leaves. Bracts ovate, 1–1 1/2 lines long, caducous. Bracteoles truncate or broadly rounded, closely investing the base of the calyx. Buds ellipsoidal, 2 lines long. "Sepals 4, imbricate, coriaceous, subequal in length, elliptical, obtuse, glabrous. Ovules 2–4." The wood has

some resemblance to rosewood. The heartwood is pink, vivid red, or red-brown with purple streaks or veins, on exposure becomes yellow or medium brown with a reddish tint. The sapwood is whitish and clearly demarcated. The texture is fine and even, the grain straight or interlocked, lustrous, sometimes highly figured. It has an unpleasant odour when first cut which disappears on drying. Though quite hard and heavy it works, saws, and planes rather well and produces a good finish, glues well. The heartwood has good durability and is resistant to termite attack.

***Chemical constituents:***

Gum, Resin.

***Test for identity:***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Test for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Galactogogue, rheumatism, gastro-enteritis, dysentery.

***Storage:***

In a cool dry place.

## **Hagenia abyssinica (Bruce) J.F.Gmel.**

### **Family name:**

Rosaceae.

### **Synonym(s)**

- (a) *Banksia abyssinica* Bruce
- (b) *Brayera anthelmintica* Brayer
- (c) *Hagenia abyssinica* var. *viridifolia* Hauman
- (d) *Hagenia anthelmintica* (Kunth) Eggleling

### **Common names:**

African redwood, Brayera, Cusso, Hagenia, Kousso (E)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: mdobore, mlozilozi



### **Brief description of the plant:**

The tree is named after Dr. K. G. Hagen of Konigsberg, a German botanist (d. 1829), and also after A. Brayera, a French physician in Constantinople, who wrote a monograph on the tree in 1823. It is a beautiful tree growing about 20 feet high, at an elevation of 3,000 to 8,000 feet. The flowers are unisexual, small, of a greenish colour, becoming purple. The dried flowers have a slight balsamic odour, and the taste is bitter and acrid; the female flowers are chiefly collected, although not exclusively so. 'Loose Kousso,' i.e. flowers stripped from their panicles, sometimes come into the market, often with some staminate flowers among it. These are much less active, easily distinguished by their greeny colour, fertile stamens and outer hairy sepals, whereas the female flowers are a dark reddish colour.

### **Geographical distribution:**

Central Africa; Eastern Africa; Eastern Arc Mountains; Lake Malawi region; Malawi; Northern Tanzania; Zambia.

### **Part used:**

Herb, unripe fruit, and the dried panicles of the pistillate flowers.

### **Name of drug:**

Kousso herb.

### **Definition:**

Kousso herb is the dried herb of *Hagenia abyssinica* (Bruce) J.F.Gmel. (family, Rosaceae).

### **Description:**

**Macroscopical:** *Hagenia abyssinica* is a slender tree up to 20 m tall, with a short trunk and thick branches; branchlets covered in silky brown hairs and ringed with leaf scars. Bark thick, brown or reddish-brown and readily peeling. No thorns or buttresses. Leaves compound, 40 cm long, in terminal tufts; leaflets pale or bright green above, with silvery

hairs below, reddish and sticky when young, 3-6 pairs plus a terminal leaflet, each about 10 cm long; margin finely toothed and fringed with long hairs; leaf stalks 12 cm long, with expanded wings formed from the stipules, densely hairy on the underside. Flowers in handsome multibranched, terminal, drooping panicles up to 60 cm long and 30 cm wide, polygamo-dioecious, female heads pinkish-red, clearly veined, bulkier than the more feathery orange-buff to white male heads. Fruit small, dry, winged, asymmetric, single seeded, brown syncarp with a single more or less ovoid carpel and fragile pericarp. *Hagenia* is a monospecific genus and is most closely related to the monospecific genus *Leucosidea*. The specific name means ‘from Ethiopia’.

***Chemical constituents:***

A volatile oil, a bitter acrid resin, tannic acid, and a bitter principle called A Kosin and B Kosin, which is found in Kousso, but thought to be decomposition products. The principle constituent of Kousso is Koso-toxin, a yellow amorphous body, possibly closely allied to filicic acid, and Rottlerin; other inactive colourless bodies are crystalline Protokosin and Kosidin.

***Tests for identity***

- (a) Macroscopical examination of the specimen to ensure compliance with descriptions given above.
- (b) Examine an extract of the plant for the presence of tannic acid by thin-layer co-chromatography

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antimicrobial, anthelmintic, antidiarrhoea.

***Storage:***

In a cool dry place.

## **Harungana madagascariensis Lam. ex Poir.**

### **Family name:**

Hypericaceae.

### **Synonyms:**

- (a) *Arungana paniculata* Pers.
- (b) *Haronga madagascariensis* (Lam. ex Poir.) Choisy
- (c) *Haronga paniculata* (Pers.) Lodd. ex Steud.



### **Common names:**

Orange-milk tree, Dragon's-blood-tree ,  
Praying-hands, Haronga tree (E)  
Guttier du Gabon, (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Sāndala giri, Sumbala
- (c) Hausa: alillibar, Alillibar-raafii
- (d) Peuhl: N/A
- (e) Swahili: kumamaji, mbura, mdamu mdamu, mgondogondo, ngoningoni
- (f) Yoruba: Adidun, Amuje, Asonje, Arunje, Adenden, Elepo = the roots, Legun soko = the roots, Igi ekpó

### **Brief description of the plant:**

Small to medium-sized shrubby tree with distinctly russet young leaves and branchlets. Bark brown, rough and scaly, with orange sap when damaged. Leaves opposite, elliptic, up to 20 cm long, dark shiny green above, densely covered in rusty hairs below; margin entire. Young leaves at stem apex flattened together; hence the common name "praying hands". Flowers in dense, branched, terminal heads, creamy-white, hairy inside, with glandular dots near the apex, sweetly scented. Fruit in clusters, 2-4 mm in diameter, greenish-orange to red when ripe.

### **Geographical distribution:**

Widespread in tropical Africa, Madagascar and the Mascarene Islands.

### **Part used:**

Barks stem, branch, trunk.

### **Name of drug:**

Haronga tree bark.

### **Definition:**

Haronga tree bark is the dried stem bark of *Harungana madagascariensis* [Lam. ex] Poir. (family, Hypericaceae)

### **Description:**

**Macroscopical:** Shrub or tree up to 12 m. (exceptionally 27 m.) high, much branched, evergreen, with scaly bark and orange or blood-red sap. Young stems densely covered with rusty stellate or dendroid hairs. Leaves petiolate; petioles up to 27 mm. long; blades lanceolate to ovate, ranging from 6.5 x 4.5 cm. and 8.5 x 3.5 cm. to 20 x 10 cm., shortly acuminate, rounded (rarely broadly cuneate, truncate or cordate) at the base, with about 14 parallel lateral veins on each side of the midrib, glabrescent and dark glossy green

above, pallid below with short glandular or rusty stellate indumentum; young leaves densely rusty on both surfaces. Inflorescence a large many-flowered corymbose-cymose panicle; pedicels and calyx rusty. Flowers sweet-scented. Sepals ovate-elliptic, about 2 mm. long, with a few longitudinal linear glands and gland dots. Petals ovate-elliptic, up to 3 mm. long, with 2–4 gland dots near the apex, white. Stamens 3–4 per bundle; filaments glabrous. Staminodes fleshy, glabrous. Drupe spherical, about 4 mm. diameter; pericarp crustaceous, yellow or orange; pyrenes each 0–2-seeded. Seeds about 2 mm. long.

**Chemical constituents:**

Leaves: Prenylated anthranoids, harunmadagascarins C and D; and kenganthranol D.; Root bark: An anthracenone, Bazouanthrone (3,5,8,9-tetrahydroxy-2,4,4-tri-(3,3-dimethylallyl)-6-methyl-1-(4H)-anthracenone), feruginin A, harunganin, harunganol A, harunganol B, friedelan-3-one and betulinic acid.; Also: Flavanone as the active compound astilbin or 3-O-alpha-L-rhamnoside-5,7,3',4'-tetrahydroxydihydroflavonol. Bark: Alkaloids, cardiac glycosides, flavonoids and saponins.

**Tests for identity**

- (a) Macroscopical examination of the specimen and its source to ensure compliance with the above descriptions
- (b) Shake an aqueous extract of the powdered bark with water. It produces a foam which does not disappear with heat
- (c) Also perform the test for flavonoids as described in volume 2. It gives a positive reaction.
- (d) An extract of the powdered bark is warmed with acidulated water and filtered. The filtrate gives a precipitate with Mayer's reagent, Wagner's reagent and with Dragendorff's reagent.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Cancer, malaria, antitrypanosomal, anti-inflammatory, antisickling, antioxidant, antibacterial.

**Storage:**

Store in a cool dry place.

## **Heliotropium indicum L.**

### **Family name:**

Boraginaceae.

### **Synonyms:**

- (a) *Heliotropium cordifolium* Moench;
- (b) *Heliotropium foetidum* Salisb.;
- (c) *Heliotropium horminifolium* Mill;
- (d) *Eliopia riparia* Raf.;
- (e) *Eliopia serrata* Raf.;
- (f) *Heliophytum indicum* (L.) DC;
- (g) *Tiaridium indicum* (L.) Lehm

### **Common names:**

Heliotrope, Indian Heliotrope, Turnsole,  
Scorpion weed, Wild clary, Erysipelas plant,  
Cock's comb (E)  
Herbe à verrues (F), Héliotrope d'Inde (F)

### **African names:**

- (a) رقیب الشمس الهندي: Arabic
- (b) Bambara: nágiku,
- (c) Hausa: Korama, Kalkashin korama,
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ori-igun, Apari-igun, Ogbe-akuko, Agogo-igun, Arapari, Obuko, Olojoburu, Akuko omade.



### **Brief description of the plant:**

A coarse somewhat succulent, annual, 15-60 cm high with stout stem and ascending branches, more or less densely hirsute. Leaves 4.5-10 cm long, ovate or ovate-oblong, obtuse or subacute, hairy. Flowers small, pale violet, numerous, sessile, 2-ranked, in simple or rarely forked, usually extra-axillary spikes, 5-15 cm long.

### **Geographical distribution:**

Pantropical and also in the south of the United States of America. Throughout the tropics in the Old World.

### **Part used:**

Whole plant, Roots, Leaves.

### **Name of drug:**

Heliotrope.

### **Definition:**

Heliotrope is the dried herb of *Heliotropium indicum* L. (Family,Boraginaceae).

### **Description:**

**Macroscopical:** Erect annual or a few times short-lived perennial herb up to 150 cm. high. Stem quadrangular, thick, empty or pithed, woody to the base, variably hairy. Leaves alternate or subopposite; petiole 20–70(110) mm. long, pubescent, with scattered bristles; lamina 40–170 x 30–130 mm., ovate to broadly ovate or triangular-ovate, strigose by areolae and with scattered bristles, roughish or only punctate above, generally

pubescent-villous, rarely tomentose or punctate and with some scattered bristles mainly on the nerves and veins below, acute at the apex, obtuse to subcordate at the base and abruptly decurrent on the petiole, often with crisped margins; secondary nerves 4–8 on each side of the midrib. Cymes long and flexuous, up to 36 cm. long when completely expanded, usually shorter, ± dense, single or sometimes in pairs, on a short terminal peduncle. Flowers sessile. Calyx lobes 1.5–3.5 mm. long, narrowly elliptic to subulate, unequal, sparsely hispid. Corolla 3.5–5.0 mm. long, hypocrateriform, pubescent outside, glabrous inside, white or rarely mauve or blue; tube 3.0–4.5 mm. long, usually longer than the calyx; lobes c. 0.6 x 1.0 mm., depressed-ovate, rounded at apex. Stamens inserted at 0.8–1.0 mm. from the base of the corolla tube; anthers 0.5–0.9 mm. long, narrowly ovate, cordate at the base, subsessile. Ovary with 4 fleshy crests, glabrous. Style 0.5 mm. long, terete, glabrous; sterile appendix hemispheric. Fruit deeply bilobed, mitre-shaped with the lobes strongly divergent, glabrous or puberulous, first divided into 2, each one c. 4 x 4 x 2.5 mm., later split into 4 nutlets, these angular, rostrate, with the surface 3-ribbed; each nutlet with 2 cavities, the distal one fertile and the proximal one empty and larger than the other.

**Chemical constituents:**

Aerial parts contain pyrrolizidine alkaloids, indicine (principal), echinitine, supinine, heleurine, heliotrine, lasiocarpine, its N-oxide, acetyl indicine, indicinine and anti-tumour alkaloid, indicine-N-oxide. The plant also contains rapanone and lupeol and an ester of retronecine. Roots contain high amount of estradiol.

It's essential oil extracts contains 49% phytol, 6.4% 1-dodecanol and 3% ?-linalool constituents.

It contains chemical constituents of heliotrine, helindicine, lycoqsamine, indicine, indicine-N-oxide, acetyl-indicine, heleurine, supinine, supinidine, lindelofidine, trachelanthamidine, retronecine, putrescine, spermidine, rapanone, C16-C18 fatty acid esters of 1-cyano-2-hydroxymethylprop-1-en-3-ol.

**Tests for identity**

- Macroscopical examination of the specimen to ensure compliance with the descriptions given above
- Thin-layer chromatographical examination of the extract of the specimen to confirm the presence of pyrrolizidine alkaloids (especially heliotrine) by co-chromatography..

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Cytotoxicity, antimicrobial, histo-gastroprotection, Diuretic, wound healing, antimicrobial, anticancer.

**Storage:**

In a cool dry place.

## **Hippocratea indica Willd.**

### **Family name:**

Celastraceae.

### **Synonyms:**

- (a) *Pristimera indica* (Willd.) A.C. Sm.
- (b) *Hippocratea loesneriana* Hutch. & M. B. Moss;
- (c) *Reissantia indica* (Willd.) N. Hallé

### **Common names:**

Mopane Paddle-pod (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Gwadayii = *H. africana*
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Youruba: Ponju-owiwi, Abodediji, Ilayin



### **Brief description of the plant:**

A shrub or slender climber to 4 m long of the closed-forest and dry deciduous forest. Young branches characteristically 4-angled with indistinct lenticels. Leaves, obovate to oblong-elliptic, 4-15 cm long, greyish- or yellowish-green, glabrous; apex tapering with a distinct tip, margin shallowly crenate-dentate with glandular teeth. Flowers in terminal and axillary branched heads, very small, yellowish. Fruit with 2 spreading flattened mericarps, oblong to elliptic, each c. 5 cm long, yellow-green, smaller than in most other species in the genus.

### **Geographical distribution :**

This species (or close relatives) is widespread in tropical Africa and tropical Asia.

### **Part used:**

Whole plant, Leaves and roots.

### **Name of drug:**

Mopane.

### **Definition:**

Mopane is the dried levees of *Hippocratea indica* Willd. Otherwise known as *Pristimera indica* (Willd.) A.C. Sm. (family, Celastraceae).

### **Description:**

**Macroscopical:** Shrub, often scandent or scrambling, 1–5 m. high, or liane up to c. 12 m. high, more rarely a small tree, glabrous; stems greyish- to yellowish-green, smooth and 4-lined when young, becoming obtusely 4-lobed or terete and reddish-purple when mature, smooth, without lenticels. Leaf-lamina greyish- or yellowish-green, concolorous or slightly paler and sometimes with brownish nervation below, 4–11·7(15) × (2)3·2–7(10) cm., oblong or elliptic to obovate or subcircular, obtuse to acuminate at the apex, with margin denticulate to subentire, cuneate, ± decurrent at the base, chartaceous, with midrib

and 5–7 lateral nerves ± prominent below but the venation otherwise plane; petiole (4) 8–12 mm. long; stipules c. 0·5–0·7 mm. long, triangular to semicircular, laciniate or irregularly dentate, not united. Flowers ? in lax to rather dense simple axillary dichasias with accessory branches; peduncles and inflorescence-branches quadrangular, sometimes glandular along angles; buds c. 0·5 mm. long, ovoid to globose; pedicels 0·5–1 mm. long; bracts c. 0·5–0·7 mm. long, triangular, acute, eroded-denticulate, persistent. Sepals reddish-brown, 0·7–1 mm. long, equal, oblong to ovate-lanceolate, acute or subacute, with margin irregularly ciliolate, united in lower 1/3–2/3. Petals yellowish to cream, drying reddish-brown, 1–2 mm. long, linear-lanceolate, acute to subacute, entire, with margins inrolled, imbricate in bud, erect or ± spreading but straight or incurved towards the apex at anthesis. Disk single, shallowly 3-lobed, surrounding the ovary. Stamens 3, with filaments short, narrow; anthers extrorse, circular, 1-thecous. Ovary with a short style; stigmas completely united; ovules 2 per loculus. Mericarps pale green, 2·8–4 (4·5) × 0·9–1·5 cm., flattened, narrowly oblong to oblanceolate, rounded at the apex, 2-seeded, striate. Seeds winged, with veins marginal and submedian.

**Chemical constituents:**

Alkaloids detected in the leaves.

**Tests for identity**

- Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- Examine the leaf extract for the presence of alkaloids by microchemical tests with Dragendorff's reagent.

**Tests for purity**

N/A

**Pharmaceutical preparations**

N/A

**Uses:**

Antibiotic, bacteriostatic, fungistatic

**Storage:**

In a cool dry place.

## **Holarrhena floribunda** T. Dur. et Schinz

### **Family name:**

Apocynaceae.

### **Synonyms:**

- (a) *Holarrhena africana* A. DC.
- (b) *Holarrhena wulfsbergii* Stapf.
- (c) *Rondeletia floribunda* G. Don

### **Common names:**

Holarrhena (E, F). Faux caoutchouc (F)

### **African names:**

- (a) Arabic: هولار هيبيا
- (b) Bambara: Fufu, Nofo, Kedan
- (c) Hausa: Baakin-mutun, Bakin maayuu, Sandan mayu, Gamon sauwa,
- (d) Peuhl: Indama, Taraki
- (e) Swahili: N/A
- (f) Yoruba: Ako-ire, Are-ibeji, Areno, Isai, Irena



### **Brief description of the plant:**

Tree reaching 15 m high; oval lanceolate leaves; lamina covered with a fine down on the inner part; corymbiform axillary cymes; white scented flowers, linear cylindrical follicles hanging in pairs reaching 60 cm in length.

### **Geographical distribution:**

Forests of Guinea and the Congo.

### **Part used:**

The dried stem bark of *Holarrhena floribunda* (G. Don) Dur. et Schinz.

### **Names of drug:**

Cortex Holarrhena. Holarrhena bark. Kurchi. Ecorce de Holarrhine.

### **Definition:**

Holarrhena is the dried stem bark of *Holarrhena floribunda* (G. Don) Dur. et Schinz. (family, Apocynaceae).

### **Description:**

**Macroscopical:** The bark occurs in recurved pieces; both longitudinally and transversely; about 6 to 12 mm thick. The outer surface shows deep cracks and is buff to brownish in colour, with brittle and splintery fracture. It is odourless and having a distinct bitter taste.

**Microscopical:** A transverse section shows an outer cork layer of 3-5 rows of polygonal, suberized cells. The secondary cortex consists of large ovoid parenchyma cells, followed by the compact parenchyma cells of the primary cortex. The pericycle region is characterised by numerous groups of lignified fibres, long, narrow or wide lumen, pointed tips, lignified pitted walls. The phloem region consists of soft bast elements.

**Powder:** Light buff brown to dark brown, odourless, with a bitter taste. It is characterised by the presence of suberized cork cells, lignified fibres, sclereids, soft phloem tissue. Starch and calcium oxalate are absent.

***Chemical constituents:***

0.1 per cent alkaloid of glucosteroid type: canessine, kurchine, holarrhenine, kurchicine, kurchenine, holarrhine, holarhimine; tannins, reducing sugars; steroidal glycosides: holacurtenin holacurtin.

***Test for identity:***

- (a) Macroscopical and microscopic examination to ensure compliance with the descriptions given above
- (b) Macrochemical tests on the total alkaloidal extract to confirm the presence of alkaloids with the common alkaloid reagents (Dragendorff's, Wagner's, Mayer's reagents)

***Assay:***

Determine the total alkaloid as described under "Determination of total alkaloid" as described in vol. 2.

***Pharmaceutical preparations:***

N/A

***Uses:***

Antidysentric, and antiamoebic.

***Storage:***

In well-closed containers, protected from light.

## **Hydrastis Canadensis L.**

### **Family:**

Ranunculaceae

### **Synonyms:**

N/A

### **Common names:**

Goldenseal, Yellow root, Yellow-puccoon, sceau d'or, Ground raspberry, Eye-balm, Indian turmeric, Orange Root, Indian Dye, Eye Root, Jaundice Root (E) Sceau d'or, Hydraste, Hydraste du Canada (F)



### **African names**

Arabic: خاتم الذهب

Bambara: N/A

Hausa: N/A

Peuhl: N/A

Swahili: N/A

Yoruba: N/A

### **Brief description of the plant:**

Goldenseal is a slow-growing perennial herb that spreads via root-like, yellow underground stems (rhizomes). Juvenile plants are often single-stemmed. Mature (reproductive-aged) individuals are characterized by a pair of leaves arranged alternately on a forked stalk that may reach about 30 cm. (one foot) in height. Leaves are palmately-lobed with toothed margins. Short minute hairs cover the stems and leaves.

Goldenseal flowers from April to May. A single white-green flower is borne atop a short flowering stalk emanating from the uppermost leaf. Fruits resemble raspberries, containing 10-30 black, shiny smooth seeds.

### **Geographical distribution:**

Goldenseal is native to the woodlands of the Eastern United States and Southern Canada.

### **Part Used:**

Whole plant.

### **Names of drug:**

Golden seal root. Hydrastis.

### **Definition:**

Golen seal root is the dried rhizome and roots of *Hydrastis Canadensis* L. (family, Ranunculaceae).

### **Description:**

**Macroscopical:** Herbs, 15-50 cm. Rhizomes with tough fibrous roots. Stems erect, unbranched, pubescent. Leaves: basal leaf often quickly deciduous, 1; cauline leaves, 2, similar to basal. Leaf blade 3-10 cm wide at anthesis, to 25 cm wide in fruit; lobes variously incised, margins singly or doubly serrate. Flowers 8-18 mm wide; peduncle 5-38 mm, ± closely subtended by distalmost cauline leaf; sepals not clawed, 3.5-7 mm, glabrous; stamens strongly exserted, white showy, 4-8 mm; pistils 1-carpellate, distinct; stigma 2-lipped. Berry aggregates dark red, 10-15 × 8-15(-20) mm, each berry 5-8 × 1.5-

5 mm. Seeds 1-2 per pistil, 2.5-4.5 mm. The drug breaks with a short, waxy fracture. It has slight but distinctive odour and bitter taste. A transverse section of the rhizome shows a fairly thick, yellow or yellowish-brown bark; 12-20 radially elongated , bright yellow wood bundles, separated by wide medullary rays; a large pith.

***Chemical Constituents:***

Goldenseal contains at least three active alkaloids, namely Hydrastine, Berberine and Canadine, as well as traces of essential oil, fatty oil and resin. The rhizome of goldenseal is a source of the medicinal alkaloids hydrastine (1.5-4%), berberine (0.5-6%), and berberastine (2-3%), with lesser amounts of canadine and some minor alkaloids.

***Test for Identity***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above
- (b) Macrochemical test on a total alkaloid extract to give a positive reaction (precipitate) with Wagner's, Dragendorff's and Mayer's reagents.
- (c) Thin-layer chromatographic examination of the total alkaloid extract to confirm the presence of hydrastine

***Test for Purity***

N/A

***Pharmaceutical preparations***

N/A

***Uses:***

For uterine haemorrhage, respiratory, immune system and gastrointestinal ailments, and externally for inflammation.

***Storage:***

In a cool dry place.

## **Hygrophila auriculata (Schumach.) Heine**

### **Family name:**

Acanthaceae.

### **Synonyms:**

- (a) *Asteracantha longifolia* (L) Nees,
- (b) *Asteracantha macracantha* Hochst,
- (c) *Barleria auriculata* Schumach,
- (d) *Barleria glabrata* Vahl ex Schumach.,
- (e) *Barleria longifolia* Linn,
- (f) *Barleria macracantha*,
- (g) *Hygrophila longifolia* (Linn) Kurz,
- (h) *Hygrophila spinosa* T. Anders
- (i) *Hygrophila schulli* (Hamilton) M.R.Almeida & S.M.Almeida



### **Common names:**

Indian paint plant, Starthorn, Long Leaved Barleria, Marsh Barbel, Asteracantha (E),

### **African names**

- (a) Arabic: Afqeet, Al-Aziniat al-Maiyah, Asfeer Aasan
- (b) Bambara: kélé béto kala,
- (c) Hausa: Zazar giwa, kayar rak'umi, Dayin giwa, Kayar giwa, Saare- gwiiwa,
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: mafowqo kauruonu

### **Brief description of the plant:**

A stout erect herb of wet places, up to 1m high, quadrangular stem, leaves whorled with strong spines. A stout erect herb of wet places, 2-3 ft. or up to 6 ft. or more, with 4-angled usually bristly stem, and bluish or purple flowers 1-1 1/4 in. long in dense whorls with about 6 strong spines.

### **Geographical distribution:**

From Senegal to W. Cameroons and widespread in the Old World tropics.

### **Part Used:**

Whole plant, leaves, seeds and Roots.

### **Name of drug:**

Starthorn.

### **Definition:**

Starthorn is the dried tops and roots of *Hygrophila auriculata* (Schumach.) Heine (family, Acanthaceae).

### **Description:**

**Macroscopical:** A stout herb with numerous fasciculate usually unbranched, subquadrangular, erect, stems, 0.6-1.5 m high, thickened at the nodes. Leaves oblong-lanceolate or oblanceolate, sparsely hispid on both sides, six at a node, the outer 2 large, reaching 15 cm long, each leaf bear straight, sharp, yellow, spines in its axil. Flowers

purple-blue, 3.5 cm long, in a whorl of 8 at each node. Capsules 8 mm long, linear-oblong, pointed.

**Chemical Constituents:**

Steroids, Alkaloids. Aerial parts contain alkaloids, phytosterol, essential oil, mucilage, triterpene alcohol, lupeol, stigmasterol and hydrocarbons. Seeds contain fixed oil, enzymes and sterol. Asterol I, II, III and IV and asteracanthine & asteracanthicine have also been isolated from the seeds. Flowers contain apigenin glucuronide. Roots contain an essential oil. (Palmitic, stearic, oleic and linoleic 80.1%) acids have been detected in seed oil.

**Test for Identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Extract of the total alkaloids to be examined macrochemically by testing with the common alkaloid reagents (Wagner's, Dragendorff's, Mayer's reagents).

**Tests for Purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antioxidant, neuroprotective, hepatoprotective, antidiabetic, antiplasmodial, antimicrobial.

**Storage:**

In a cool dry place.

## **Hyptis suaveolens (L.) Poit.**

### **Family name:**

Lamiaceae.

### **Synonyms:**

*Ballota suaveolens* L.

### **Common names:**

Wild spikenard, Bush tea. Chan, Horehound, Mintbush, Mintweed, Pignut, Stinking Roger (E). Gros baume (F)

### **African names**

- (a) Arabic: نعناع دغلي حلو الرائحة
- (b) Bambara:
- (c) Hausa: kimbar dawaakii = *H. pectinata*
- (d) Peuhl:
- (e) Swahili:
- (f) Yoruba: Jogbo, Arunfofo



### **Brief description of the plant:**

A strongly aromatic, stout bush to 1 m tall, flowers blue, 6 mm across, borne in lax axillary heads; of roadsides, waste places and cultivated land across the Region from Senegal to South Nigeria; native of tropical America and now widely established in tropic. Terrestrial, annual, erect, aromatic herb, up to 200 cm tall. Taproot white or brown. Stem quadrangular, hollow, (glandular) hairy. Leaves simple, entire, opposite, stalked, ovate, hairy on both sides, margin coarsely dentate, papillae present, apex acute, base cordate or rounded, pinnately veined. Flowers bisexual, grouped together in an axillary head, sessile, petals 5, white. Fruit a nut.

### **Geographical Distribution:**

Encountered in all tropical zones, originating from tropical America.

### **Part used:**

Leaves, Seeds

### **Name of drug:**

Spikenard

### **Definition:**

Spikenard is the dried or fresh leaves of *Hyptis suaveolens* (L.) Poit. (family, Lamiaceae)

### **Description:**

**Macroscopical:** A much-branched erect annual, with slender pilose stems. Leaves petioled, ovate, the lower cordate, irregularly crenate, thin, pubescent on both surfaces. Cymes few-flowered, umbellate, shortly peduncled, arising from the axils of the reduced upper leaves so as to form a lax terminal panicle. Calyx-tube campanulate, pubescent, strongly 5-ribbed, finally 1/6 in. long; teeth subulate, equal, shorter than the tube.

### **Chemical Constituents:**

Alkaloids, tannins, flavonoids and phenols. Leaves twigs and flowers yield an essential oil containing  $\beta$ -caryophyllen, cineol, terpenol,  $\alpha$ -bergamotene, sabinene, menthol, l-sabinene, d-limonene and azulenic sesquiterpenes. Leaves and flowers also contain campesterol and fucosterol. Seeds contain anti-A haemagglutinin. Roots contain  $\beta$ -

sitosterol, oleanolic and  $\alpha$ -peltoboykinolic acids. Two new diterpenes suaveolic acid and suaveolol have also been isolated from this plant.

**Tests for Identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions
- (b) Extract of the total alkaloids to be examined macrochemically by testing with the common alkaloid reagents (Wagner's, Dragendorff's, Mayer's reagents).
- (c) Gas chromatographic examination of the essential oil to confirm the presence of  $\beta$  - cayophelene, cineole, terpeneol, etc

**Tests for Purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Stimulant, carminative, sudorific and lactagogue; infusion is used in catarrhal conditions, affections of the uterus and parasitical cutaneous diseasesAnticancer, antispasmodic,

**Storage:**

In a cool dry place.

## **Hyoscyamus muticus L.**

### **Family name:**

Solanaceae.

### **Synonyms:**

- (a) *Hyoscyamus falelez* Coss., rient. iv. 293.
- (b) *Scopolia mutica* Duna
- (c) *Scopolia Datora* Dunal

### **Common names:**

Egyptian Hyoscymus. Egyptian Henbane  
(E). Jusquiame d'Egypt (F).

### **African names:**

- (a) Arabic: Assakaranel Misri, Sakaraan, Sekran
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Herbaceous plant reaching up to 6 m in height with cylindrical stalks, unbroken or dentate petiolated generally downy leaves; inflorescence in cymes on flower bearing branches. Flowers emerging from a swelling striped downy calyx with yellow or whitish corolla; fruit: a corpulent pyxidium capsular with very small and numerous seeds.

### **Geographical distribution:**

Originates from India and introduced and cultivated in Upper Egypt and Southern Algeria.

### **Part used:**

Dried leaves and flowering tops.

### **Names of drug:**

Herba Hyoscyami mutici, *Hyoscyamus muticus* herb, Jusquiame d'Egypte. Egyptian Hyoscymus

### **Definition:**

Egyptian Hyoscymus is the dried leaves and flowering tops of *Hyoscyamus muticus* L. (family, Solanaceae). Egyptian Hyoscymus contains not more than 45 per cent of its stem, not exceeding 10 mm in diameter, and not more than 2 per cent of foreign organic matter; and yields not less than 0.8 per cent of total alkaloids of Egyptian Hyoscymus, calculated as hyoscyamine.

### **Description:**

Egyptian Hyoscymus occurs generally in matted masses or broken loose pieces of shrivelled leaves inter-mixed with stems and flowering tops and also few fruits; odour, slightly foetid and narcotic; taste, bitter, acrid especially on chewing.

**Macroscopical:** Stem, cylindrical, slightly compressed, greyish-yellow, finely longitudinally striated, slightly hairy, hollow with hairy branches.

Leaves, pale green to yellowish; petiolate, or nearly sessile; varying in shape and size; lamina, oval rhomboidal to broadly elliptical, up to 15 cm long; tapering to an equal base and acuminate apex; margin, entire or with 2 to 5 triangular acute teeth on each side; both surfaces, densely hairy; midrib, broad, prominent on the lower surface; venation, pinnate, the main side veins at an angle of 45° to the midrib; lower leaves, large, with few large teeth on each side and narrowly winged petioles; upper leaves, smaller, shortly petiolate to nearly sessile, with less teeth to entire margin.

Flowers, crowded together in a more or less unilateral cyme; each shortly pedicellate, pushed to one side of large, hairy, leafy bract; bract, usually ovate lanceolate to narrowly lanceolate; calyx, very hairy, tabular, striated, 2 to 4 cm long and 8 cm wide at the mouth, with 5 short, unequal

triangular, obtuse teeth (distinction from *H. niger*); corolla, when dried yellowish, sometimes with deep coloured patches, zygomorphic, funnel-shaped, with 5 broad, unequal lobes, slightly longer than the calyx tube and almost of the same width at the mouth; stamens, 5, epipetalous,

unequal in length, with hairy purplish filaments and brownish or sometimes purplish anthers; ovary, ovoid, superior, bicarpellary, bilocular, slightly hairy, containing numerous campylotropous ovules, attached to axile placenta. Fruit, pyxis, enclosed in the persistent calyx cylindrical, 1.5 cm long and 0.6 cm broad, slightly laterally compressed, apiculate, with or without the lid. Seed, minute, yellowish-grey to brown, more or less reniform laterally compressed, about 1mm long, with reticulate testa; internally, shows a curved embryo embedded in an oily endosperm.

**Microscopical:** Leaf, isobilateral; epidermal cells, polygonal with slightly sinuous anticlinal walls and striated thick cuticle; stomata, present on both surfaces surrounded by 3, rarely 4, subsidiary cells, one of which is distinctly smaller than the others, cruciferous type; glandular hairs very numerous up to 600  $\mu$  long, multicellular, branched (distinction from *H. niger*) and non-branched, each with terminal, glandular, globular unicellular head and 1- to 4-celled stalk; and non-glandular hairs, very few, short, multicellular, uniseriate; mesophyll shows a single layer of short palisade cells abutting on each epidermis; numerous crystals of calcium oxalate, prisms, twins minute cubes, rarely cluster or micro-sphenoids in idioblasts; midrib, without peripheral collenchyma in cortex and shows an arc of several collateral bundles with numerous groups of perimedullary phloem, in supernumerary strands. Stem shows epidermis with numerous hairs similar to those of the leaf; cortex, with peripheral collenchyma and endodermis in the form of starch sheath; pericycle, with isolated small groups of fibres with wide lumen; phloem, without fibres; xylem, as a continuous cylinder, with annular, spiral, reticulate and pitted vessels; pith, with a central cavity, formed of rounded, thin-walled parenchyma and shows numerous strands of perimedullary phloem accompanied by isolated fibres with wide lumen; crystals, as in the leaf, scattered in the cortex and pith. Calyx, with stomata and hairs as in the leaf, and with bast fibres. Corolla, with elongated epidermal cells, having striated cuticle; hairs and few stomata on outer epidermis only; small prisms of calcium oxalate scattered in mesophyll. Stamen, with hairy filament, papillosed and striated exothecium and polygonal endothecial cells with thick lignified bars. Pollen grains, rounded, about 50  $\mu$  in diameter, with finely pitted exine and 3 conical exit pores.

Pericarp, with elongated, pitted, lignified endocarpal cells. Epidermal cells of testa are thickened on the lateral and inner but not on the outer walls. Endosperm with thin-walled cells, containing oil droplets and oval aleurone grains, 3 to 8 microns in diameter, each containing a polygonal crystalloid and a small globoid.

**Powder:** Powdered Egyptian Hyoscyamus is light greenish-yellow; characterized by numerous green fragments of leaf showing sinuous epidermal cells, striated cuticle and stomata of cruciferous type; few, multicellular, uniseriate, non-glandular hairs; numerous branched and non-branched glandular; fragments of wood fibres and vessels; very few fragments of pericyclic fibres; numerous crystals of calcium oxalate having variable shapes, prisms, 45 to 110  $\mu$ , mostly 70 to 75  $\mu$  long, twin crystals, rarely cluster or micro-sphenoidal; yellowish fragments of petals and of anthers showing thickened bands of endothecium; few rounded pollen grains, with finely pitted exine, up to 50  $\mu$  in diameter; very occasional fragments of seed coat.

**Chemical constituents:**

0.7-1.5 per cent of alkaloid mainly hyoscyamine.

**Tests for purity:**

(a) Shake vigorously about 0.2 g of powdered Egyptian Hyoscyamus with 2 ml of dilute hydrochloric acid, filter, and to the filtrate add a drop of potassio-mercuric iodide T.S.; a precipitate is immediately formed (exhausted Egyptian Hyoscyamus).

(b) Mix 1 g of powdered drug with 10 ml of 0.1N sulphuric acid, shake, filter, add to the filtrate 1 ml of strong ammonia solution and add 5 ml of water, and extract with 15 ml of ether, taking care to avoid formation of an emulsion; dry the ether layer over anhydrous sodium sulphate, filter, evaporate to dryness in a porcelain dish, add 10 drops of fuming nitric acid, evaporate to dryness over small flame, and add 10 ml of acetone and, dropwise, a 3 per cent solution of potassium hydroxide in alcohol; a violet colour is produced.

(c) Egyptian Hyoscyamus is free from ammoniacal odour (bad storage).

(d) Ash, not more than 30 per cent; acid-insoluble ash, not more than 15 per cent.

**Assay:**

Carry out the assay as mentioned under *Datura metel* using about 10 g of powdered Egyptian Hyoscyamus, module No. 22 accurately weighed.

**Pharmaceutical preparations:**

Extractum Hyoscyami Fluidum.

Extractum Hyosciami Siccum.

Pilulae Colocynthidis et Hyoscyami.

Tinctura Hyoscyami.

Potassium Citrate and Hyoscyamus Mixture.

**Uses:**

Parasympatholytic, antispasmodic for plain muscles of trachea, alimentary tract and kidney.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Lagenaria siceraria (Molina) Standl.**

### **Family name:**

Cucurbitaceae.

### **Synonyms:**

- (a) *Cucurbita lagenaria* L.
- (b) *Cucurbita siceraria* Molina
- (c) *Lagenaria vulgaris* Ser.
- (d) *Lagenaria leucantha* (Duchesne ex Lam.)  
Rusby

### **Common names:**

Bottle gourd, Calabash gourd, Common gourd, White-flowered gourd, Birdhouse gourd, Hard-shelled gourd, Dolphine gourd, Long Squash, Trumpet gourd (E) Calebasse; Calebasse cultivée; Ccourse; Cougourde; Gourde massue ; Ggourde trompette ; Gourde de pèlerins (F)



### **African names**

- (a) Arabic: قرع
- (b) Bambara: fie, file, bara,
- (c) Hausa: Dumar kwaryaa, Jemo, Bumbu, Dumaa, Dumar-luudayii, Karaguna, K'I ta'bewa, Kulubuutuu, K'undumasa, Tsana, Dumar gauraallaa, Bukhsa langa, Gumbul, Gumbul alme, Agofata, Akwato, Bango, Borin danki, Gooráá, Ka-fi-d'a-wuya
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Igba, Ugba, Àdó, Agbè, Aha, Akèngbè, Akerengbe, Akoto, Pánsá, Pòokó

### **Brief Description of the plant:**

Vigorous annual herb. Stems prostrate or climbing, angular, ribbed, thick, brittle, softly hairy, up to 5 m long, cut stems exude no sap. Leaves simple, up to 400 mm long and 400 mm broad, shortly and softly hairy, broadly egg-, kidney- or heart-shaped in outline, undivided, angular or faintly 3-7-lobed, lobes rounded, margins shallowly toothed, crushed leaves non-aromatic. Leaf stalks up to 300 mm long, thick, often hollow, densely hairy, with two small, lateral glands inserted at the leaf base. Tendrils split in two. Flowers stalked (female flower stalks shorter than male), solitary, monoecious (male and female flowers on the same plant); petals 5, crisped, cream or white with darker veins, pale yellow at the base, obovate, up to 45 mm long, opening in the evenings, soon wilting. Fruit large, variable, up to 800 x 200 mm, subglobose to cylindrical, flask-shaped or globose with a constriction above the middle; fleshy, densely hairy to ultimately glabrous, indehiscent, green, maturing yellowish or pale brown, pulp drying out completely on ripening, leaving a thick, hard, hollow shell with almost nothing inside except the seeds. Seeds many, embedded in a spongy pulp, 7-20 mm long, compressed, with two flat facial ridges, in some variants rather irregular and rugose.

### **Geographical Distribution:**

Cultivated and subspontaneous in the tropics of both hemispheres.

**Part Used:**

Fruit, Leaves, Seed, Calabash.

**Name of drug:**

Bottle gourd.

**Definition:**

Bottle gourd is the fruit of *Lagenaria siceraria* (Molina) Standl. (family, Cucurbitaceae).

**Description:**

**Macroscopical:** Monoecious, annual, climbing or trailing herb, with proximally bifid tendrils. Leaves alternate, simple; stipules absent; petiole 2.5–12.5 cm long, pubescent, with a pair of tiny glands at apex; blade broadly ovate to kidney-shaped in outline, 3–33 cm × 4.5–33 cm, undivided or shortly palmately 5–9-lobed, cordate at base, shallowly sinuate-dentate, palmately veined. Flowers unisexual (rarely bisexual), solitary in leaf axils, regular, 5-merous, up to 15 cm in diameter; receptacle tube obconic-cylindrical, 1–1.5 cm long, lobes remote; petals free, white; male flowers on long pedicels 7–31 cm long, with 3 free stamens inserted on the receptacle tube, connectives broad; female flowers on short pedicels 2–10 cm long, with inferior, densely hairy ovary, stigma 3-lobed, thick, each lobe 2-lobed. Fruit a berry, very variable in size and shape, often globular, bottle- or club-shaped, up to 1 m long, white-yellow to dark green when young, sometimes whitish speckled, usually brown when mature and dried, with hard, durable rind, flesh white and soft, many-seeded. Seeds oblong, compressed, up to 2 cm long, emarginate at base, with 2 flat facial ridges, smooth, sometimes rugose, whitish to brownish.

**Chemical Constituents:**

Tannins, Saponins, Steroids. The oil is rich in linoleic acid (about 60%), but contains only 0.1% linolenic acid. One of the major bitterness components of the bitter fruits is the poisonous cucurbitacin B. Elaterase, an active  $\beta$ -glucosidase, has been isolated from the juice of bitter fruits; it is an enzyme for hydrolysis of the bitter principles of the Cucurbitaceae, capable of splitting glucose from tri-glucosides and tetra-glucosides.

**Test for Identity:**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

**Tests for Purity:**

N/A

**Pharmaceutical Preparations:**

N/A

**Uses:**

Antioxidant, antidiabetic, antihypertensive, cardioprotective.

**Storage:**

In a cool dry place.

## **Lavandula angustifolia Mill.**

### **Family name:**

Lamiaceae.

### **Synonyms:**

- (a) *Lavandula vera* DC.
- (b) *Lavandula officinalis* Chaix.
- (c) *Lavandula spica* Loisel.
- (d) *Lavandula vulgaris* Lam.

### **Common names:**

Lavender (E). Lavande (F).

### **African names:**

- (a) Arabic: لافدر حقيق أو الضرم ضيق الأوراق
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Lofinda



### **Brief description of the plant:**

Perennial subligneous branched plant of less than 1 m in height; bark sparkling grey and detachable; elliptical narrow and scented leaves; flowers mauve, in terminal cluster, sweet smelling.

### **Geographical distribution:**

Spontaneous or cultivated in arid or pebbly surface in mediterranean regions of Africa.

### **Part used:**

Flower.

### **Names of drug:**

Flos Lavendulae. Lavender flower.

### **Definition:**

Lavender flower is the dried flowers of *Lavandula officinalis* Chaix. (family, Lamiaceae) Lavender flower contains not more than 2 per cent of foreign organic matter, and yields not less than 0.5 per cent v/w of volatile oil.

### **Description:**

Odour, fragrant, aromatic; taste, aromatic, bitter and somewhat camphoraceous.

**Macroscopical:** Flower, nearly sessile, up to 8 mm long. Calyx, tubular, hairy, greyish-blue to bluish-violet, about 5 mm long, with 10 to 13 ribs, and formed of 5 united sepals; the posterior sepal, large, rounded, while the others, small. Corolla, bilabiate, hairy, dark blue, about 8 mm long; the upper lip, 2-lobed, while the lower lip, 3-lobed. Stamens, 4, epipetalous, didynamous. Ovary, superior, bicarpellary, tetralocular; stigma, bifid.

**Microscopical:** Calyx and corolla bear glandular hairs. with very short unicellular stalk and 4- to 8-celled head of labiate type, and characteristic branching unicellular and multicellular non-glandular hairs with pointed ends and somewhat streaked or warty cuticle. Corolla bears also on the inner surface at the throat characteristic glandular hairs with unicellular, globular head and a bicellular stalk, its basal cell being long and knotted and the other cell, short and cylindrical. Anthers covered with whip-shaped, unicellular, non-glandular hairs; pollen grains, almost rounded, with 6 germ pores.

**Powder:** Grey-blue with fragments of calyx, elongated epidermal cells with wavy anticlinal walls, and multicellular non-glandular covering trichomes. Encapsulated labiate oil glands. Corolla fragments, almost oval and slightly wavy-walled epidermal cells, labiate oil glands and branched covering hairs; unicellular glandular hairs. Pollen grains spherical to ellipsoidal, 24–30 µm in diameter, with six furrows, six germ pores and lines of pits radiating from the poles. Leaf fragments, almost straight-walled epidermal cells, covering branched trichomes and labiate oil glands, glandular hairs with a unicellular stalk and a bicellular head.

**Chemical constituents:**

Volatile oil, containing linalyl acetate and geranyl acetate.

**Test for identity:**

- a) Macroscopical and microscopical examination to ensure compliance with the above descriptions
- b) Carry out thin-layer chromatography as described in volume 2, to confirm the presence of linalyl acetate and linalool.

**Tests for purity:**

Ash, not more than 8 per cent.; Moisture, not more than 10 per cent.

**Assay:**

Carry out the assay as directed in volume 2 under "Determination of volatile oils in drugs", using about 20 g of Lavender flower, accurately weighed.

**Pharmaceutical preparations:**

Aetheroleum Lavendulae.

Gamma Bensene Hexachloride Application.

**Uses:**

In perfumery and cosmetics.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Lawsonia inermis L.**

### **Family name:**

Lythraceae.

### **Synonym:**

*Lawsonia alba* Lam.

### **Common names:**

Henna (E). Henne (F).

### **African names:**

- (a) Arabic: حناء
- (b) Bambara: Jabi, Dabe
- (c) Hausa: Lale, Lallee, Gwarwoo
- (d) Peuhl: Bubure
- (e) Swahili: Mhina
- (f) Yoruba: Laali, Laari

### **Brief description of the plant:**

Shrub of 2 to 4 m high, branched at the base with branches bristling with thorns; leaves opposite elliptical or oblanceolate; inflorescence in densely flowered terminal panicles of small aromatic cream-white flowers; fruit spherical and capsular of 5 mm.



### **Geographical distribution:**

Tropical plant abundant in the sahelian region.

### **Part used:**

Leaves.

### **Name of drug:**

Henna.

### **Definition:**

Henna is the dried leaves of *Lawsonia alba* Lam. containing not less than 1 per cent of lawsone and not more than 2 per cent of foreign organic matter.

### **Description:**

Odour faint and characteristic, taste, astringent and slightly bitter.

**Macroscopical:** The leaves are greenish-brown, oblong or broadly lanceolate, having symmetric base, entire margin and acute to acuminate apex. They measure 2-3 cm in length and 1-2 cm in width. They are shortly petiolate and petiole is concavo-convex and winged. Venation is reticulate pinnate and the lateral veins leave the midrib at an angle of 60°. The leaves are leathery and glabrous.

**Microscopical:** The leaves are isobilateral showing 2-3 rows of palisade cells abutting the upper epidermis and one to two rows abutting the lower side with narrow spongy mesophyll containing idioblast with cluster crystals of calcium oxalate. The upper epidermis consists of polygonal isodiametric cells with straight anticlinal wall showing few anomocytic stomata and the cells are covered with striated cuticle. The cells of the lower epidermis are almost similar to those of the upper side but the stomata are more frequent and the anticlinal walls are slightly wavy. In the midrib region the vascular

strand is surrounded by an arc of pericyclic fibres and the vascular strands are bicollateral. Bands of subepidermal collenchyma are present.

**Powder:** Dark green colour with faint characteristic odour and astringent slightly bitter taste. It shows fragments of upper and lower epidermal cells covered with striated cuticle and shows anomocytic stomata, cluster crystals of calcium oxalate, numerous palisade cells, spiral, annular and reticulate vessels. Fragments of lignified pericyclic fibres with thick walls, narrow lumina and acute apices.

**Chemical constituents:**

Lawsone, mannite, flavonoids, coumarins, naphthalene derivatives, sterols, pentacyclic triterpenes, essential oils and tannins.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) Boil 1 g of powdered Henna with 15 ml of water, filter. The decoction has an orange-brown colour which fades on addition of acid and deepens with alkali.
- (c) Thin-layer-chromatographic examination of an extract of the specimen to confirm the presence of lawsone by co-chromatography.

**Tests for purity:**

- (a) Moisture: Not more than 7.3 per cent.
- (b) Ash: 8.32 per cent.
- (c) Water-soluble extractive: Not less than 11.2 per cent
- (d) Alcohol (70 per cent)-soluble extractive: Not less than 9.52 per cent.

**Assay:**

Macerate 2 g of powdered Henna in saturated solution of sodium carbonate for 24 hours, percolate with the same solution until all the orange colour has been removed. Acidify the sodium carbonate extract to litmus by the addition of small increments of hydrochloric acid, taking care against strong effervescence.

Shake with successive portions of chloroform (about 5 x 20 ml) or until 1 ml of the chloroform extract imparts no colour on shaking with 1 ml of saturated solution of sodium carbonate. Dry the chloroform extract with anhydrous sodium sulphate, filter and adjust to 100 ml (concentrate

if necessary). Apply 0.4 ml to a silica gel G or aluminium oxide G plate as band and develop with ethyl acetate-methanol-SN ammonium hydroxide (60: 15:5). Locate the zone corresponding to lawsone visually and scrape with a thin spatula.

Transfer the powder corresponding to the located lawsone area to a flask and extract with 5 ml of saturated sodium carbonate. Filter the solution, wash the residue with 2 ml of sodium carbonate twice, and adjust the volume to 10 ml.

Measure the developed colour in a colorimeter using filter No.2 (or appropriate filter). The percentage of lawsone is calculated from the standard calibration curve of lawsone or by comparing with a known concentration of authentic lawsone.

Alternatively, estimate the lawsone content as follows:

Transfer 0.4 ml of the above chloroform solution to a test-tube, evaporate by means of boiling water, add 20 ml of saturated solution of sodium carbonate and measure the colour as directed above. The results obtained by the direct method are higher than those of TLC method by 7 per cent.

***Pharmaceutical preparations:***

N/A

***Uses:***

Hair dye. Dye for hands and feet.

***Storage:***

In well-closed containers, in a cool place, protected from light.

## **Lindackeria dentata (Oliv.) Gilg**

### **Family name:**

Flacourtiaceae.

### **Synonyms:**

- (a) *Lindackeria caillei* A. Chev. ex Hutch. & Dalz
- (b) *Oncoba dentata* Oliv.

### **Common names:**

N/A

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ooa-edun, Iyagbo



### **Brief description of the plant:**

Shrub or small tree recognized by its small spiny fruits and its dentate leaves with long petioles. The blade has a ± distinct pair of basal, ascending laterals. Lamina with 8 - 12 pairs of laterals and scalariform venation; stipules/stipule scars may be present. Stem often with spines; slash thin, orange, scented. The spiny fruit looks very similar to that of *Caloncoba echinata* but is smaller and the infructescence is more branched.

### **Geographical Distribution:**

Extends through Cameroons and Congo to A.-E. Sudan and Angola.

### **Part used:**

Seeds, leaves, roots, barks, stem.

### **Name of drug:**

Lindackeria leaf.

### **Definition**

Lindackeria leaf is the dried leaves of *Lindackeria dentata* (Oliv.) Gilg (family, Flacourtiaceae)

### **Description**

**Macroscopical:** This tree rarely reaches more than 10 m in height. Large individuals have a trunk diameter of up to 20 cm. The large triangular leaves with long petioles are not always obviously toothed, despite the Latin name. However, the leaves always have at least some small sharp teeth and each tooth has a veinlet which ends at its tip. The first pair of veins arise at the base of the leaf. The stipules are narrow and pointed and are semi-persistent. The flowers are white with bright yellow anthers on very short filaments. The flowers have a very sweet scent. The most striking aspect to this plant are the bunches of long-spined fruit which are orange when ripe. The slash is rather distinct; it is whitish to pale yellow with orange fibers.

***Chemical constituents:***

Alkaloids, Saponins, hydrocyanic acid. Also a mixture of cyanogenic glucosides epivolkenin and taraktophyllin, 1,4-dihydroxy-2-cyclopentenecarboxamide, and uridine were isolated from. Another cyclopentanoid amide, (1 R,4 S,5 R)-1,4,5-trihydroxy-2-cyclopentenecarboxamide also synthetised,

***Tests for Identity***

- (a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions
- (b) Extract of the total alkaloids to be examined macrochemically by testing with the common alkaloid reagents (Wagner's, Dragendorff's, Mayer's reagents).

***Tests for Purity***

N/A

***Pharmaceutical preparations***

N/A

***Uses:***

Yaws, leprosy, treating fleas and mental problems.

***Storage:***

In a cool dry place.

## **Lippia multiflora Moldenke**

### **Family name:**

Verbenaceae.

### **Synonym:**

*Lippia adoensis* Hochst. p.p.

### **Common names:**

Tea bush; Gambian tea bush; Healer tea, Healer herb, Lippia tea; Bush tea (E). Thé de Gambie (F)

### **African names:**

- (a) Arabic:
- (b) Bambara: Ganéla, Ganéba
- (c) Hausa: Bunsurun fadama or 'Godon kada'
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Efinrin gogoro', 'Efinrin odan' or 'Efinrin Ajase', Efinrin-foromoba, Kanhoun, Efirim-oko,



### **Brief description of the plant:**

*Lippia multiflora* Moldenke is a shrubby plant which grows in the tropical regions of Africa. It is commonly called Savanna tea or Gambia tea. *Lippia multiflora* Moldenke also known as *Lippia adoensis* Hochst is a herbaceous plant of the genus *Lippia*. It belongs to the family Verbenaceae, which is composed of 41 genera with approximately 220 species of herbs, shrubs and small trees. *L. multiflora* is a stout woody, perennial and aromatic shrub mainly distributed throughout tropical Africa, South and Central American countries. It occurs in a wide ecological range throughout West Africa. In undisturbed sites, the plant can grow to a height of 2.7 to 4.0 m bearing large oblong-lanceolate bluish-green leaves. The plant flowers from September to November and fruits in January. It possesses white, sweet-scented flowers stalked on cone-like heads in a terminal panicle nearly 120 mm long.

### **Geographical distribution:**

Common throughout the Region and across Africa to Sudan and Zaire.

### **Part used:**

Leaves.

### **Name of drug:**

Healer herb.

### **Definition:**

Healer herb consists of the fresh or dried leaf of *Lippia multiflora* Moldenke, (family, Verbenaceae).

### **Description:**

**Macroscopical:** Robust woody perennial up to 12 ft. high with large oblong-lanceolate bluish-green leaves; pleasantly aromatic flowers; small, whitish in branched inflorescences; in savanna. Leaves broadly oblong-lanceolate, 5-12cm by 2-4 cm, margin

serrated, acuminate apex, base asymmetric, texture rough; colour olive green; odour aromatic; taste sharp.

**Microscopical:** Both surfaces covered with numerous clothing and glandular trichomes, more abundant on lower surface, clothing trichomes unicellular uniseriate, thin and warty; stomata on both surfaces paracytic; epidermis striated; transverse section shows straight anticlinal epidermal cell walls; mesophyll abounds in collenchymas tissue in midrib region; vascular bundle bicollateral, xylem lignified.

**Powder:** Colour green; numerous clothing trichomes, warty; paracytic stomata; lignified vascular elements in veins and veinlets.

**Chemical constituents:**

Essential oils, lignins, cellulose, tannins, starch, oxalates, flavonoids, saponin glycosides, peptides, caffeine, terpenes and alkaloids.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure it complies with the descriptions given above.
- (b) Gas chromatographical examination of an extract of the leaves to confirm the presence of linalool, camphor and thymol.

**Tests for purity:**

Moisture: Not more than 7.9 per cent.

Ash: 17.8 per cent

Acid-insoluble ash: 27.9 per cent.

Water-soluble extractive: Not less than 1.58 per cent.

Alcohol (70 per cent.)-soluble extractive: Not less than 5.0 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

As a sedative. Make an infusion of 30 grams in 200mls of water. Drink a glassful before going to bed.

**Storage:**

Store in a cool dry place in converted containers.

## **Lobelia inflata L.**

### **Family name:**

Campanulaceae.

### **Synonym:**

- (a) *Lobelia michauxii* Nutt.
- (b) *Lobelia inflata f. albiflora*
- (c) *Lobelia inflata var. simplex*
- (d) *Rapuntium inflatum* (L.) Mill.
- (e) *Rapuntium michauxii* (Nutt.) C.Presl
- (f) *Dortmanna inflata* (L.) Kuntze
- (g) *Lobelia syphilitica* L.

### **Common names:**

Indian tobacco. Wild Tobacco, Bladder-pod Lobelia (E).  
Tabac Indien (F).



### **African names:**

- (a) Arabic: Lobelia
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Annual herbaceous plant downy or hirsute with leafy ramoso stalks; thin denticulate leaves, oval or oboval, rounded and narrowing down to short leaf stalks on the lower part, while the upper leaves are oval and sessile. Flowers in loose clusters with sky-blue corolla with leaf-like bracts; more or less smooth calyx with awl-shaped lobes; swelling and veined capsule.

### **Geographical distribution:**

Grows widely in temperate and subtropical Africa.

### **Part used:**

Aerial parts.

### **Names of drug:**

Herba Lobeliae. Lobelia Herb. Lobelia.

### **Definition:**

Lobelia is the dried aerial parts of *Lobelia inflata* L. (family, Campanulaceae) collected towards the end of the flowering stage.

Lobelia contains not more than 60 per cent of its stems, and not more than 4 per cent of foreign matter, and yields not less than 0.3 per cent of total alkaloids of lobelia, calculated as lobeline.

### **Description:**

Lobelia occurs generally in oblong compressed masses or in more or less broken loose pieces; odour, slight and irritant; taste, at first slight but subsequently burning and acrid.

**Macroscopic:** Stem, branched, angular, irregularly furrowed, with narrow wings, green to yellowish, usually with large purplish patches, hairy on the upper parts and nearly

glabrous on the lower. Leaves, frequently much broken, alternate, pale-green, with scattered stiff hairs especially along the margin and veins on the lower surfaces; lower leaves, oblong,

shortly petiolate, up to 9 cm long; upper leaves, smaller, oval to lanceolate, sessile; margin, irregularly crenate-dentate, each tooth ending in a yellowish-brown swollen apex. Flowers, shortly pedicellate, arranged in long racemes, pale blue, about 7 mm long; calyx, tubular with 5 long linear teeth; corolla, tubular, bilabiate, the posterior lip with 2 erect lobes and cleft nearly to the base, the anterior lip with 3 spreading lobes; stamens, with blue anthers, united above forming a curved tube enclosing the bifid stigma; each anther ends with a tuft of hairs at the apex; ovary, inferior, bilocular, bicarpellary. Fruit, inflated capsule, dehiscing by 2 pores at the summit, ovoid or ellipsoidal, 5 to 8 mm long, light brown, inferior, crowned by the remains of the calyx, with 10-ribbed, membranous pericarp; internally bilocular, containing numerous seeds arranged on an axile placenta. Seeds, minute, oval oblong 0.5 to 0.7 mm long and about 0.3 mm wide, reddish-brown, with fine, elongated, polygonal reticulations.

**Microscopical:** Stem shows epidermis with axially elongated cells, striated cuticle, few stomata and non-glandular hairs, 1200  $\mu$  long; cortex, of rounded parenchyma and well marked endodermis, with rather large cells having distinct caspian strips; pericycle, parenchymatous; phloem, narrow, with brownish anastomosing laticiferous vessels; xylem, as a continuous

cylinder, surrounding a partly hollow pith; wood fibres, numerous, narrow, very long, and lignified; vessels, numerous, pitted, spiral and scalariform remains of pith, formed of lignified, thin-walled parenchyma with simple pits. Leaf, indistinctly dorsiventral; upper epidermal cells, mostly papillosed, polygonal with straight, beaded anticlinal walls and striated cuticle; lower epidermal cells, with wavy walls; stomata, without special subsidiary cells, present on lower epidermis only, non-glandular hairs, present on both surfaces, conical, swollen at the base, unicellular, rarely bicellular, with lignified walls and warty or streaked cuticle, 300 to 600  $\mu$  long and 50 to 60  $\mu$  wide at base; mesophyll shows a single layer of short, rectangular palisade cells and some layers of spongy tissue, containing minute droplets of oil, and in some leaves numerous small crystals are present in many of the cells; each marginal tooth exhibits several wide water-pores on the upper surface and some on the edge; midrib, with peripheral collenchyma in cortex, and laticiferous vessels but no fibres in phloem. Corolla, with papillosed upper epidermis. Hairs, on apex of the anther, narrow, cylindrical 300  $\mu$  long, with rounded tips.

Pollen grains, nearly spherical, smooth or faintly warty and with 3 exit pores. Pericarp, longitudinally traversed by several vascular bundles and showing well developed irregularly shaped lignified idioblast in mesocarp especially beneath the veins and in the dissepiment. Seed-coat shows elongated polygonal, tabular epidermal cells, about 100  $\mu$  long, and 25  $\mu$  wide, with lignified thick, brown anticlinal walls.

**Powder:** Powdered Lobelia is green to dark-green; characterised by numerous fragments of stem, some showing wood fibres, vessels etc.; occasional hairs up to 1200  $\mu$  long; green fragments of leaf, some showing beaded papillosed epidermal cells and conical hairs up to 600  $\mu$  long; few fragments of petals, some showing delicate, strongly

papillosed cells; very few fragments of fibrous layer of the anthers; and pieces of the brown seed coat showing the characteristic thick-walled, lignified epidermal cells; pollen grains, subspherical, smooth or faintly warty, 20 to 30  $\mu$  in diameter; calcium oxalate crystals, absent.

**Chemical constituents:**

Lobelia contains the alkaloids lobeline, lobelidrine, lobelanine and isolobelanine.

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) Extract of the total alkaloids to be examined macrochemically by testing with the common alkaloid reagents (Wagner's, Dragendorff's, Mayer's reagents).
- (c) Thin-layerchromatographical examination of the total alkaloid extract to confirm the presence of Lobeline by co-chromatography

**Test for purity:**

Ash, not more than 13 per cent; acid-insoluble ash, not more than 5 per cent.

**Assay:**

Introduce 10 g of powdered Lobelia, module No. 22, into a 150 ml flask, add 5 ml of alcohol (90 per cent) and 45 ml of ether, and shake well. Set aside for 10 minutes, add 5 ml of dilute solution of ammonium hydroxide, and shake frequently for 1 hour. Transfer the mixture to a small percolator, plugged with cotton-wool, and when the liquid ceases to flow, pack firmly and continue the percolation, until complete extraction of the alkaloids is effected. Filter the ethereal extract through a small dry filter paper into a separator, and wash the receiver and the filter, previously used, with 3 successive portions, each of 5 ml of ether, transferring each to the separator. Add to the mixed ethereal extract and washings 20 ml of N/10 hydrochloric acid, shake well, allow to separate, and run off the lower layer into another separator. Continue the extraction with successive portions, each of 10 ml of N/10 hydrochloric acid, until complete extraction of the alkaloids is effected. Mix the acid liquids, and wash with 10 ml of ether. Run off the lower acid layer into another separator, wash the ether with a few ml of water, and add the water to the acid liquids, rejecting the ether. Make distinctly alkaline with dilute solution of ammonium hydroxide, and repeat the extraction with successive portions, each of 20 ml of ether, until complete extraction of the alkaloids is effected. Wash the combined ethereal extract with about 10 ml of water, reject the water, and dehydrate the ether with about 2 g of anhydrous sodium sulfate. Filter through a dry filter paper into a porcelain dish, wash the sodium sulfate

and the filter with a few ml of ether, adding the washings to the ethereal extract in the dish, and evaporate to dryness. Dissolve the residue in 10 ml of N/10 hydrochloric acid, and titrate with

N/10 sodium hydroxide, using methyl red T.S. as indicator.

Each ml of N/10 hydrochloric acid is equivalent to 0.033722 g of the alkaloids of lobelia, calculated as lobeline.

**Pharmaceutical preparation:**

Tinctura Lobeliae.

**Uses:**

Expectorant, respiratory stimulant.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Mangifera indica L.**

### **Family name:**

Anacardiaceae

### **Synonyms:**

- (a) *Mangifera amba* Forsk.
- (b) *Mangifera domestica* Gaertn.
- (c) *Mangifera gladiata* Boj.
- (d) *Mangifera racemosa* Boj.
- (e) *Mangifera rubra* Boj.

### **Common names:**

Mango; Cuckoo's joy, Mango tree (E)  
Manguier, Margot, Mangue (F)



### **African names**

- (a) Arabic: المانجو الشائع أو المانجو الهندية
- (b) Bambara: Maguru
- (c) Hausa: Mangoro, Mangwaro
- (d) Peuhl: N/A
- (e) Swahili: Muembe, Maembe, Mwembe
- (f) Yoruba: Mangoro

### **Brief description of the plant:**

Tall tree with a dense crown. Leaves glabrous; petiole 2–4.5 cm long; blade oblong or oblong-lanceolate, 10–30 x 3.5–6.5 cm, acute to acuminate at the apex, cuneate at the base, shiny, ± leathery; midrib and lateral nerves prominent. Flowers in 10–60 cm long much-branched pubescent panicles; sepals 2–2.5 mm long, pubescent; petals 3–5 mm long, reflexed, cream becoming pinkish; stamens 1(–2), staminodes 3(–4). Drupe 8–30 x 7–12 cm, green to yellow or red.

### **Geographical distribution:**

Cultivated particularly in southern Somalia and locally naturalized native of southern Asia, now cultivated throughout the tropics

### **Part used:**

Roots, bark, leaves, fruits, seeds, flowers and kernels are used.

### **Name of drug:**

Mango bark.

### **Definition**

Mango bark is the dried stem bark of *Mangifera indica* L. (family, Anacardiaceae). It sometimes comes with leaves.

### **Description:**

**Macroscopical:** The Mango tree is erect, 30 to 100 ft (roughly 10-30 m) high, with a broad, rounded canopy which may, with age, attain 100 to 125 ft (30-38 m) in width, or a more upright, oval, relatively slender crown. The tree is long-lived, some specimens being known to be 300 years old and still fruiting. Nearly evergreen, alternate leaves are borne mainly in rosettes at the tips of the branches and numerous twigs from which they droop like ribbons on slender petioles 1 to 4 in (2.5-10 cm) long. The new leaves, appearing periodically and irregularly on a few branches at a time, are yellowish, pink,

deep-rose or wine-red, becoming dark-green and glossy above, lighter beneath. The midrib is pale and conspicuous and the many horizontal veins distinct. Full-grown leaves may be 4 to 12.5 in (10-32 cm) long and 3/4 to 2 1/8 in (2-5.4 cm) wide. Hundreds and even as many as 3,000 to 4,000 small, yellowish or reddish flowers, 25 to 98 % male, the rest hermaphroditic, are borne in profuse, showy, erect, pyramidal, branched clusters 2 1/2 to 15 1/2 in (6-40 cm) high. There is great variation in the form, size, color and quality of the fruits. They may be nearly round, oval, ovoid-oblong, or somewhat kidney-shaped, often with a break at the apex, and are usually more or less lop-sided. They range from 2 1/2 to 10 in (6.25-25 cm) in length and from a few ounces to 4 to 5 lbs (1.8-2.26 kg). The skin is leathery, waxy, smooth, fairly thick, aromatic and ranges from light-or dark-green to clear yellow, yellow-orange, yellow and reddish-pink, or more or less blushed with bright-or dark-red or purple-red, with fine yellow, greenish or reddish dots, and thin or thick whitish, gray or purplish bloom, when fully ripe. Some have a "turpentine" odor and flavor, while others are richly and pleasantly fragrant. The flesh ranges from pale-yellow to deep-orange. It is essentially peach-like but much more fibrous, extremely juicy, with a flavor range from very sweet to subacid to tart. There is a single, longitudinally ribbed, pale yellowish-white, somewhat woody stone, flattened, oval or kidney-shaped, sometimes rather elongated. Within the stone is the starchy seed, monoembryonic - usually single-sprouting or polyembryonic - usually producing more than one seedling.

#### ***Chemical Constituents***

Mangiferin a xanthone glycoside major bio-active constituent, isomangiferin, tannins & gallic acid derivatives. The bark is reported to contain protocatechic acid, catechin, mangiferin , alanine, glycine,  $\gamma$ -aminobutyric acid, kinic acid, shikimic acid and the tetracyclic triterpenoids cycloart-24-en-3 $\beta$ ,26diol, 3-ketodammar-24 (E)-en-20S,26-diol, C-24 epimers of cycloart-25 en 3 $\beta$ ,24,27-triol and cycloartan-3 $\beta$ ,24,27-triol.

#### ***Test for Identity***

Macroscopical examination of the specimen to ensure compliance with the above descriptions.

#### ***Tests for purity***

N/A

#### ***Pharmaceutical preparations***

N/A

#### ***Uses:***

A decoction or infusion of leaves and bark for diabetes or cough.

#### ***Storage:***

In a cool dry place.

## **Matricaria chamomilla L.**

### **Family name:**

Asteraceae.

### **Synonyms:**

- (a) *Chamomilla chamomilla* (L.) Rydb.
- (b) *Chamomilla recutita* (L.) Rauschert
- (c) *Matricaria recutita* L.
- (d) *Matricaria suaveolens* L.

### **Common names:**

Camomile, German camomile (E).  
Petite camomille. Camomille sauvage (F).

### **African names:**

- (a) Arabic: بابونج
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Herbaceous perennial stem of 10 to 30 cm with downy recumbent stalks that become erect and branch out; pinnatisected leaves; terminal capitulum with golden yellow disk. Fruit very small, smooth and yellowish.

Plant emitting a strong camomile smell.

### **Geographical distribution:**

Spontaneous or cultivated around the Mediterranean region in North Africa.

### **Part used:**

Flower heads.

### **Names of drug:**

Flos Chamomillae. Camomile.

### **Definition:**

Camomile is the dried flower head of *Matricaria chamomilla* L.

German Camomile contains not more than 10 per cent of its stems, and not more than 2 per cent of foreign organic matter, and yields not less than 0.4 per cent v/w of volatile oil.

### **Description:**

Odour, pleasant, aromatic; taste, aromatic, slightly bitter.

**Macroscopical:** Flower-head, hemispherical; about 6 mm in diameter; composed of a few ray florets, and numerous disc florets (distinction from *Matricaria disco idea*, with disc floret only), carried on a receptant surrounded by an involucre. Involucre, green, formed of 2 to 3 rows of lanceolate, glabrous, imbricated bracts with blunt apices and scarious whitish edges.

Ray florets, usually fallen off, 10 to 20 pistilate; corolla, ligulate, white, but darkens on 6 mm long, 2 mm wide, with more or less 3 teeth, ·and traversed by 4 main veins. Disc

florets, yellow, perfect, about 2 mm long without pappus (distinction from *Matricaria chamomilla* L. var. *courrantiana*), usually firmly attached to the receptacle; corolla, tubular with 5 teeth;

stamens, 5 apipetelous syngenous. Receptacle, hollow (distinction from *Chrysanthemum* and *Anthemis* species), hemispherical in the young and conical in the old flower-head, 3 to 10 mm wide, and devoid of paleae.

Fruit, capsule, ovoid, with 3 to 5 longitudinal ribs.

**Microscopical:** Receptacle shows schizogenous secretory ducts, present also in the bracteoles; vascular bundles, with phloem fibres, spiral, annular and reticulate but no pitted vessels, and lignified cells at the bases of the ovaries. Nearly all parts of both florets bear glandular hairs with short, biseriate stalk and enlarged head, formed of several tiers, each of two cells, of compositae type, ovary possesses longitudinal bands of small mucilage cells; stigma, with elongated papillae at the apex pollen grains, spherical or triangular, spiny, with short, numerous spines.

**Powder:** Powdered Camomile is greenish-yellow to yellowish-brown; characterised by numerous spiny pollen grains, up to 20  $\mu$  in diameter; yellow or white fragments of corolla, with polygonal, small, epidermal cells having straight, or slightly wavy walls, sometimes papillosed, and sometimes bearing glandular hairs of compositae type; fragments of the fibrous layer of anther; fragments from ovary, with glandular hairs and rows of small mucilage cells; green fragments of parenchyma of involucre; minute cluster crystals of calcium oxalate, up to 10  $\mu$  in diameter; fragments of lignified parenchyma of the filaments and occasional fragments of vessels.

#### **Chemical constituents:**

Volatile oil (0.8 to 1.0 per cent), the bitter principle anthemic acid and a yellow colouring substance, apigenin, free and in the form of glycoside.

The volatile oil is blue when freshly distilled; it consists chiefly of ester of angelic and tiglic acids, with isobutyl and amyl alcohols; it also contains the alcohol anthemol and a crystalline hydrocarbon anthemene.

#### **Tests for purity:**

- (a) Camomile does not contain numerous pitted vessels (stalk).
- (b) Ash, not more than 14 per cent; acid-insoluble ash, not more than 4 per cent.

#### **Assay:**

Carry out the assay as directed under "Determination of volatile oil in drugs" as described in vol. 2, using about 20 g of powdered camomile, module No. 24, accurately weighed.

#### **Uses:**

Camomile flowers possess aromatic, bitter stomachic properties; the oil is carminative.

#### **Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Maytenus senegalensis (Lam.) Exell**

### **Family name:**

Celastraceae.

### **Synonyms:**

- (a) *Gymnosporia senegalensis* (Lam.) Loes.
- (b) *Celastrus senegalensis* Lam.  
*Maytenus emarginata*
- (c) *Celastrus coriaceus* Guill. & Perr.

### **Common names:**

Confetti Tree, Thorny staff tree, Red Spike  
Thorn (E)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Bakororo, Namijin tsada, Mangaladi, Kyalbuwa, Kunjushewa
- (d) Peuhl: Guiel gotel
- (e) Swahili: N/A
- (f) Yoruba: Shepolohun, Iyepolowun, Isepolohun

### **Brief description of the plant:**

*Maytenus senegalensis* (Lam.) Exell, is a savannah shrub or tree, 5-6m high, spiny, often forming an impenetrable thicket. Flowers white. Fruit an ovoid capsule, yellowish pink or red. Seeds brown and avillate.

### **Geographical distribution:**

Semi desert regions of both Asia and Africa.

### **Part used:**

Leaves, Roots, Stems, Bark.

### **Name of drug:**

Confetti tree leaf.

### **Definition:**

Confetti tree leaf is the dried leaf of *Maytenus senegalensis* (Lam.) Exell (family Celastraceae)

### **Description:**

**Macroscopical:** Shrub or tree, often spreading or straggling, or more rarely a shrublet, (0.3)1-7(9) m. high, unarmed or with green to brown spines up to 24 cm. long, axillary or terminating short axillary branches, glabrous or very rarely with young shoots and leaves puberulous (*var. puberula*), without latex; branches lined or angular or rarely subterete, pale green or rarely reddish-purple or glaucous at first, becoming terete (or rarely remaining angular), grey-brown or dark grey to purplish-brown or whitish, usually without visible lenticels. Leaves fasciculate or not, petiolate; lamina pale to deep green or rarely ± glaucous above, concolorous or often grey-green below, often with pale midrib, rarely mottled when dry, 1-9.5 × 0.4-5 cm., ovate or oblong-ovate or elliptic or circular (on long shoots) to obovate or oblanceolate or linear-oblanceolate or often spatulate (on fasciculate shoots), subacute or obtuse to rounded or emarginate and often shortly apiculate at the apex, with margin acutely or rarely obtusely shallowly and often

irregularly serrulate (especially towards the apex) to entire, cuneate or rarely rounded to angustate at the base, membranous to coriaceous, with lateral nerves and reticulation varying in prominence and density; petiole 1–10 mm. long. Cymes dichasial, solitary and axillary or 1–7 on short axillary shoots, or rarely in axillary panicles, with peduncle 1–30 mm. long or occasionally absent; pedicels 1–7 mm. long, articulated at or near the base; flowers 2–24 or more in each cyme or very rarely solitary, 2–5 mm. in diam., always (?) dioecious, unscented or sometimes apparently malodorous. Sepals 5(6), equal, 0·3–1(1·5) mm., circular to triangular-lanceolate, rounded to acute, with margin ciliolate. Petals 5(6), white, 1–3·5 mm. long, elliptic-oblong to oblong-spathulate, with margin finely ciliolate to entire. Male flowers with stamens 5(6), shorter or longer than petals, with filaments 1–2·5 mm. long, slender, arising below disk; disk relatively narrow, ± concave, 5(6)-lobed; pistillode small, globose, with short style without spreading stigmas. Female flowers smaller than the male flowers, with staminodes 5 shorter than ovary; disk as in the male flowers; ovary 2–3(4)-locular, 0·3–0·5 mm. long, globose, not or scarcely immersed in the disk; style 0·2–0·5 mm. long, shorter than or equalling the ovary, shorter than or exceeding the petals, with 2–3(4) spreading stigmas. Capsule yellow or yellow-tinged-red or red, 3–10 mm. long, obovoid or subpyriform to 3-gonous or subglobose, thinly to thickly coriaceous or slightly succulent, smooth or rugulose. Seeds 1–3(4), reddish-brown, glossy, with a thin yellowish aril obliquely covering the lower 1/2–2/3.

**Chemical constituents:**

Alkaloid amines such as cathine often occur in this botanical family as also, rarely, benzylisoquinolin alkaloids. Celastraceae members are commonly tanniferous, containing anthocyanins, sometimes saponiferous, only rarely cyanogenic and without iridoid compounds. Among the compounds isolated from their species, triterpenes and triterpenoid quinonemethides are of great interest due to their wide range of biological activities. Constituents as  $\beta$ -amyrin, lupane derivatives and quinoid pigments are considered typical of the Celastraceae family members.

**Test for identity:**

Macroscopical examination of the specimen to ensure compliance with the above descriptions.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Cytotoxicity, anti-inflammatory, antiplasmodial, antidiabetic, antitumour.

**Storage:**

In a cool dry place.

## **Melia azedarach L.**

### **Family name:**

Meliaceae.

### **Synonyms:**

- (a) *Melia australis* Sweet
- (b) *Melia candollei* Sw.
- (c) *Melia japonica* G.Don
- (d) *Melia sempervirens* Sw

### **Common names:**

White cedar, Chinaberry tree, Bead-tree, Cape lilac, Syringa Berrytree, Persian lilac, Indian lilac, Texas umbrella, Ceylon cedar, Umbrella tree, Margosa tree (E) Arbre à chapelets, Lilas des Indes, lilas de Perse; lilas du Japon; orgueil des Indes; lilas des Falls (F)



### **African names:**

- (a) Arabic: الزنلخت أو الازدرخت أو التمر الآخرس
- (b) Bambara: N/A
- (c) Hausa: Kurnam nasara, Itcin-kur'di
- (d) Peuhl: N/A
- (e) Swahili: Mmeliya, Mwarubaini nusu
- (f) Yoruba: Eke-oyinbo, Aforo-oyinbo

### **Brief description of the plant:**

White Cedar belongs to the mahogany family Meliaceae. It is a deciduous, shade tree with a rounded crown. The tree can reach height of 12m at maturity and having a width of 6-8m (sometimes up to 30m in its natural environment). The plant has an average lifespan around 20 years.

The flowers are small with pale purple and white petals of five. The flowers are often found growing in clusters. The stamens are clustered into a cylindrical dark purple tube 6-8mm long. The fruit of the White Cedar is round (1.5cm in diameter), fleshy and yellow in colour when mature. Fruits are poisonous to humans and some other mammals but birds are able to eat the fruits and thus disperse the seed through their droppings.

### **Geographical distribution:**

Native of India. Widely planted in tropics and subtropics.

### **Parts used:**

Bark, kernels, leaves.

### **Name of drug:**

Margosa bark. White Cedar.

### **Definition**

Margosa bark is the dried bark of *Melia azedarach* L. (family, Meliaceae)

### **Description:**

**Macroscopical:** *Melia azedarach* is a deciduous tree up to 45 m tall; bole fluted below when old, up to 30-60 (max. 120) cm in diameter, with a spreading crown and sparsely branched limbs. Bark smooth, greenish-brown when young, turning grey and fissured with age. Leaves alternate, 20-40 cm long, bipinnate or occasionally tripinnate. Leaflets

3-11, serrate and with a pungent odour when crushed. Inflorescence a long, axillary panicle up to 20 cm long; flowers showy, fragrant, numerous on slender stalks, white to lilac; sepals 5-lobed, 1 cm long; petals 5-lobed, 0.9 cm long, pubescent; staminal tube deep purple blue, 0.5 cm long, 1 cm across. Fruit a small, yellow drupe, nearly round, about 15 mm in diameter, smooth and becoming a little shrivelled, slightly fleshy. Seed oblongoid, 3.5 mm x 1.6 mm, smooth, brown and surrounded by pulp.

**Chemical constituents:**

Four flavonol 3-O-glycosides including rutin, kaempferol-3-O-robinobioside, kaempferol-3-O-rutinoside and isoquercetin along with a purin nucleoside,  $\hat{I}^2$ -adenosine.; Thirty-one limonoids and one tirucallane-type triterpenoid were isolated from the fruits. Also: hexadecanoic, acetic, and hexanoic acids as well as furfural, 5-hydroxymethylfurfural, 5-methylfurfural, and furfurol.. Meliarachin C and 3-O-deacetyl-4'-demethyl-28-oxosalannin exhibited potent cytotoxic activity against HL60 cells. 12-O-Acetylazedarachin B also from fruit is cytotoxic; Fruit also yielded: tirucallane-type triterpene, 3-alpha-tigloylmelianol and three known tirucallanes, melianone, 21-beta-acetoxy-melianone, and methyl kulonate. From the stem bark: two limonoids, one triterpenoid, one steroid, and one sesquiterpenoid, along with nine known limonoids. The leaf yielded six compounds, namely  $\beta$ -sitosterol,  $\beta$ -amyrin, ursolic acid, benzoic acid, 3,5 dimethoxybenzoic acid and maesol were isolated from the chloroform fraction and found to be antifungal. Also, meliacin obtained from the leaves was antiviral.

**Test for identity:**

Macroscopical examination of the specimen to ensure compliance with descriptions given above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Anti-syphilitic, boils, skin diseases, antihelmintic, immune-modulatory, antiviral

**Storage:**

In a cool dry place.

## **Mentha piperita L. (pro sp.)**

### **Family name:**

Lamiaceae.

### **Synonyms:**

- (a) *Mentha aquatica* var. *crispa* (L.) Benth.
- (b) *Mentha balsamea* Willd
- (c) *Mentha crispa* L.
- (d) *Mentha piperata* Stokes
- (e) *Mentha piperita* (L.) Huds.,

### **Common names:**

- (a) Peppermint, Black peppermint, Crisped mint(E).
- (b) Menthe anglaise, Menthe poivree, Sentebon (F).



### **African names:**

- (a) Arabic: نعنع فلفلي
- (b) Bambara: N/A
- (c) Peuhl: N/A
- (d) Swahili: Pereminde
- (e) Yoruba: Mintii

### **Brief description of the plant:**

Perennial plant of 30 to 90 cm; lanceolate ovate dark green leaves; pink purple flowers grouping on a long terminal spike. The two *Mentha* present only some slight vegetative and morphological differences.

### **Geographical distribution:**

Cosmopolitan, cultivated in gardens, in intertropical Africa.

### **Name of drug:**

Folium Menthae Piperitae, *Mentha piperita* leaf, Peppermint

### **Definition:**

Peppermint is the dried leaves and flowering tops of *Mentha x piperita* L. (family, Lamiaceae).

Peppermint contains not more than 2 per cent of foreign organic matter, and yields not less than 0.5 per cent of volatile oil of peppermint.

### **Description:**

Odour, aromatic, characteristic; taste, aromatic, followed by a cold sensation in the mouth.

**Macroscopical:** Stem, quadrangular; 1 to 3 mm thick; green to dark purple, nearly glabrous, with scattered deflexed hairs. Leaves, crumpled, opposite decussate, frequently detached from stem; petiolate; ovate-lanceolate: 1 to 9 cm long, 0.5 to 5 cm wide; light or dark green with purplish tinge; upper surface, dark green, nearly glabrous; lower surface, light green, hairy especially on the veins; apex, acute; base, acute or rounded; margin, sharply serrate; petiole, 4 to 15 mm long, slightly hairy.

Flowers, small, purple, zygomorphic, occurring in terminal obtuse spikes, consisting of closely arranged verticillasters; bract, oblong-lanceolate, 4 to 7 mm long; calyx, tubular, equally 5-toothed, green to dark purple, hairy; corolla, dark purple, hairy, bilabiate, about 3 mm long; stamens, 4, short, equal; ovary, superior, bicarpellary, tetralocular, with gynobasic style

terminating with a bifid stigma. Fruit, of 4 nutlets, ellipsoidal, about 0.5 mm in diameter, blackish-brown.

**Microscopical:** Stem shows an epidermis with numerous uni- to multicellular, uniseriate, conical, warty, non-glandular hairs, and a few glandular hairs; cortex with collenchyma in the ridges; xylem, consisting of spiral reticulate and pitted vessels, wood fibres and wood parenchyma; pith, parenchymatous, partly hollow. Leaf dorsiventral; epidermal cells, with

wavy anticlinal walls; stomata, very few on the upper, numerous on the lower surface, each surrounded by 2 subsidiary cells with their long axes perpendicular to the ostiole, caryophyllaceous type; hairs, few; glandular hairs, with 1- to 2-celled stalk and globular head of 1 to 8 radiating cells, labiateous type, usually occurring in depressions in the leaf and occasionally showing refractive crystals of menthol; non-glandular hairs, present, especially on the lower surface near the veins, uniseriate, 1- to 8-celled, thin-walled, with warty or streaked cuticle. Pollen grains, spheroidal and smooth.

**Powder:** Powdered Peppermint is green to light olive green; characterized by fragments of epidermis with wavy walls, stomata of caryophyllaceous type; non-glandular and labiateous glandular hairs; fragments of chlorenchyma with vascular tissue; fragments of collenchyma and of pith cells; fragments of vascular tissue consisting of spiral, reticulate or pitted vessels,

wood fibres, and wood parenchyma; smooth spheroidal pollen grains; calcium oxalate crystals, absent.

#### **Chemical constituents:**

Volatile oil containing 50-60 per cent menthol and 9-12 per cent, methyl acetate, methyl isovalerianate and menthone.

#### **Test for identity:**

- Perform the following test with the volatile oil obtained by carrying out the assay for "Determination of volatile oil in drugs" as described in volume 2;
- Mix in a dry test-tube 3 drops of the oil with 5 ml of a mixture containing 1 volume of nitric acid and 300 volumes of glacial acetic acid, and place the tube in a beaker of boiling water; a blue colour develops within 5 minutes. Continue heating; the colour deepens and shows a copper-coloured fluorescence, and finally fades, leaving a golden-yellow solution (distinction from other mint oils).

#### **Test for purity:**

- Not more than 5 per cent. stems, the diameter of which must be not more than 1.5 mm; not more than 8 per cent. leaves showing brown stains due to *Puccinia menthae*; not more than 2 per cent. other foreign matter
- Ash, not more than 12 per cent; acid-insoluble ash, not more than 2 per cent.

#### **Assay:**

Carry out the assay as described in vol. 2 under "Determination of volatile oil in drugs", using about 100 g of powdered Peppermint, module No. 26, accurately weighed.

***Pharmaceutical preparations:***

Aqua Menthae Piperitae Conc.  
Spiritus Menthae Piperitae.  
Concentrated Peppermint Emulsion.  
Compound Magnesium Trisilicate Tablets.  
Compound Sodium Bicarbonate Tablets.

***Uses:***

Flavouring agent, carminative.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Mentha spicata L.**

### **Family name:**

Lamiaceae

### **Synonym:**

*Mentha viridis L.*

### **Common names:**

Common mint. Spearmint. Whorled mint  
(E). Menthe (F).

### **African names:**

نعنع أخضر أو النعناع المدبب: Arabic

Bambara: N/A

Hausa: N/A

Peuhl: N/A

Swahili: N/A

Yoruba: N/A



### **Brief description of the plant:**

Perennial plant of 30 to 90 cm; lanceolate ovate dark green leaves; pink purple flowers grouping on a long terminal spike. The *Mentha viridis L.* and the *M. piperita* present only some slight vegetative and morphological differences.

### **Distribution in Africa:**

Cosmopolitan, cultivated in gardens in intertropical Africa.

### **Part used:**

Herb.

### **Names of drug:**

Herba *Mentha viridis*. Spearmint herb.

### **Definition:**

Spearmint consists of the dried leaves and flowering tops of *Mentha viridis L.* (Lamiaceae)

### **Description:**

The odour is strong and characteristic; the taste is somewhat bitter and pungent.

**Macroscopical:** The stems, quadrangular, purplish in colour, with scattered reflexed hairs; leaves, sessile, elliptical-oblong, acute, sharply serrate about four times as long as their width. Flowers, slender somewhat terminal spikes, bract, oblong-lanceolate 7-10 mm long; calyx, tubular, equally 5-toothed, hairy green to dark green; corolla, dark purple, hairy bilabiate; stamens 4, long; ovary, superior, bicapillary, tetralocular with gynobasic style terminating with a bifid stigma. Fruit, of 4 nutlets, blackish-brown.

**Microscopical:** Stem, shows an epidermis with numerous multicellular uniserial, conical, up to 6-celled non glandular hairs, and few glandular hairs; cortex with collenchyma in the ridges; xylem, consisting of spiral, reticulate and pitted vessels, wood fibres and wood parenchyma; pith, parenchymatous. Leaf, dorsiventral; epidermal cells with wavy anticlinal walls; stomata, very few on the upper, numerous on the lower surface, of the caryophyllaceous type; hairs, few; glandular hairs of 1 to 2-celled stalk

and globular head of 1 to 8 radiating cells showing no crystals of menthol, non-glandular or uniseriate up to 6-celled, pollen grains, spheroidal and smooth.

**Powder:** Powdered spearmint is green to olive green; characterised by fragments of epidermis with wavy walls; stomata of caryophyllaceous type; non-glandular and labiate glandular hairs; fragments of collenchyma and of pith cells; fragments of vascular tissue consisting of spiral, reticulate or pitted vessels, wood fibres and wood parenchyma; smooth spheroidal pollen grains.

**Chemical constituents:**

The drug contains volatile oil. Spearmint resembles peppermint in its properties, but its flavour is less agreeable in medicines. The spearmint oil contains from 45 to 60 per cent of 1-carvone, 6 to 20 per cent of alcohols, 4 to 20 per cent of esters and terpenes, chiefly l-limonene, l-phellandren and l-pinene.

**Test for purity:**

Contains not more than 2 per cent of stems over 3 mm in diameter or other foreign organic matters.

**Assay:**

Carry out the "Determination of the volatile oil content" as described in vol. 2.

**Pharmaceutical preparations:**

Aqua Mentha Viridis Concentrata.

Aqua Mentha Viridis Distillata.

**Uses:**

Spearmint oil is a flavour. It possesses carminative properties. It is used to a considerable extent in the chewing gum industry.

**Storage:**

In well-closed containers, in a place protected from light.

## **Mimosa pudica L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Mimosa hispidula* Kunth
- (b) *Mimosa tetrandra* Humb. & Bonpl. ex Willd.,
- (c) *Mimosa pudica L. var. tetrandra* (Willd.) DC.,
- (d) *Mimosa unijuga* Duch. & Walp.,
- (e) *Mimosa pudica L. var. unijuga* (Duch. & Walp.) Griseb.

### **Common names:**

Sensitive plant, touch-me-not plant, humble plant, shameful plant, Sleeping Grass, Prayer Plant(E); Sensitiva, Sensitive (F)



### **African names:**

- (a) Arabic: نبات ميموسا بوديكا
- (b) Bambara: N/A
- (c) Hausa: Aluro, Dan-kunya
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Patanmo

### **Brief description of the plant:**

Native to Brazil, this short lived evergreen sub shrub is usually treated as an annual. It is grown for its curiosity value- the fern like leaves close up and droop when touched, usually re-opening within minutes. It has prickly stems and small, fluffy, ball shaped pink flowers in summer. It grows to a height of 5 ft and spreads around 3 ft- a perennial plant, it grows to a height of 0.5m with a spread of 0.3m. In some areas this plant is becoming a noxious weed. The stem is erect, slender and branching. The leaves are bipinnate, fern like and pale green- closing when disturbed. The flowers are pale lilac pink, occurring in globose heads and appearing in summer.

### **Geographical distribution:**

The sensitive plant is native to tropical America, and is found as a weed throughout the tropics

### **Part used:**

Leaves, entire plant.

### **Name of drug:**

Prayer plant.

### **Definition:**

Prayer plant is the dried or fresh whole plant of *Mimosa pudica L.* (family, Fabaceae).

### **Description:**

**Macroscopical:** *Mimosa pudica* is an annual or perennial that normally grows to 50-70 cm tall (but can be up to 1 m tall), and often takes the form of a straggling prickly sub-shrub. Its stems have sparse prickles, 2-2.5 mm long, or are sometimes bristly, or can also be almost hairless. The leaves are alternate, bipinnate (twice compound), do not have

prickles and are very sensitive to touch. The rachis (axis of the compound leaf) is 1.5-5.5 cm long, and the pinnae (primary divisions of the compound leaf) are subdigitate (almost finger-like projections). There are 10-26 pairs of leaflets (the smallest segments of the leaf) per pinna, which are 6-15 x 1.2-3 mm and linear-oblong. The flowers are lilac or pink (the colour mainly the stamen filaments) and are held in ovoid, stalked heads of 1-1.3 x 0.6-1 cm. A cluster of 1-5 flower heads is borne in the leaf axil. The calyx is minute, about 0.2 mm long. The corolla is 2-2.3 mm long, and contains four stamens. The pods are 1.8 cm x 3-5 mm, densely bristly, clustered, and have prickles along their margins.

***Chemical constituents:***

Contains the alkaloid mimosine (a hydroxamino acid of aromatic nature), which in large doses is toxic to humans and animals. Ascorbic-acid, crocetin, crocetin-dimethyl-ether, D-glucuronic-acid, D-xylose, linoleic-acid, linolenic-acid, mimosine, mucilage, norepinephrine, oleic-acid, palmitic-acid, sitosterol, stearic-acid.

***Test for identify:***

- a) Macroscopical examination of the specimen to ensure compliance with descriptions given above.
- b) Extract of the total alkaloids give a positive reaction to common alkaloid reagents (Dragendorff's, Wagner's, Meyer's)
- c) Thin-layer chromatographic examination to confirm the presence of mimosine in the total alkaloid extract

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Cancer, lumbago, nephritis, analgesic, wound healing

***Storage:***

In a cool dry place.

## **Mirabilis jalapa L.**

### **Family name:**

Nyctaginaceae

### **Synonyms:**

- (a) *Jalapa congesta* Moench
- (b) *Mirabilis dichotoma*

### **Common names:**

Clavillia, Jalap, Maravilla, Beauty of the night, Marvel of Peru, False jalap, Four o'clock flower, Four o'clock plant, Garden jalap, Jalap plant, Japanese wonder flower, Marvel of the world, pearl of Egypt, Pretty-by-night, Tea time plant, Coat of many colours, Austin Chalk Four-o'clock (E). Belle de nuit.(F)



### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Giyeya
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Tanaposo, Ajeonisu

### **Brief description of the plant:**

Herb up to 1.5 m. tall. Stems glabrescent or pubescent, pubescence often concentrated in longitudinal strips down stem. Leaves ovate, 3.5–13 × 2–8 cm., entire, acuminate, base rounded, truncate or cordate, glabrous to puberulent (particularly along veins above), margins often ciliate, raphides usually conspicuous beneath, superior leaves frequently subsessile, inferior leaves petiolate; petioles up to 4.5 cm. long, pubescent along superior surface. Inflorescences terminal. Pedicels pubescent. Involucre 5–13 mm. long, divided more or less halfway into 5 triangular to ovate, acute to acuminate lobes, glabrescent to pubescent or pilose particularly along margins. Perianth tubular 4–5.5 cm. long, lower portion green, upper portion spreading 2–3 cm. diam., purple, red, yellow, white or variegated. Stamens 5–6, exserted, 2.75–6 cm. long; filaments filiform, united into fleshy cup at base; anthers 1.2–2 mm. long, oblong-ellipsoid. Ovary ellipsoid or ovoid, 1–1.5 mm. long; style 4–6.5 cm. long, filiform; stigma with stalked papillae. Anthocarp ellipsoid to subglobose, 7 – 9 mm. long, ribbed or angled, tuberculate between the ribs (in dried state), hard, black.

### **Geographical distribution:**

Introduced from tropical America, now widely cultivated and naturalised in all tropical regions.

### **Part used:**

Leaves, root, flowers.

### **Name of drug:**

Clavillia.

**Definition:**

Clavillia is the dried resin obtained from *Mirabilis jalapa* L. (family, Nyctaginaceae)

**Description:**

**Macroscopical:** *Mirabilis jalapa* is a long-lived (perennial) herb growing up to 2 metres high, with a tuberous root. Its leaves are egg-shaped in outline with broad end at base (ovate), oblong, or triangular, measuring to 9 cm long.; the leaf tip is acute, base cordate. The leaf stalk (petiole) is 4 cm long.

Flowers of *M. jalapa* occur in groups of 3-7; flower stalks more or less absent; flowers are fragrant and open in the afternoon; flowers are tubular, white, pink or red in colour, up to 6.5 long by 3.5 wide with 5-6 stamens. The fruit is a small, one-seeded capsule (anthocarp).

Native to Peru, four-o-clock or marvel of Peru is a bushy tender perennial that typically grows to 24-36" (less frequently to 48") tall on erect, branching stems. It is an old garden favorite that features fragrant, funnel-shaped, tubular flowers (2" long) with five flaring petal-like lobes. Flowers bloom from early/mid-summer to fall. Flowers come in pink, rose, red, magenta, yellow and white, sometimes with interesting mottling and striping. Different colored flowers often appear on the same plant. Flowers open in the late afternoon (around four o'clock) and stay open only until the following morning. Flowers are attractive to hummingbirds. Ovate dark green leaves (to 4" long) are heart-shaped at the base.

**Chemical constituents:**

Chemical analysis of clavillia shows that it is rich in many active compounds including triterpenes, proteins, flavonoids, alkaloids, and steroids. Of particular interest to researchers is a group of amino acid-based proteins, called mirabilis antiviral proteins (MAPs). These chemicals have shown specific antiviral and antifungal actions. Clavillia's main chemicals include: alanine, alpha-amyrins, arabinose, beta amyrins, betalamic acid, betanin, brassicasterol, beta-sitosterols, 2-carbosyarabinitol, campesterol, daucosterol, d-glucan, dopamine, hexacosan-1-ol, indicaxanthin, isobetanin, 6-methoxyboeravinone C, methylabronisoflavone, mirabilis antiviral proteins, mirabilis peptides, miraxanthins, n-dotricontane, n-hentricontane, n-heptacosane, n-hexacosane, n-nonacosane, n-octacosane, n-pentacosane, n-pentatriacontane, n-tetracosane, n-tetratriacontane, n-triacontane, n-tricosane, n-tritriacontane, oleanolic acid, stigmasterol, tartaric acid, trigonelline, tryptophan, ursolic acid, and vulgaxanthin I.

**Test for identify:**

Macroscopical examination of the specimen to ensure compliance with descriptions given above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antidiabetic, anti-inflammatory, antiallergic, antiasthmatic, antimicrobial, antinociceptive.

**Storage:**

In a cool dry place.

## **Mitragyna inermis (Willd.) Kuntze**

### **Family name:**

Rubiaceae.

### **Synonyms :**

- (a) *Nauclea africana* Willd
- (b) *Adina inermis* (Willd.) Roberty
- (c) *Nauclea africana* Willd.
- (d) *Nauclea africana* var. *luzoniensis* DC.
- (e) *Nauclea inermis* (Willd.) Baill.
- (f) *Nauclea platanocarpa* Hook.f.
- (g) *Platanocarpum africanum* (Willd.) Hook.f.
- (h) *Stephegyne africana* (Willd.) Walp.
- (i) *Uncaria inermis* Willd
- (j) *Cephalanthus africanus* Rchb. ex DC.
- (k) *Mitragyna africana* (Willd.) Korth.



### **Common names:**

African linden, False abura, (E). Pied d'éléphant (F)

### **African names:**

- (a) Arabic: Agbal, Agelal, El bokz.
- (b) Bambara: N/A
- (c) Hausa : Giyayya/Etiyayya; Giyeya
- (d) Peuhl: Koyli
- (e) Swahili: N/A
- (f) Yoruba: Okobo

### **Brief description of the plant:**

The plant is a low branching tree up to 16m, height. Its bole is 60cm diameter, scaly grayish bark and flower head is white. *M. inermis* is grown on damp perennially flooded, sites, swampy savannah, or inland site of coastal mangrove.

### **Geographical distribution:**

Tropical Africa - Senegal to Sudan, south to Zaire.

### **Part used:**

Leaves.

### **Name of drug:**

Mitragyna leaf.

### **Definition:**

Mitragyna leaf is the dried leaf of *Mitragyna inermis* (Willd.) O. Kuntz (family, Rubiaceae).

### **Description:**

**Macroscopical:** Bark is grayish with a fairly smooth surface. Inner bark is pale to dark brown and is fibrous. Odour and taste characteristic.

**Microscopical:** Leaves with straight walled epidermal cells with numerous anisocytic cells. Numerous unicellular and multicellular clothing trichomes. Bark has numerous pitted vessels and cortical fibres.

**Powder:** Numerous starch grains occur, non-lignified pitted vessels, bundles of sclereids, scanty prismatic calcium oxalate crystals, cork cells, non-lignified fibres and unicellular covering trichomes.

**Chemical constituents:**

Steroids, triterpenoids, polyphenols, flavonoids, catecunic tannins, saponins and alkaloids. The alkaloids, speciophylline and uncarine were isolated from the leaves, while glycosides (Inermiside I and II) were isolated from the stem bark.

**Test for identify:**

- (a) Macroscopical and microscopical examination of the specimen to ensure it complies with the above descriptions.
- (b) Microchemical tests for the presence of alkaloids in the extract of the specimen using Dragendorff's and Mayer's reagents.
- (c) Thin-layer chromatographic examination of the extract to confirm the presence of speciophylline and uncarine by co-chromatography.

**Tests for purity:**

Moisture: Not more than 8.9 per cent.

Ash: 2.02 per cent.

Water-soluble extractive: Not less than 7.35 per cent.

Alcohol (70 per cent)-soluble: Not less than 10.3 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

Antimalaria, febrifuge, antispasmodic, cardiotonic, anticholesteremic.. Decoction: 30g leaf per litre of water, boil for 15 minutes, take a cupful three times daily.

**Storage:**

In a cool, dry place.

## **Momordica charantia L.**

### **Family name:**

Cucurbitaceae.

### **Synonyms :**

- (a) *Momordica balsamina* Banco,
- (b) *Momordica chinensis* Spreng.
- (c) *M. elegans* Salisb.
- (d) *M. indica* L.

### **Common names:**

Bitter melon, Bitter gourd, Bitter squash, Balsam apple, African cucumber, Balsam pear (E). Concombre africain, Liane merveille, Margose, Poire de balsam (F)



### **African names:**

- (a) Arabic: القرع المر أو مثل الكمثرى البسمية أو الخيار الكوري
- (b) Bambara: N/A
- (c) Hausa : Garaafunii, Garahuni, Daddagu
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Akara-aje, Ejinrin-weere, Ejinri-aja, Ejinrin-dudu, Awara, Edjini, ìgbólé ajá

### **Brief description of the plant:**

A climbing vine, it is commonly seen growing on walls and shrubs in the tropics. The textured leaves look as though a bite has been taken from them giving the plant its Latin name *Momordica* which means to bite. The orange fruits are soft when ripe and inside black seeds have a red covering.

### **Geographical distribution:**

Found throughout the tropics. Widespread in the warmer parts of the world.

### **Part used:**

Fruit

### **Name of drug:**

Fructus Momordicae

### **Definition:**

Fructus Momordicae consists of the fresh or the dried fruits of *Momordica charantia* L. (family, Cucurbitaceae).

### **Description:**

Odour: characteristic; taste: bitter

**Macroscopical:** This herbaceous, tendril-bearing vine grows to 5 m. It bears simple, alternate leaves 4–12 cm across, with three to seven deeply separated lobes. Each plant bears separate yellow male and female flowers. In the Northern Hemisphere, flowering occurs during June to July and fruiting during September to November.

The fruit has a distinct warty exterior and an oblong shape. It is hollow in cross-section, with a relatively thin layer of flesh surrounding a central seed cavity filled with large, flat seeds and pith. The fruit is most often eaten green, or as it is beginning to turn yellow. At this stage, the fruit's flesh is crunchy and watery in texture, similar to cucumber, chayote

or green bell pepper, but bitter. The skin is tender and edible. Seeds and pith appear white in unripe fruits; they are not intensely bitter and can be removed before cooking.

As the fruit ripens, the flesh (rind) becomes tougher, more bitter, and too distasteful to eat. On the other hand, the pith becomes sweet and intensely red; it can be eaten uncooked in this state, and is a popular ingredient in some Southeast Asian salads.

When the fruit is fully ripe, it turns orange and mushy, and splits into segments which curl back dramatically to expose seeds covered in bright red pulp.

***Chemical constituents:***

Aerial parts -- flavanoids, saponocides, phenols, tannins, alkaloids, steroids, terpenoids-momordicines 1,2,3, quinines.

Fruits -- amino acids alanine, beta alanine, gamma alanine, gamma-amino-butyric acid, glutamic acid, prolin, tryptamine, p-polypeptides, steroids-charantine, alpha-spinasterol, beta-sitosterol, stigmasterol and derivatives, D-galacturonic acid.

Green fruit-saponins-diosgenin, triterpine momordicosides,

Fruit pericarpium: carotinoids abg caratine derivatives lutein, lycopene, Zeaxantine, zeinoxantine. Amino acids found in seeds-alanine, arginine, asparagines, aspartic acid, glutamic acid, glycine, histidine, leucine, leusine, lysine, ornatine, sterine, tyrosine, vicine, a and b momorcrines, momordine, zeatine and zeatine rhibosides, momordicosides A,B,C,D,E.

Monordicine I and II (leaves) Cucurbitane triterpenoids, Stearic acid, oleic acid, linoleic and oleostearic acid (seeds).

***Test for identity:***

- a) Macroscopical examination of the specimen to ensure compliance with the above descriptions
- b) Thin-layer chromatographic examination of the extract of the specimen for the presence of constituents like flavonoids, diosgenin.

***Tests for purity:***

Ash: Not more than 8.5 per cent.

Acid-insoluble ash: Not more than 0.6 per cent.

Water-soluble extractive: Not less than 28 per cent.

Alcohol-soluble extractive: Not less than 6 per cent.

***Pharmaceutical preparations:***

N/A

***Uses:***

Used to treat diabetes, stomach upset, rectal prolapse and hernia.

***Storage:***

In a cool dry place.

## **Morinda geminata DC.**

### **Family name:**

Rubiaceae.

### **Synonyms:**

N/A

### **Common names:**

Brimstone bush, Indian mulberry (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Mâgana
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Much branched small tree with strong quadrangular branches. Leaves widely elliptic, up to 20cm long and 12cm wide, glabrous. Inflorescences globose, terminal or opposite to the leaves, with robust peduncles. Flowers white, tube-like with 5 lobes ovate. Fruits closely united in a globose whitish somewhat succulent infrutescence. The bark of the trunk is roughly and deeply fissured. The wood is yellow.

### **Geographical distribution:**

W. Africa from Senegal to Angola, Zaire, Uganda and Tanzania.

### **Part used:**

Roots, leaves and bark.

### **Name of drug:**

*Morinda geminata* leaf.

### **Definition:**

*Morinda geminata* leaf is the dried or fresh leaves of *Morinda geminata* DC. (family, Rubiaceae)

### **Description:**

A tree to 10 m tall, sometimes multi-stemmed, bark heavily fissured, with crown branches 4-angled; of secondary jungle and scrub. The plant is said to be commonly planted near to houses in Sierra Leone for its general use.

### **Chemical constituents:**

The plant has anthraquinones, triterpenes and sterols.

### **Test for identity:**

Macroscopical examination of the specimen to ensure it complies with the above descriptions.

### **Tests for purity:**

N/A

### **Pharmaceutical preparations:**

N/A

### **Uses:**

Diuretic, hypotensive, laxative, antimicrobial.

*Storage:*

In a cool dry place.

## **Morinda lucida Benth.**

### **Family name:**

Rubiaceae.

### **Synonyms:**

- (a) *Morinda citrifolia* sensu Hiern
- (b) *Morinda lucida* A.Gray

### **Common names:**

Brimstone tree (E) Arbre à soufre (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Oruwo, Eruwo, Owuru, Erigho



### **Brief description of the plant:**

This distinctive tree has light coloured, scaly or fissured bark and dark shiny leaves on the upper surface. The shiny leaves are the origin of the latin name ‘lucida’. Unlike most members of Rubiaceae the stipules fall very early, leaving a clear scar. The ‘fruit’ of this species is actually a compound inflorescence made of several flowers fused together at their base. The result is similar in structure to the fruit of *Myrianthus arboreus*. These fruits are especially appreciated by hornbills. In the axils of the veins and the midrib there are small tufts of hair called ‘domatia’. There are also two species of liana in this genus which occur in the area.

### **Geographical distribution:**

*Morinda lucida* occurs from Senegal to Sudan and southward to Tanzania, Angola and Zambia.

### **Part used:**

Stem bark, leaves.

### **Name of drug:**

Brimstone tree.

### **Definition:**

Brimstone tree consists of the leaf or stem bark of *Morinda lucida* Benth. (family, Rubiaceae).

### **Description:**

**Macroscopical:** Evergreen shrub or small to medium-sized tree up to 18(–25) m tall, with bole and branches often crooked or gnarled; bark smooth to roughly scaly, grey to brown, often with some distinct purple layers. Leaves opposite, simple and entire; stipules ovate or triangular, 1–7 mm long, falling early; petiole up to 1.5 cm long; blade elliptical, 6–18 cm × 2–9 cm, base rounded to cuneate, apex acute to acuminate, shiny above, sometimes finely pubescent when young, later only tufts of hairs in vein axils beneath and some hairs on the midrib. Inflorescence a stalked head 4–7 mm in diameter, 1–3 at the nodes opposite a single leaf; peduncle up to 8 cm long bearing at base a stalked cup-shaped gland. Flowers bisexual, regular, 5-merous, heterostylous, fragrant; calyx cup-shaped, c. 2 mm long, persistent; corolla salver-shaped, c. 1.5 cm long, white or greenish yellow,

lobes ovate-lanceolate, up to 5 mm × 2.5 mm; ovary inferior, 2-celled, style 8–11 mm long with 2 stigma lobes 4–7 mm long; stamens 5, inserted in the corolla throat, with short filaments. Fruit a drupe, several together arranged into an almost globose succulent syncarp 1–2.5 cm in diameter, soft and black when mature; pyrene compressed ovoid, up to 6.5 mm × 4 mm, dark red-brown, very hard, 1-seeded. Seed ellipsoid, c. 3.5 mm × 2 mm × 0.5 mm, yellowish, soft. Outer bark is smooth to roughly scaly, grey to brown. The inner bark is light brown to yellowish. It has an aromatic smell with bitter taste.

**Microscopical:** Thick walled collenchymas cells below the upper epidermis and above the lower epidermis. Acicular crystals in cortical parenchyma cells. Vascular bundle is arc shaped. Straight-walled epidermal cells with numerous anisocytic stomata. Unicellular covering trichomes.

**Powder:** Acicular calcium oxalate crystals as well as raphides with few prismatic crystals. Abundance of stone cells with pits. Numerous cork cells and pitted vessels.

**Chemical constituents:**

From the wood and bark of *Morinda lucida* 18 anthraquinones have been isolated, including the red colorants 1-methylether-alizarin, rubiadin and derivatives, lucidin, soranjidiol, damnacanthal, nordamnacanthal, morindin, munjistin and purpuroxanthin. Two anthraquinols, oruwal and oruwalol, have also been found; these give a yellow colour and possibly are intermediates in the formation of anthraquinones. In addition to anthraquinones, tannins, flavonoids and saponosides have been isolated.

**Test for identity:**

- Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above.
- Microchemical tests for the presence of anthraquinones (Borntrager's test)
- Thin-layer chromatographic examination to establish the presence of Oruwal and oruwalol. Also confirm the presence of lucidin, morindin or any other of its anthraquinone constituents by co-chromatography

**Tests for purity:**

Moisture: 6.35 per cent. (leaves), 6.13 per cent. (stem bark)

Ash: 8.39 per cent (leaves), 5.54 per cent. (stem bark)

Sulphated ash: 12.33 per cent. (leaves), 6.64 per cent. (stem bark)

Water-soluble extractive: Not less than 17.65 per cent. (leaves), 20.89 per cent. (stem bark)

Alcohol (70 per cent.)-soluble extractive: Not less than 15.78 per cent (stem bark)

**Pharmaceutical preparations:**

N/A

**Uses:**

Malaria, stomach upset, jaundice.

30g plant material in 900ml water; simmer until reduced to 600ml. 1 teacup three times daily.

**Storage:**

In a cool and dry place.

## **Moringa oleifera Lamk.**

### **Family name:**

Moringaceae.

### **Synonym:**

- (a) *Moringa pterigosperma* Gaertn.
- (b) *Moringa moringa* (L.) Millsp.

### **Common names:**

Moringa tree, Horseradish tree, Drumstick Tree (E).

Ben aile, Pois quenique, arbre radis du cheval (F).

### **African names:**

- (a) Arabic: البان الزيتونى او الشوع
- (b) Bambara: Nevrede
- (c) Hausa: Samaarin-dangaa, Danga, Zogallagandi, Zingaridende, Bagaaruwar-makka, Barambo, Karaukin zaila, Riimin nasaara, Riimin-tuuraa, Zogalle, Zogallandi
- (d) Peuhl: Nebodey
- (e) Swahili: Mronge, Mzunze, Mlonge, Mrongo
- (f) Yoruba: Ewe-Igbale, Ewe-Ile



### **Brief description of the plant:**

Branchy shrub of 4 to 5 m, with a coarsely lenticellate brownish bark, bipinnate or tripinnate leaves with opposite pinnules; axillary or terminal panicles of white flowers; fruit; angular, linear pods of 20 over 2 cm; spherical seeds of 1 cm with 3 hyaline wings.

### **Geographical distribution:**

Originates from India, cultivated throughout all tropical regions.

### **Part used:**

Seeds.

### **Names of drug:**

Semen Moringae, Moringa seeds.

### **Definition:**

Moringa seeds are the dried ripe seeds of *Moringa oleifera* Lamk. (family, Moringaceae) which contain not less than 45 per cent of fixed oil and not more than 2 per cent of foreign organic matter.

### **Description:**

Odourless and with bland oily taste.

**Macroscopic:** The seeds are white, ovate to elongated ovoid, nearly sac-like shaped, measuring 8-12 mm in length and 5-9 mm in width with almost smooth surface, showing 3 prominent marginal ridges and 3 shallow grooves under each ridge, the hilum and micropyle are situated at the pointed end at the connection of the 3 ridges. The seeds are anatropous, exalbuminous, easily crushed, with thin testa having 3 membranous wings each is 25-30 mm in length and 2-5 mm in width. The embryo is straight with 2 fleshy plano-convex cotyledons 7-10 mm in length and 4-7 mm in width. The radicle is short and conical.

**Microscopical:** Testa shows an epidermis of axially elongated, subrectangular cells. The subepidermal layer is of 12-14 rows of reticulate lignified cells. The cotyledons show an epidermis of small rectangular cells, the ground tissues of thin-walled cells filled with oil globules and aleurone grains free of crystalloids or globoids.

**Powder:** Pale yellowish-white, odourless and with bland oily taste. It shows fragments of reticulate lignified parenchyma, numerous fragments of embryo cells filled with oil globules and aleurone grains, few fragments of the epidermal cells and few spiral and annular vessels.

**Chemical constituents:**

Fixed oil, 45 per cent containing up to 77.5 per cent of oleic acid and 6.5 per cent linoleic acid.

**Test for identity:**

Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.

**Test for purity:**

N/A

**Uses:**

Wound healing, cerebroprotective, haemostatic, antibacterial, anticancer, antiulcer, antioxidant, anti-inflammatory, etc.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Mucuna pruriens (L.) DC.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Carpopogon capitatum* Roxb.
- (b) *Carpopogon capitatus* Roxb.
- (c) *Carpopogon niveum* Roxb.
- (d) *Macranthus cochinchinensis* Lour.
- (e) *Mucuna aterrima* (Piper & Tracy)  
*Holland Mucuna atrocarpa* F.P.  
Metcalf,
- (f) *Mucuna capitata* Wight & Arn.
- (g) *Mucuna deerigiana* (Bort) Merr.,
- (h) *Mucuna hassjoo* (Piper & Tracy) Mansf.
- (i) *Mucuna martinii* H. Lev. & Vaniot
- (j) *Mucuna nivea* (Roxb.) Wight & Arn.
- (k) *Mucuna utilis* Wight
- (l) *Stizolobium aterrimum* Piper & Tracy
- (m) *Stizolobium deerigianum* Bort
- (n) *Stizolobium hassjoo* Piper & Tracy
- (o) *Stizolobium pruriens* (L.) Medik.
- (p) *Stizolobium utile* (Wall. ex Wight) Ditmer
- (q) *Stizolobium niveum* (Roxb.) Kuntze



### **Common names:**

Mucuna, Mauritius bean, Itchy bean, Buffalobean, Velvet bean, Bengal bean, Cowitch, Cowhage, Donkey eye, Hard-fern (E).

### **African names:**

- (a) Arabic: شجر البلسم
- (b) Bambara: N/A
- (c) Hausa: kakara, Abbala, Sansoni, Karara
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Werepe or Yerepe, Igherepe, Esiyi, Ewe-ina, Herepe

### **Brief description of the plant:**

A lofty climber, with more or less pubescent stems; flowers deep purple to almost black; fruit densely clothed with rusty stinging hairs.

### **Geographical distribution:**

Widespread in the tropics.

### **Part used:**

Seeds, Hairs on the pod .

### **Name of the drug:**

Velvet bean.

**Definition:**

Velvet bean is the dried seed of *Mucuna pruriens* (L.) DC. (family, Fabaceae)

**Description:**

**Macroscopical:** Velvet bean (*Mucuna pruriens* (L.) DC. var. *utilis* (Wall. ex Wight) Baker ex Burck) is an annual (sometimes short-lived perennial), vigorous trailing or climbing leguminous vine that can be up to 6-18 m long. Velvet bean has a taproot with numerous, 7-10 m long, lateral roots. The stems are slender and slightly pubescent. The leaves are generally slightly pubescent, alternate, trifoliolate with rhomboid ovate, 5-15 cm long x 3-12 cm broad, leaflets. The inflorescence is a drooping axillary raceme that bears many white to dark purple flowers. After flower pollination, velvet bean produces clusters of 10 to 14 pods. They are stout, curved, 10-12.5 cm long, 2-6 seeded, covered with greyish-white or orange hairs that may cause irritation to the skin. The velvet bean seeds are variable in colour, ranging from black glossy to white or brownish with black mottling. Seeds are oblong ellipsoid, 1.2 to 1.5 cm long, 1 cm broad and 0.5 cm thick.

**Chemical constituents:**

The seeds of velvet bean are high in protein, carbohydrates, lipids, fiber, and minerals. They are also rich in novel alkaloids, saponins, and sterols. The seeds of all mucuna species contain a high concentration of L-dopa; velvet bean seeds contain 7-10% L-dopa. Concentrations of serotonin also have been found in the pod, leaf and fruit. The stinging hairs of the seed pods contain the phytochemical mucunain, which is responsible for causing skin irritation and itch.

The main plant chemicals found in velvet bean include: alkaloids, alkylamines, arachidic acid, behenic acid, betacarboline, beta-sitosterol, bufotenine, cystine, dopamine, fatty acids, flavones, galactose d, gallic acid, genistein, glutamic acid, glutathione, glycine, histidine, hydroxygenistein, 5-hydroxytryptamine, isoleucine, l-dopa, linoleic acid, linolenic acid, lysine, mannose d, methionine, 6-methoxyharman, mucunadine, mucunain, mucunine, myristic acid, niacin, nicotine, oleic acid, palmitic acid, palmitoleic acid, phenylalanine, prurienidine, prurienine, riboflavin, saponins, serine, serotonin, stearic acid, stizolamine, threonine, trypsin, tryptamine, tyrosine, valine, and vernolic acid.

**Tests for identity:**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Neuro-protective, antioxidant, antiparkinsonism, nociceptive, antidiabetic,

**Storage:**

In a cool dry place.

## **Myristica fragrans** Houtt.

### **Family name:**

Myristicaceae.

### **Synonym:**

- (a) *Myristica moschata* Thunb.
- (b) *Myristica officinalis* L. f.

### **Common names:**

Nutmeg tree (E). Muscadier. Noix de muscade (F).

### **African names:**

- (a) Arabic: جوز الطيب
- (b) Basbasa, Josat at-Tib, Josat al-Tib
- (c) Bambara: N/A
- (d) Hausa: N/A
- (e) Peuhl: N/A
- (f) Swahili: Kungu
- (g) Yoruba: Ariwo, Abolakose



### **Brief description of the plant:**

10 to 15 m high tree with oval-lanceolate glossy dark green leaves of 10 to 15 cm long; dioecious insignificant flowers, fleshy fruit opening into two valves; seeds wrapped in an orange coloured aril or mace.

### **Geographical distribution:**

Originates from the spice Islands and cultivated in humid tropical regions.

### **Part used:**

Seeds.

### **Names of drug:**

Semen Myristicae. Nutmeg.

### **Definition:**

Nutmeg is the dried ripe seeds of *Myristica fragrans* Rott. deprived of its arillus and testa, and with or without a thin coat of lime. Nutmeg yields not less than 25 per cent of fat, and not less than 5 per cent of volatile oil.

### **Description:**

Odour, strong aromatic and characteristic; taste, pungent and somewhat bitter.

**Macroscopical:** The kernel of the seed, rounded, ovoid, or broadly oval; 10 to 33 mm mostly 20 to 30 mm long, and 15 to 28 mm mostly 15 to 20 mm broad; externally, light brown, or whitish from dressing of lime, reticulately furrowed, and marked with numerous small dark brown points

and lines; position of hilum, indicated by a slight circular elevation, 3 to 6 mm in diameter somewhat eccentrically placed at the wider end with a depression in the centre, indicating position of micropyle; position of raphe, indicated by a broad shallow groove extending from the circular elevation at one end to a slight dark depression at the opposite end, indicating the position of the chalaza. The kernel is easily cut by a knife; internally, with a waxy luster and thin dark brown perisperm, penetrating into the greyish-brown or yellowish-brown endosperm by numerous enfoldings.

Embryo, small, generally shrunken and lying in an irregular cavity in the endosperm near the micropyle. When pressed by the fingernail, the cut surface exudes oil.

**Microscopical:** Perisperm, with an outer layer of irregular or flattened cells, with brown contents or containing prismatic crystals; remainder mostly of collapse cells with thin brown walls, containing occasional oil cells, and traversed by vascular bundles; the enfoldings show loose parenchyma and numerous large oil cells with brown cell walls, either isolated or in groups.

Endosperm, parenchymatous with occasional dark brown tannin idioblasts; cells, large polyhedral, with thin brown walls, each containing numerous starch granules, simple, rounded up to 20  $\mu$  in diameter, and compound with 2 to 10 components; most of the cells with crystals of fat and often single large aleurone grains with a large crystalloid, about 12 by 20  $\mu$  and small aleurone grains with less regular crystalloids; all frequently embedded in a dark-brown fatty mass. Embryo, of shrivelled and collapsed parenchyma, with short conical unicellular trichomes on plumule.

**Powder:** Powdered Nutmeg is reddish-yellow to reddish-brown; characterized by irregular yellowish fragments of perisperm with large circular or elliptical oil cells, thin-walled parenchyma with brown contents or prismatic crystals and occasional spiral tacheae; fragments of endosperm, with parenchyma containing starch granules, aleurone grains and crystals of fat and occasional brown pigment cells, tannin idioblast, starch granules, simple or compound 2 to 10 components granules or less rounded, polygonal or plano-convex, 3 to 20  $\mu$  in diameter, with distinct, sometimes cleft hilum; aleurone grains with a large rhomboidal crystalloid about 12 to 20  $\mu$ ; sclerenchyma, absent. In chloral hydrate T.S. the powder shows numerous fixed oil globules.

**Chemical constituents:**

7 to 15 per cent volatile oil and solid fat (25 to 35 per cent), also starch.

**Test for identity:**

Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above

**Test for purity:**

Ash, not more than 5 per cent; acid-insoluble ash, not more than 0.5 per cent.

**Assay:**

Introduce about 10 g of moderately fine powdered Nutmeg, accurately weighed, into a small continuous extraction apparatus plugged with cotton-wool, add 50 cc of ether, and when the liquid ceases to flow, pack firmly, and continue the extraction, until complete exhaustion of the drug is effected. Evaporate the ether, dry the residue in a dessicator for 21 hours and weigh. The weight of the residue represents the amount of fat and volatile oil present in the weight of the drug taken. Mix the residue with 10 ml of water and distil the water completely to drive off the volatile oil.

Dry the residue at about 105°C. Cool in a dessicator, and weigh the residue of fat. The loss in weight of the residue after the steam distillation represents the amount of volatile oil present in the weight of the drug taken.

**Pharmaceutical preparation:**

Aromatic chalk powder.

**Uses:**

Nutmeg has stimulant and carminative properties. In large doses, it is toxic, producing convulsions due to myristicin. The expressed and volatile oil is used externally in chronic rheumatism.

***Storage:***

In the entire form, in well-closed containers, in a cool dry place.

## **Ocimum gratissimum L**

### **Family name:**

Lamiaceae.

### **Synonyms:**

- (a) *Ocimum viride* Willd.
- (b) *Ocimum guineense* Schum. et Thonn.
- (c) *Ocimum suave* Willd.
- (d) *Ocimum viridiflorum* Roth

### **Common names:**

Tea bush. Mosquito plant. Fever leaf of Sierra Leone. Fever plant of Sierra Leone, African basil, Wild basil (E).



### **African names:**

- (a) Arabic: حرق سرديب
- (b) Bambara: Sukolan
- (c) Hausa: Dai doya ta gida, Daddoya, Dai Dooyaa ta gidaa, Tagida
- (d) Peuhl: Guguma
- (e) Swahili: N/A
- (f) Yoruba: Efinrin, Efinrin nla

### **Brief description of the plant:**

Leaves are nearly glabrous with rather long petiole. They are lanceolate to oblong lanceolate or ovate in shape, acute at both ends. They can be up to 12 cm long and 6 cm wide. The base is usually cuneate with toothed or distinctly serrated margin. They are markedly punctuate glandular below; racemes spike-like, strict, solitary to several in a panicle about 15 cm long.

### **Geographical distribution:**

Found mainly in gardens, in compounds, old farms near villages, often cultivated in various parts of West Africa.

### **Part used:**

Leaves.

### **Name of drug:**

Ocimum leaves. Folium Ocimi.

### **Definition:**

Ocimum leaves are the fresh young leaves of *Ocimum gratissimum* L. (family, Lamiaceae) containing not more than 2% of stem.

### **Description:**

Odour, thyme-like, pungent, characteristic. Taste, pungent, aromatic.

**Macroscopical:** Leaves of *O. gratissimum* are about 6-12 cm long and 3 cm broad. They vary from ovate to obovate in shape with cuneate base; while beneath it is subglabrous but gland pitted and slightly pubescent on the nerves. The calyx is about 6 mm long in the fruit. The whorls are only continuous in the flowers and are interrupted in fruit. The pedicels are pubescent, with 2 lipped calyx, upper lip broadly ovate and mucronate.

The lower lip is usually oblong with 2 teeth, with a continuous or more or less strongly curved arc often with incurved ends to a closed ring of bundles.

**Microscopical:** The midrib and transverse section of *O. gratissimum* leaf show a bifacial structure and characteristic subepidermal masses of collenchyma on both surfaces.

The xylem takes the form of a strongly curved arc. Stomata of diacytic type are present on both surfaces though more common on the lower epidermis.

The hairs are most numerous in young leaves particularly in the midribs and veins. They are uniseriate and 3 to 8 cells long, slightly curved with thin warty walls.

Palisade ratio is 4.25-5-89-7.5.

Stomatal index is 12.5 to 28.7 (Upper epidermis).

Stomatal index is 18.2 to 28.5 (Lower epidermis).

Stomatal number is 100 to 184 to 300 (Upper epidermis).

Vein-islet number is 300 to 317 to 400 (Lower epidermis).

Veinlet termination number is 10.0 to 14.5.

**Powder:** Colour green; taste aromatic and spicy. Wavy epidermal cell walls; lignified elements of veins and veinlets; starch grains; oil globules; multicellular uniseriate clothing trichomes; warty uniseriate and fairly curved, and some with collapsed cells, small groups of fragmented epidermal paenchymatous cells and collenchymas tissue; diacytic stomata; fragmented xylem vessels members and oil droplets are present.

**Chemical constituents:**

Volatile oil (3% v/w) and non-phlobatannin. Thymol and/or Eugenol (up to 75 per cent of oil) and other terpenes.

**Tests for identity:**

- a) Macroscopic and microscopic examination of the specimen to ensure compliance with the descriptions given above.
- b) Thin-layer chromatographic examination of the extract to show the presence of eugenol or thymol.

**Test for purity:**

Total ash, not more than 15.5 per cent.

Acid-insoluble ash, not more than 3.4 per cent.

Water-soluble ash, not less than 4.0 per cent.

Water-soluble extractive, not less than 15.0 per cent (Coarse powder).

Alcohol-soluble extractive-not less than 10.0 per cent (Moderately fine powder).

**Assay:**

Perform the assay for volatile oil content as described in vol. 2.

**Uses:**

As antibacterial agent and as a spice; for diarrhoea.

**Storage:**

Store the oil in airtight containers, in a cool place, protected from light.

The leaves are to be used fresh.

## **Papaver somniferum L.**

### **Family name:**

Papaveraceae.

### **Synonyms:**

- (a) *Papaver hortense* Huss.
- (b) *Papaver officinale* Gmel.

### **Common names:**

Poppy (E). Pavot, Eillette (F).

### **African names:**

- (a) Arabic: خشخاش الأفيون أو الخشخاش المنوم
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Kasumba
- (f) Yoruba: N/A



### **Brief description of the plant:**

Annual plant of 0.3 to 1.5 m high; 'branchy and leafy stalks; smooth stalks and sepals; leaves: caulin, amplexical and glaucous; very large purplish red flowers; fruit: large capsule without opening.

### **Geographical distribution:**

Cultivated in the flat spaces of the Mediterranean.

### **Part used:**

Dried latex.

### **Names of drug:**

Opium. Opium Bert or Raw Opium.

### **Definition:**

Opium is the dried latex obtained by incision from the fully grown but unripe capsule of *Papaver somniferum* L. (family, Papaveraceae) and its varieties.

Opium yields not less than 10 per cent of morphine, calculated as anhydrous morphine.

### **Description:**

Opium occurs in more or less rounded, or cubical pieces, or somewhat flattened or brick-shaped masses, usually about 8 to 15 cm in diameter varying in weight, but commonly weighing between 250 and 1000 g sometimes wrapped in tissue red paper or covered with poppy leaves or

rumex fruits; externally, dark brown to chocolate brown, sometimes with fragments of poppy leaves and with rumex fruits adhering to the masses; more or less plastic, when fresh, becoming hard and tough, or occasionally brittle on keeping; internally, dark brown, coarsely granular or nearly smooth, frequently interspersed with lighter areas, somewhat lustrous; odour, strong, characteristic, and narcotic; taste, characteristic, and very bitter.

### **Chemical constituents:**

Alkaloids (morphine, codeine, narcotine, narciene, papaverine, thebaine, protopine, laudanine, codamine, cryptopine, grosopine, lanthopine, laudanine, laudanidine, deuteropine, meconine, meconidine, pseudornorphine, etc., in combination with meconic

or sulfuric acid, free meconic acid, glucose, mucilage, pectin, wax, fatty matter, meconin, odoriferous substances and colouring matter.

**Tests for identity:**

(a) Exhaust about 1 g of Opium with water, and examine the insoluble residue microscopically; it shows more or less granular or irregular brown to yellow fragments of the outer epidermis of the poppy capsules, with thick-walled, dotted, polygonal or isodiametric elongated epidermal cells and a few large stomata of ranunculaceous type; rarely collenchymatous hypodermal cells; a few fragments of spiral or pitted vessels, fragments of pitted fibres of the capsule wall; a few fragments of the tissues of poppy leaves, with thin-walled polygonal cells of the upper epidermis having no stomata, and with slightly wavy-walled cells of the lower epidermis having numerous large stomata of ranunculaceous type; fragments of mesophyll, very rarely spiral vessels, tracheids; round starch granules, 2 to 12  $\mu$  in diameter; pollen grains, 16 to 40 $\mu$  in diameter, and occasionally fragments of rumex fruits.

(b) Extract about 0.1 g of Opium by warming with 5 ml of water, filter and add to the filtrate a few drops of ferric chloride T.S.; a deep purplish colour is produced which is not destroyed by adding a few drops of dilute hydrochloric acid (distinction from acetates and formates), or by adding mercuric chloride T.S. (distinction from thiocyanates).

(c) Shake about 0.2 g of powdered Opium with 5 ml of chloroform and a few drops of dilute solution of ammonium hydroxide for 10 minutes, and filter.

Allow the chloroform to evaporate spontaneously in a watch-glass; a white-grey crystalline residue is left. Add to the residue the mixture of 1 drop of solution of formaldehyde and 5 drops of sulfuric acid; an intense crimson colour is produced.

**Assay:**

Triturate about 5 g of Opium, accurately weighed, in a mortar with 10 ml of water, accurately measured, until a perfectly uniform mixture is produced. Add 2 g of calcium hydroxide, mix thoroughly, and triturate carefully with 40 ml of water, accurately measured, for half an hour, taking care to prevent evaporation of water. Filter slowly through a coarse sintered-glass suction filter. Transfer 26 ml of the filtrate, accurately measured, representing half the quantity of the Opium to be assayed, to a 50 ml conical flask, add 2.5 ml of alcohol (90 per cent), and 12.5 ml of ether, stopper the flask, shake, add 1 g of ammonium chloride and shake vigorously for 5 minutes, then frequently for half an hour. Allow the mixture to stand overnight in the stoppered flask. Bring the deposited morphine into suspension by vigorous shaking, and pour out the contents of the flask as completely as possible into a fine sintered-glass suction filter, taking care not to wet the upper portion of the filter. Filter off the liquid completely by the application of slight suction. Wash the flask with 3 ml of ether, pour this into the fine sintered-glass suction filter, and filter without applying suction. Incline the filter, turn round so as to rinse the filter, and suck the liquid completely through. Repeat the rinsing of the flask and filter with successive portions, each of 3 ml of a saturated aqueous solution of morphine, until the filtrate is free from chlorides. Dry the flask, in which some traces of morphine may be left, and the glass-suction filter which contains most of the morphine, at about 105°C for half an hour. Add to the flask 10 ml of warm neutralised alcohol to dissolve the last adhering morphine crystals, then pour the warm solution into

the fine sintered-glass suction filter without applying any suction. Dissolve the main mass of morphine on the filter by stirring, and then apply suction. Wash the flask and filter repeatedly with 2 to 3 successive portions, each of 10 ml of warm methyl alcohol R., until no more morphine remains in the flask, and filter.

The filtrate must be absolutely clear. If any morphine crystallises out, it must be brought into solution by gently warming the mixture. Add 10 drops of methyl red T.S., and titrate with *N/10* sulfuric acid, until a faint orange colour is produced.

Then add 120 ml of freshly boiled and cooled water to the titrated liquid, and complete the titrations until the liquid begins to turn red. Each ml of *N/10* sulfuric acid is equivalent to 0.02853 g of C<sub>17</sub>H<sub>19</sub>O<sub>3</sub>N.

To the amount indicated by the titration add 0.02853 g in order to correct for loss of morphine due to its solubility.

To 5 ml of the titrated liquid, add a few drops of potassium-ferricyanide T.S. containing 1 drop of ferric chloride T.S. per *ml*; an immediate blue-green colour is produced.

***Pharmaceutical preparations:***

Extractum Opii Siccum.

Pulvis Opii Standardizata.

Tinctura Opii.

Tinctura Opii Benzoica.

Aromatic Chalk with Opium Mixture (Mistura Cretae Aromatica cum Opio).

Aromatic Chalk with Opium Powder (Pulvis Cretae Aromaticus cum Opio).

Camphorated Opium Tincture (paregoric).

Concentrated Camphorated Opium Tincture (Liquor Opii Camphoratus Concentratus).

Prepared Opium (Opium pulveratum).

Opiate Squill Linctus.

Opiate Squill Pastilles.

***Uses:***

Analgesic, hypnotic, narcotic.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Pauridiantha callicarpoides (Hiern) Bremek.**

### **Family name:**

Rubiaceae.

### **Synonym:**

*Urophyllum callicarpoides* Hiern.

### **Common names:**

N/A

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

N/A

### **Geographical distribution:**

Cameroon to Uganda.

### **Part used:**

Root bark.

### **Name of drug:**

Pauridiantha root.

### **Definition:**

Pauridiantha root bark is the dried root bark of *Pauridiantha callicarpoides* (Hiern) Bremek (family, Rubiaceae).

### **Description:**

**Macroscopical:** Shrub or small tree 4–15 m. tall, the branches concentrated towards the apex of the main stem; youngest parts of shoots hairy, very soon glabrous or in Zaire material persistently pubescent. Leaf-blades narrowly oblong or obovate-oblong, 15–40 cm. long, 3.7–12 cm. wide, acuminate at the apex, cuneate to shallowly emarginate at the base, sometimes bullate, at first shortly pubescent above and beneath particularly on the venation, at length practically glabrous save for a few hairs on the midnerve particularly above or in Zaire material often scabrid yellowish pubescent to densely velvety all over; lateral nerves ± 15–30 on each side; petioles 0.4–1.3 cm. long; stipules ovate-triangular, 1.1–2.3 cm. long, 0.9–1.9 cm. wide, glabrous to pubescent outside, deciduous, the scar hairy within. Inflorescences axillary, often trichotomous from the extreme base, peduncles or apparent peduncles 0.5–2.5 cm. long, the bracts borne towards the apex, 2–6 mm. long, 1–1.5 mm. wide; secondary peduncles 5 mm. long; pedicels 1–5 mm. long; all parts of inflorescence rather sparsely to very densely yellowish pubescent. Calyx hemispherical, the tube 1–1.5 mm. long, the limb 1.1–1.6 mm. long, glabrous or pubescent at the base, the lobes no more than slight undulations on the limb edge. Buds grooved and ribbed when dry. Corolla glabrous outside, whitish or pale green with blue hairs in the throat; tube 1.6–3.2 mm. long; lobes ovate-triangular, 2.2–3 mm. long, 1.3–1.7 mm. wide. Stamens almost as long as the lobes in short-styled flowers, just exserted

in long-styled flowers. Disc subglobose, pubescent to tomentose, the central stigma-pit surrounded by 10 small pits visible only when hairs have worn off. Style densely hairy, 0.8–1.7 mm. long in short-styled flowers, 2–6 mm. long in long-styled flowers; stigma 0.7–1.25 mm. long. Berries green, subglobose, ± 6 mm. in diameter. Seeds dark brown, ovoid, 0.8–1 mm. long, deeply wrinkled and pitted.

***Chemical constituents :***

Root bark alkaloids: (Pyridine Harman alkaloids) Harman, Pauridianthine, Pauridianthinine, Pauridiantholinol

***Test for identity:***

- (a) Macroscopical examination of the specimen and its source to ensure compliance with the detail descriptions given above.
- (b) Make an extract of the total alkaloids and shake with dilute acid. Treat the acidulated fraction with Daragendorff's, Wagner's or Mayer's reagents. Precipitates are produced in each case
- (c) Examine the total alkaloid extract chromatographically to confirm the presence of Harmane, Pauridianine and Pauridianthinine by co-chromatography

***Test for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Anti-osteoporotic , Molluscicidal, antioxidant, cytotoxicity,

***Storage:***

In a cool dry place.

## **Pericopsis angolensis (Baker) Meeuwen.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Afrormosia angolensis* (Baker) De Wild
- (b) *Pericopsis angolensis* var. *subtomentosa* (De Wild.) Meeuwen.
- (c) *Pericopsis schliebenii* (Harms) Meeuwen.
- (d) *Afrormosia angolensis* var. *subtomentosa* (De Wild.) Louis.
- (e) *Afrormosia angolensis* var. *brasseuriana* (De Wild.) Louis.
- (f) *Afrormosia schliebenii* Harms.

### **Common names:**

Afrormosia, East African afrormosia (E).

### **African names:**

Arabic: N/A

Bambara: N/A

Hausa: Bafini, Barkin-makarfo, Kariye gatari, Bajini.

Peuhl: N/A

Swahili: N/A

Yoruba: N/A

### **Brief description of the plant:**

Medium to large tree. *Bark smooth, pale grey to whitish*, with large irregularly shaped thin pieces peeling off the lower trunk. Leaves alternate, imparipinnate with 8 to 20 alternate leaflets and a terminal leaflet. Flowers in terminal branched inflorescences, pale pink to purple with a darker centre and veining, covered with golden-brown hairs on the calyx. Fruit a flattened pod, pale brown with narrow wings along the margins.

### **Geographical distribution:**

Central African Republic, Tanzania, Zaire, Zimbabwe, DRC, Angola, Zambia, Malawi and Mozambique.

### **Part used:**

Wood.

### **Name of drug:**

Afromosia wood.

### **Definition:**

Afrormosia wood is the dried wood of the trunk and branches of *Afrormosia angolensis* (Baker) De Wild. (family, Fabaceae) known as East African Afrormosia, or of *Pericopsis angolensis* (Baker) Meeuwen. (family, Fabaceae).

It contains not more than 2 per cent of foreign organic matter.

### **Description:**

The colour of this timber can be quite wide ranging and covers from Golden to Dark Brown. The timber itself is considered to be very durable and has often been used as a substitute for Teak.



**Macroscopical:** Medium to large tree. *Bark smooth, pale grey to whitish*, with large irregularly shaped thin pieces peeling off the lower trunk. Leaves alternate, imparipinnate with 8 to 20 alternate leaflets and a terminal leaflet. Flowers in terminal branched inflorescences, pale pink to purple with a darker centre and veining, covered with golden-brown hairs on the calyx. Fruit a flattened pod, pale brown with narrow wings along the margins.

**Chemical constituents:**

N/A

**Test for identity:**

Macroscopical examination of the specimen, and its source, to ensure compliance with the descriptions given above

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Afromosia wood can be used as an alternative to teak where a strong, stable and durable wood is required. It is used for Furniture. Used in medicine to chase away witchcraft (Tanzania).

**Storage:**

In well closed containers away from light.

## **Pericopsis laxiflora (Benth. ex Baker) Meeuwen**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Afrormosia laxiflora* (Baker) Harms
- (b) *Pericopsis laxiflora* (Baker) Meeuwen

### **Common names:**

Kulkuli, Satin wood; False dalbergia; Afrormosia (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Makarfo, Bafini, Barkin-makarfo, Kariye gatari, Karya gatari, Bajini, Don zakara.
- (d) Peuhl: Koukouli.
- (e) Swahili: N/A
- (f) Yoruba: Shedun, Sedun.



### **Brief description of the plant:**

A small medium sized tree 2-12m tall, reaching to 25cm of diameter, bearing crooked, drooping branches forming a disheveled crown, one of the commonest trees of the savannah woodland and fringing forest and also in dry dense forest.

### **Geographical distribution:**

West Central Africa.

### **Part used:**

Roots, seed, leaves and wood.

### **Name of drug:**

Kulkuli bark.

### **Definition:**

Kulkuli bark is the dried stem bark of *Afrormosia laxiflora* (Baker) Harms also known as *Pericopsis laxiflora* (Baker) Meeuwen (family, Fabaceae).

### **Description:**

N/A

### **Chemical constituents:**

$\alpha$ -methyldeoxybenzoins angolensin, 2-O-methyl-angolensin and the pterocarpan maackiain (demethylpterocarpin) have been isolated by bioactivity-guided fractionation (brine shrimp test) from the bark of *Pericopsis* (*Afrormosia*) *laxiflora*. The presence of compounds such as polyphenols, flavonoids, tannins, cardiac glycosides, alkaloids and sterols and polyterpenes have been demonstrated.

### **Tests for identity:**

- a) Macroscopical examination of the specimen and its source to ensure compliance with the descriptions given above
- b) Macrochemical test with an alkaloidal extract of the bark gives a positive reaction with Wagner's, Dragendorff's and Mayer's reagents.

### **Tests for purity:**

Water-soluble extractive: 16.4 per cent (dried leaves)

***Pharmaceutical preparations:***

N/A

***Uses:***

Headache, body pains, agitation and anxiety, rat ovulation blocked through effect of stem bark on pituitary gland.

***Storage:***

In a cool dry place.

## **Peumus boldus Molina**

### **Family name:**

Monimiaceae.

### **Synonyms:**

- (a) *Laurus boldus* Molina
- (b) *Peumus fragrans*
- (c) *Ruizia fragrans* Ruiz & Pav.

### **Common names:**

Boldo leaves, Boldu, Boldus, Boldoa, Boldina, Baldina, Molina. Chilean bold-tree

### **African names**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

A Chilean tree now introduced to the Ivory Coast and to Guinea . The wood is hard and the bark yields a dye. The leaves are aromatic with a fresh taste.

### **Geographical distribution:**

Boldo is found in the Andean regions of Chile, Argentina, Ecuador, Bolivia and Peru, and also is indigenous to parts of Morocco. It is cultivated in Italy, Brazil, and North Africa to meet the demand for its medicinal leaves in European and Canadian markets where it is widely used.

### **Part used:**

Dry leaves, fruits, bark, wood

### **Name of drug:**

Boldo leaf.

### **Definition:**

Boldo leaf is the dried leaves of *Peumus boldus* Molina (family, Monimiaceae).

### **Description:**

**Macroscopic:** Boldo is a slow-growing, shrubby evergreen tree that grows 6-8 m in height and produces small, berrylike fruit. The plant's scented flowers are either male or female, and only one sex is found on any one plant; as such, male and female plants must be grown together for the plants to reproduce. Its leaves have an aromatic fragrance and it grows white or yellow corolla flowers. Suitable for: light (sandy) and medium (loamy) soils and prefers well-drained soil. Suitable pH: acid and neutral soils. It can grow in semi-shade (light woodland) or no shade. It prefers dry or moist soil. An evergreen shrub growing in the fields of the Andes in Chile, where its yellowish-green fruit is eaten, its bark used for tanning, and its wood utilized in charcoalmaking.

Leaves are opposite, sessile, about 2 inches long entire, and colour when dried red brown, coriaceous, prominent midrib, a number of small glands on their surface. Odour peculiar, when crushed very strongly disagreeable, not unlike oil of *Chenopodium* (wormseed).

The leaves contain about 2 per cent on distillation of an aromatic volatile oil, chemically related to oil of Chenopodium

***Chemical constituents:***

Boldo leaves contain about 2 per cent of volatile oil, in which, in addition to terpenes, terpineol has been detected. They also contain the bitter alkaloid Boldine and the glucoside Boldin or Boldoglucin.

***Test for identity***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Test for purity***

N/A

***Pharmaceutical preparations:***

Tincture of Boldo, B.P.C.,  
Boldo Fluid extract,

***Uses:***

Antifungal, antioxidant, cytotoxicity, anthelmintic, anti-inflammatory, hepatoprotective.

***Storage***

In a cool dry place.

## **Phaseolus vulgaris L.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Phaseolus compressus* DC.
- (b) *Phaseolus communis* Pritzl.
- (c) *Phaseolus nanus* L. & Jusl.
- (d) *Phaseolus vulgaris* L. var. *humilis* Alef.

### **Common names:**

Bean, Dwarf Bean, Kidney Bean (E). Haricot (F).

### **African names:**

- (a) Arabic: فاصولياء
- (b) Bambara: N/A
- (c) Hausa: Wake.
- (d) Peuhl: N/A
- (e) Swahili: Haragwe, Haragi.
- (f) Yoruba: Awuje.



### **Brief description of the plant:**

Annual herbaceous plant of short stems, erect or recumbent climbing 5 to 3 m; leaf opposite, oval pinnate and acuminate; whitish flowers with yellow or purple spots; pod containing seeds of various colours.

### **Geographical distribution:**

Grown everywhere.

### **Part used:**

The dried ripe seeds.

### **Name of drug:**

Bean

### **Definition:**

Bean is the dried ripe seeds of *Phaseolus vulgaris* L. (family, Fabaceae)

### **Description:**

The seeds are almost odourless and with a starchy characteristic taste.

**Macroscopical:** The seeds are flattened, subcylindrical, ovate to reniform, glassy, smooth or slightly wrinkled, white to yellowish white, being 10 to 19 mm long, 5 to 9 mm wide and 4 to 6 mm thick. It has a convex dorsal side and more or less straight ventral side; hilum large oval scar at the middle of the ventral side; micropyle, small opening at the top of the ventral side; raphe, runs from the hilum to the distal end of the seed on the ventral side as slightly raised line; seed, anatropous, when dry is hard to break; embryo, filling the cavity of the seed and is exalbuminous.

**Microscopical:** Testa consists of three regions; palisade layer with thick cuticle, radially elongated, having unequally thick, highly refractive, cellulosic, non-lignified walls with bar-like thickening, conical lumen which is narrow at the outer extremity and wide or irregular at the base. The cells measure 13-21  $\mu$  long, 9-17  $\mu$  wide and 21-83  $\mu$  height; bearer layer, single, radially elongated, thick-walled, narrow discontinuous lumen, the cells measure 13-17  $\mu$  in length, 9-13  $\mu$  in width and 21-43  $\mu$  in height; nutritive layer of several rows of branched irregular parenchyma. Embryo, of two cotyledons showing thin

epidermal cells and moderately thick-walled mesophyll cells containing rounded or oval starch granules with fissured central hilae. Numerous aleurone grains are present.

**Powder:** Powdered seed is faintly yellowish white, odourless and with starchy characteristic taste, it shows fragments of palisade layer with polygonal isodiametric cells with bar-like thickening, fragments of the bearer layer with polygonal thick walls and narrow uneven lamina. Numerous parenchymatous cells of the embryo containing starch granules with fissured hilae and aleurone grains.

**Chemical constituents:**

Protein, starch and a cyanogenetic glycoside: phaseolinin.

**Test for identity**

Macroscopical and microscopical examination of the specimen to ensure compliance with the above given descriptions

**Test for purity:**

N/A

**Uses:**

Nutritive.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Physostigma venenosum** Balfour

### **Family name:**

Fabaceae.

### **Synonym:**

*Physostigma venosum* Balf.

### **Common names:**

- (a) Calabar bean, African ordeal bean (E).
- (b) Feve de Calabar (F).



### **African names:**

- (a) Arabic: Shagar lubiyah Kalabar
- (b) Bambara: N/A
- (c) Hausa: Esere, Djirou
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Iso

### **Brief description of the plant:**

Subligneous creeper with smooth climbing stalks; trifoliolate leaves of 6 x 10 cm; axillary racemes; pink or purple flowers; oblong pods of 15 x 4 cm with few ellipsoidal seeds of 3 cm long.

### **Geographical distribution:**

Dense forest areas of Guinea and the Congo.

### **Part used:**

Seeds.

### **Names of drug:**

Semen physostigma. Physostigma seed. Graines de Calabar.

### **Definition:**

Physostigma seed, is the dried ripe seeds of *Physostigma venenosum* Balfour. (family, Fabaceae).

It contains not more than 2 per cent of foreign organic matter and not less than 0.5 per cent of total alkaloids.

### **Description:**

No characteristic odour or taste.

**Macroscopical:** Calabar beans, somewhat flattened, reniform shape, 15-30 cm long, 10-15 mm wide, up to 15 mm thick. Seeds extremely hard, dark brown, testa smooth in the neighbourhood of the grooved hilum which runs the whole length of the convex side and round one end; where somewhat wrinkled, on other side the groove well marked ridge, in the groove the greyish, papery remains of the funiculus.

### **Chemical constituents:**

Physostigmine (eserine), eseridine, eseramine, physovenine, phytosterol, starch.

### **Test for identity:**

- a) Macroscopical examination of the specimen to ensure compliance with the above given descriptions
- b) Shake the specimen with acidulated water. Filter and add a few drops of Wagner's, Dragendorff's or Mayer's reagent. A precipitate is obtained.

- c) Basify the acid extract from b) above with ammonia. Shake out the alkaloid into chloroform. Perform a thin-layer chromatographical examination of the concentrated chloroform extract to confirm the presence of physostigmine by co-chromatography.

***Test for purity:***

It yields about 4 per cent of ash.

***Pharmaceutical preparations:***

Physostigmine salicylate and physostigmine sulphate eye drops.

***Uses:***

In ophthalmology in treatment of glaucoma; also as a source of physostigmine alkaloids.

***Storage:***

In tight, light-resistant containers in quantities not exceeding 1 g.

## **Pimpinella anisum L.**

### **Family name:**

Apiaceae.

### **Synonyms:**

- (a) *Anisum odoratum* Raf.
- (b) *Anisum vulgare* Gaertn.
- (c) *Apium anisum* (L.) Crantz
- (d) *Pimpinele anisa* St.-Lag.
- (e) *Petroselinum sativum* Hook. & Gillies
- (f) *Sison anisum* (L.) Spreng.



### **Common names:**

Anise or Aniseed, Anise Burnet, Saxifrage (E).  
Anis. Boucage. Anis d'Europe, Anis vert (F).

### **African names:**

- (a) الأنیسون أو الیانسون أو کمون حلو: Arabic
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Annual herbaceous plant 60 cm high with dentate lobate lower leaves, upper leaves contain 3 various linear lobes; umbel or umbellules of small white flowers; fruits, oblong, striped, greenish grey and very sweet smelling.

### **Geographical distribution:**

Cultivated in temperate and Mediterranean parts of Africa.

### **Part used:**

Fruits.

### **Names of drug:**

Fructus Anisi. Anise Fruit. Anis, Anis Vert.

### **Definition:**

Anise is the dried ripe fruits of *Pimpinella anisum* L.(family, Apiaceae) It contains not more than 3 per cent of foreign organic matter, and yields not less than 1.5 per cent of volatile oil v/w.

### **Description:**

Odour, strong, aromatic, agreeable and characteristic; taste, sweet and strongly aromatic.

**Macroscopical:** Fruit, cremocarp, partly separated into its mericarps, often entire remaining attached to a slender pedicel, 2 to 12 mm long; ovoid enlarged at the base and tapering at apex, somewhat laterally compressed 3 to 6 mm long and 2 to 3 mm broad; greyish or greenish-grey, seldom greyish-brown; externally, rather rough to the touch due to the presence of numerous very short, stiff hairs, marked on each mericarp with 5 very slightly raised filiform pale brown primary ridges (distinction from *Conium*), and at the apex with a ring-like disc, stylopod, and the remains of two diverging styles; commissural surface, nearly flat, with two dark brownish longitudinal areas, containing vittae, separated by a middle paler one; internally, the mericarp shows a pericarp with

numerous branched vittae, in the dorsal and usually 2 large ones in the commissural side, a large oily endosperm, not deeply grooved on the commissural surface (distinction from Conium) and a small apical embryo.

**Microscopical:** Epidermis of peri carp consists of cells with striated cuticle, many of which project into short, conical, curved, thick-walled, unicellular, sometimes bicellular non-glandular hairs with bluntly pointed apex and finely warty cuticle. Mesocarp, formed of thin-walled parenchyma traversed longitudinally by numerous schizogenous vittae with brown epithelial cells and in each primary ridge, by a small vascular bundle accompanied by a few fibres and shows a patch of porous or reticulate lignified cells existing only in the middle of the commissural side, but not in the ridges (distinction from Fennel). Endocarp, composed of narrow, tangentially elongated thin-walled cells, except when adjacent to the reticulate cells in the mesocarp, where it is formed of porous, lignified and reticulately thickened cells. Seed-coat consists of one layer of tangentially elongated cells with yellowish-brown walls, closely adhering to the endocarp except when separated by a large cavity along the commissural surface. Endosperm, formed of polygonal thick-walled cellulosic cells, containing fixed oil and many aleurone grains, each enclosing one globoid and one or two micro-rosette crystals of calcium oxalate. Carpophore, split passing at the apex into the raphe of each mericarp; traversed by a vascular strand of fibres and spiral vessels.

**Powder:** Powdered Anise is grey, greenish-brown; or yellowish-brown; characterised by numerous almost colourless fragments of endosperm; abundant minute oil globules; numerous warty simple hairs 25 to 200  $\mu$  long and 10 to 15  $\mu$  broad; fragments of pericarp with yellowish-brown comparatively narrow branching vittae, usually crossed by the cells of the endocarp, the ratio of the width of these cells to that of the vittae varies from 1.75 to 1.5 (distinction from Fennel and other umbelliferous fruits) few fibres and very scanty pitted lignified, parenchyma; aleurone grains 2 to 15 mostly 6 to 10  $\mu$  in diameter, calcium oxalate, micro-rosette crystals 2 to 10 mostly 4 to 6  $\mu$  in diameter and each containing a minute air bubble.

**Chemical constituents:**

Volatile oil containing up to 90 per cent anethole, fixed oil and proteins.

**Test for identity:**

- Macroscopical and microscopical examination should fit the description given above.
- Carry out thin-layer or gas- chromatographic examination to confirm the presence of anethole as described in volume 2.

**Tests for purity:**

- Powdered Anise shows no starch granules more than  $\mu$  in diameter (Flours, etc.), no vessels more than 20  $\mu$  in diameter and not more than a small amount of small starch granules (stalks).
- Heat 1 g of powdered Anise with 10 cc of potassium hydroxide T.S.; no mouse-like odour is developed (Conium).
- Ash, not more than 11 per cent; acid-insoluble ash, not more than 2.5 per cent.
- Moisture, not more than 7 per cent.

**Assay:**

Carry out the assay as directed under "Determination of volatile oils in drugs", using about 10 g of powdered Anise, module No: 24 accurately weighed.

***Pharmaceutical preparations:***

Aetheroleum Anisi.

Aqua Anisi.

***Uses:***

Flavouring agent, carminative.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Pisum sativum L.**

### **Family name:**

Fabaceae.

### **Synonym:**

- (a) *Pisum arvense* L.
- (b) *Pisum humile* Boiss. & Noe
- (c) *Pisum sativum* L. *ssp. arvense* (L.) Poir.
- (d) *Pisum sativum* L. *var. arvense* (L.) Poir.
- (e) *Pisum sativum* L. *var. humile* Poir.
- (f) *Pisum sativum* L. *var. macrocarpon* Ser.

### **Common names:**

Garden pea. Common pea (E). Pois (F).

### **African names:**

- (a) بازيلاء مزروعة او بسلة او الجبانة: Arabic
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Njegele, Kunde
- (f) Yoruba: N/A



### **Brief description of the plant:**

Climbing herbaceous plant with tendrils that can reach 3 m; paripinnate leaves, pedunculate flowers solitary or clusters of three, white or purple wings or without; spherical or angular seeds that may be mottled or not.

### **Geographical distribution:**

Grown throughout the world.

### **Part used:**

Ripe seeds.

### **Name of drug:**

Pea.

### **Definition:**

Pea is the dried seeds of *Pisum sativum* L. (family, Fabaceae) containing not more than 3 per cent of foreign organic matter, and yielding not less than 3.5 per cent of proteins.

### **Description:**

Odour of delicate flavour; taste, sweet and characteristic.

**Macroscopical:** Seed, spherical 0.5-0.7 cm in diameter, buff or green in colour, funicle prominent 3 to 4 mm long, broaded at the end; hilum oval with a slit through its longest diameter; strophiola consisting of a slight elevation, raphe extending from the hilum and beneath the strophiola to the chalaza, micropyle close by the other end of the hilum slit, radicle is beak-like; cotyledons two and hemispherical, somewhat distorted by the short recurved radicle.

**Microscopical:** Epidermis of the seed coat formed of palisade-like cells covered with thin cuticle, the lumen of these cells is narrow and smooth in the outer two-thirds, broader and wrinkled in the inner portion. This layer followed by spool-shaped cells with ribs which are more or less evident especially in surface view, the third layer formed of parenchyma

cells without inward decrease in size and have increasingly large intercellular spaces. Endosperm and peri sperm are not evident; cotyledons consist of two epidermis of narrow tangentially elongated cells, often in parquetry-like groups, followed by very indistinctly porous-walled cells, with small intercellular spaces at the corners, containing starch grains 20-40  $\mu$  oval-oblong, rounded or subreniform in shape, many are irregularly enlarged so that their outline appears composed as arcs of circles of varying radius. Hilum is elongated sometimes with dark transverse clefts; radial fissures are comparatively common. Most grains are distinctly striated, especially near the periphery, the central portion often presenting a more or less homogeneous appearance.

**Powder:** Powdered Pea is pale green, characterised by fragments of palisade cells of the seed-coat, fragments of subepidermal cells spool-shaped, fragments of cotyledonous cells in parquetry form, some with starch grains.

**Chemical constituents:**

Proteins, mainly vicilin and legumin; fats and starch.

**Tests for identity:**

Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above

**Test for purity:**

Ash, about 3.46 per cent.

**Uses:**

Nutritive.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Plantago ovata** Forssk.

### **Family name:**

Plantaginaceae.

### **Synonyms:**

- (a) *Plantago brunnea* Morris
- (b) *Plantago fastigiata* Morris
- (c) *Plantago gooddigii* A. Nelson & Kennedy
- (d) *Plantago insularis* Eastw.
- (e) *Plantago minima* A. Cunn
- (f) *Plantago ispaghula* Roxb.



### **Common name:**

Ispaghula husk, Blond Plantain, Blond Psyllium, (E)  
Graines de Psyllium (F)

### **African names:**

- لسان الحمل البيضوي أو لسان الحمل أولقمة النعجة  
 (a) Arabic:  
 (b) Bambara:  
 (c) Hausa:  
 (d) Peuhl:  
 (e) Swahili:  
 (f) Yoruba:

### **Brief description of the plant:**

Perennial plant with one or few rosette of flowers; linear or linear lanceolate leaves of 2.5 to 12 cm long covered with woolly brown spikes over-top, the leaves with dense clusters, flowers of 0.5 to 3.5 cm; small flowers with scarious edged, sepals and corolla with lobes reaching 2.5 mm; capsule around 3 mm with small seeds in the form of a carina.

### **Geographical distribution:**

Mediterranean and subtropical regions.

### **Part used:**

Dried ripe seeds.

### **Name of drug:**

Plantago seeds. Semen Plantaginis.

### **Definition:**

Plantago seed is the dried ripe seed of *Plantago ovata* Forsk. (family, Plantaginaceae)

### **Description:**

The seeds are odourless and with mucilagenous taste.

**Macroscopical:** The seed is boat-shaped with ovate outline, pinkish grey to brown in colour along the margin with opaque reticulate surface, 2-2.3 mm long, 1-1.5 mm wide and 1 mm thick, usually with central reddish-brown oval patch extending about 1/3 of the length of the seed. The convex dorsal surface exhibits a longitudinal brown area extending nearly along the length of the seed and represents the position of the embryo lying beneath the seed-coat, as well as a transverse groove nearer to the broader than to the narrower extremity and over the points of union of the hypocotyle and cotyledons. The ventral surface shows a deep brown furrow which does not reach to either end of the seeds, in the centre of which is an oval yellowish-white hilum, from which extends to the

chalazal end, a slightly elevated dark brown raphe. The seed is albuminous with oily endosperm. the embryo is straight, formed of two large plano-convex cotyledons and a small radicle in the narrow end and directed towards the micropyle. The seed is mucilagenous and upon soaking in water, the seed-coat swells and the seed becomes enveloped with a colourless mucilage.

The weight of 100 seeds is about 0.1 g. A longitudinal cut perpendicular to the ventral surface and passing through the hilum, shows a thin dark brown testa within which is a narrow endosperm surrounding a large oval-lanceolate cotyledon and large pyramidal radicle directed towards the micropyle.

**Microscopical:** The transverse cut through the central region possesses a reniform or a concave-convex outline and shows a testa, endosperm and two plano-convex cotyledons. Each cotyledon shows aleurone strands. On the convex surface a small raphe. The testa formed of one integument showing outer epidermis consisting of polygonal tabular cells with straight thin anticlinal walls covered with smooth cuticle. They measure 52-60-68  $\mu$  in length, 30-45-52  $\mu$  in width and 27-29-32  $\mu$  in height, the middle (nutrient) layer is formed of collapsed layer of thin cellulosic parenchyma usually more than one layer about 5 or 6 rows; the inner epidermis consists of polygonal cells with straight thin anticlinal walls, containing reddishbrown contents, they measure 16-25-38  $\mu$  in length and 11-16-20  $\mu$  in width and 2-3  $\mu$  in height. The endosperm is formed of irregularly shaped thick cellulosic parenchyma showing an epidermis which is palisade like, cells containing aleurone, grains without inclusion, and fixed oil. The embryo, formed of thin-walled cellulosic parenchyma containing fixed oil and aleurone grains. Each cotyledon shows 3 aleurone strands.

**Powder:** Greyish-brown in colour showing glossy particles, colourless and with mucilagenous taste, characterised by fragments of epidermis formed of thin-wall polygonal cells with smooth cuticle and containing mucilage in the outer tangential and anticlinal walls, staining red with ruthenium red and blue with methylene blue; fragments of the pigment layer which is formed of polygonal cells with thin straight anticlinal walls with brown content traversed by collapsed colourless parenchyma; abundant fragments of endosperm with aleurone grains which are free of content and fixed oil; fragments of embryo tissues showing thin wall parenchyma containing fixed oil and aleurone grains; few fragments showing spiral vessels attaining 11-13-15  $\mu$  width and few fibres which are elongated with thin pitted walls and pointed ends attaining 80-150-180  $\mu$  in length and 8-10-12  $\mu$  in width.

**Chemical constituents:**

Mucilage, fixed oil and brown pigments, glycoside (Aucubin).

**Test for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Place 1 g of the fresh plant material, which is reduced to coarse particles, in a test tube with 5 ml of 1 per cent HCl, after 3-6 hours maceration, transfer about 0.1 ml of macerate to another test tube, add 1 ml of Feld's reagent and heat on a small flame; a blue colour is produced; indicating the presence of aucubin.

**Tests for purity:**

Foreign organic matter: not more than 0.5 per cent; Total ash: not more than 4 per cent.; Acid insoluble ash: not more than 1 per cent.; moisture: not more than 14 per cent.

**Assay:**

**Determination of aucubin content:** The aucubin content is estimated colorimetrically by measuring the blue colour developed on warming the glycoside with p-dimethylamino-benzaldehyde reagent; 1 g of the powdered air dried organs of the plant is defatted, extracted with ethanol (50 per cent) for 24 hours, filtered and the process repeated three times. The combined filtrates are concentrated to 40 ml, transferred to a 50 ml volumetric flask and adjusted to the mark with alcohol (50 per cent). 1 ml of the alcohol extract is then treated with 1 ml of p-dimethylaminobenzaldehyde reagent, 1 ml of 20 per cent HCl and 7 ml ethanol 50 per cent. The mixture is heated for 8 minutes at 65°C, cooled to room temperature, allowed to stand for 15 minutes and then the developed blue colour is measured at 595 nm by means of a spectrophotometer.

Ash not more than 4.5 per cent.

**Uses:**

Laxative, suspending agent.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Pogostemon cablin (Blanco) Benth.**

### **Family name:**

Lamiaceae.

### **Synonyms**

- (a) *Pogostemon patchouli* Pellet.
- (b) *Mentha cablin* Blanco

### **Common names**

Patchouli, puchaput (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

It is a bushy herb of the mint family, with erect stems, reaching two or three feet (about 0.75 metre) in height and bearing small, pale pink-white flowers. The patchouli plant is grown for the intoxicating fragrance of its leaves. The flowers are not showy but they are more fragrant than the leaves so it might be worth the trouble to provide your plant with the conditions it needs to bloom.

### **Geographical distribution:**

The plant is native to tropical regions of Asia, and is now extensively cultivated in China, Indonesia, India, Malaysia, Mauritius, Taiwan, the Philippines, Thailand, and Vietnam, as well as West Africa.

### **Part used**

Leaf oil.

### **Name of drug:**

Pachouli oil.

### **Definition:**

Patchouli oil is the essential oil extracted from the dried grass of the *Pogostemon cablin* (Blanco) Benth. (family, Lamiaceae) plant by steam distillation.

### **Description:**

**Macroscopical:** Herbs or subshrubs, perennial, aromatic. Stems erect, 30-100 cm tall, tomentose. Petiole 1-6 cm; leaf blade circular to broadly ovate, 2-10.5 × 1-8.5 cm, herbaceous, adaxially dark green, sparsely tomentose, abaxially tomentose, base cuneate-attenuate, margin irregularly incised, apex obtuse to acute; lateral veins ca. 5-paired. Spikes 4-6.5 × 1.5-1.8 cm, densely tomentose, terminal and axillary; verticillasters 10- to many flowered, basally somewhat lax; peduncle 0.5-2 cm; bracts and bracteoles linear-lanceolate, somewhat shorter than to as long as calyx, densely tomentose. Calyx tubular, 7-9 mm, tomentose outside, minutely tomentose inside; teeth subulate-lanceolate, ca. 1/3 as long as calyx tube. Corolla purple, ca. 1 cm, lobes villous outside. Stamens bearded. Fl. Apr.

***Chemical constituents:***

Three terpenoids Germacrene, Patchoulol or patchouli alcohol, Norpatchoulenol found in patchouli oil

***Tests for identity:***

- (a) Macroscopical examination of the leaf specimen for extracting the oil to ensure compliance with the descriptions given above.
- (b) Gas chromatographical examination of the essential oil to confirm the presence of Germacrene, Patchoulol or Patchouli alcohol and Norpatchoulenol.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Patchouli is used widely in modern perfumery and industry.

***Storage:***

Dried leaves to be kept in a cool dry place. Oil to be stored in well closed containers away from light and heat.

## **Polygala senega L.**

### **Family name:**

Polygalaceae.

### **Synonym:**

- (a) *Polygala senega* L. var. *latifolia* Torr. & A. Gray
- (b) *Polygala senega* var. *senega* L.
- (c) *Polygala senegum* L.

### **Common names:**

Senaca, snake-root, Senega, Seneca Milkwort, Mountain Flax (E).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Hankakidako = *P. arenaria*
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Perennial herbaceous plant with numerous stems sprouting from a single thick gnarled stump; leaves lanceolate or oblong-lanceolate with rough edges; flowers, almost sessile with rounded-obovate wings, concave with a short-crested carina.

### **Geographical distribution:**

Temperate and subtropical regions of Africa.

### **Part used:**

Root and root-stock.

### **Names of drug:**

Radix senegae. Senega root. Racine de senega.

### **Definition:**

Senega is the dried root and root-stock of *Polygala senega* L. (family, Polygalaceae). Senega contains not more than 5 per cent of its stems, and not more than 2 per cent of other foreign organic matter.

### **Description:**

Odour, slight and characteristic, recalling that of methyl salicylate, sternutatory when in powder form; taste, sweet, subsequently acrid and irritant to the throat.

**Macroscopical:** Senega occurs usually in pieces, sometimes entire, consisting of a large, knotty, tortuous crown or root-stock, up to 3 cm wide, bearing numerous purplish short stem-bases and buds, and of a long tapering root slender, more or less obconical, frequently curved and contorted, somewhat twisted, sparingly branched: 3 to 20 cm mostly 8 to 9 cm long, 2 to 10 mm thick; greyish-yellow or brownish-grey; externally transversely wrinkled, sometimes more or less annulated especially on the convex side in the upper part, also longitudinally wrinkled, frequently showing a longitudinal ridge, the keel, running spirally and prominent on the concave side; fracture, short, smooth in the bark, splintery in the wood; internally, consisting of a narrow, light-yellow, horny,

somewhat translucent bark, frequently strongly developed on one side and protruding to form the keel, and of a hard whitish, uniform normal wood, or irregularly developed anomalous wood, appearing in transverse section, oval semi-circular, or variously wedged with one or more broad parenchyma rays commonly reaching to the centre.

**Microscopical:** Cork, narrow, formed of 2 to 6 layers of tangentially elongated, yellowish-brown, thick-walled cells; cortex of phellogen, narrow, usually containing large lacunae, and formed of 2 to 6 layers of isodiametric, occasionally tangentially elongated, collenchymatous parenchyma, phloem in parts wholly replaced by parenchyma but abnormally developed in the keel region, consisting of radial rows of parenchyma, small groups of sieve tissue, and traversed by medullary-rays 1 to 3 cell-wide; cambium, circular; xylem, with the exception of the parenchyma wedges, wholly lignified, consisting mainly of tracheids, and short pitted vessels, few fibrous tracheids, and thin-walled fibres, the whole traversed by numerous indistinct lignified medullary-rays; primary xylem, 2-arch. All parenchyma with small oily globules but no starch or calcium oxalate. Root-stock, with polygonal cork cells, irregularly disposed xylem elements, occasional spiral vessels and thin-walled parenchymatous pith.

Stem with epidermis of elongated subrectangular cells; cortex parenchymatous; pericycle, with a band of unlignified fibres; xylem containing pitted tracheid and pitted reticulate and spiral vessels; pith, parenchymatous.

Scale leaf, with ranunculaceous stomata and unicellular warty simple hairs.

**Powder:** Powdered Senega, yellowish-grey to grey characterised by few fragments of cork; numerous fragments of wood showing pitted tracheids, fibrous tracheids and few vessels up to 65  $\mu$  in diameter, usually crossed with medullary-ray cells; numerous small oily globules, free or in cells; occasional fragments of aerial stems with long un lignified fibres, and frequent fragments of scale leaves, with ranunculaceous stomata and unicellular warty simple hairs with solid tips.

#### **Chemical constituents:**

Senega root contains as principal constituents the saponin senegin about 4 per cent and polygalic acid, about 5.5 per cent. The drug contains a small percentage of methyl salicylate. Senega root also contains 5 per cent of fixed oil.

#### **Tests for identity:**

- (a) Shake the aqueous decoction of Senega, a voluminous froth is produced.
- (b) Extract 10 g of powdered Senega firstly with ether, then with ether acidulated with dilute hydrochloric acid (2 drops of dilute hydrochloric acid for each 25 ml of ether) so as to obtain 25 ml of the ethereal extract in each time; mix the two extracts, and divide into two portions, each of 25 ml.

Add one portion to 20 ml of warm water, 40° to 50°C, placed in an evaporating dish, drive off the ether, filter if necessary, and then add 1 drop of ferric chloride T.S.; a reddish-violet colour is produced.

Evaporate the other portion to dryness, and weigh; the residue is not less than 0.2 g. Dissolve the residue in 2 ml of chloroform, transfer to a test-tube, and run carefully on the side of the tube 1 ml of sulfuric acid; a deep reddish-brown zone is formed between the two liquids, and the sulfuric acid layer shows a faint greenish fluorescence within 24 hours.

**Tests for purity:**

- (a) Powdered Senega contains no, or very few, starch granules; no crystals of calcium oxalate (other roots); no inulin (False Senega); and only very few fragments of bast fibres (Senega Stem).
  - (b) Boil, for 5 minutes, 1 g of very finely powdered Senega with 100 ml of water in a porcelain dish, cool, filter through cotton-wool, and wash with sufficient water to obtain 100 ml of filtrate. Transfer 4 ml of the filtrate to a 100 ml measuring cylinder having a diameter of 3 cm, complete with water to 100 ml and shake vigorously; a voluminous froth is produced which persists for not less than one hour (Exhausted Senega).
  - (c) Alcohol (20 per cent) soluble extractives, not less than 27 per cent.
- Ash, not more than 7 per cent; acid-insoluble ash not more than 2 per cent.; moisture, not more than 13 per cent.

**Pharmaceutical preparations:**

- Extractum Senegae Fluidum.  
Tinctura Senegae.

**Uses:**

- Expectorant.

**Storage:**

- In well-closed containers, in a cool dry place, protected from light.

## **Prosopis africana (Guill. & Perr.)Taub.**

### **Family name:**

Fabaceae.

### **Synonyms:**

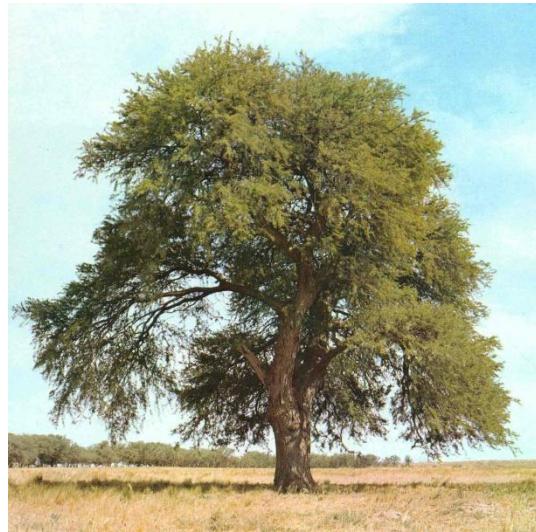
- (a) *Prosopis lanceolata* Benth.
- (b) *Prosopis oblonga* Benth.
- (c) *Coulteria africana* Guill. & Perr.
- (d) *Prosopis oblonga* Benth

### **Common names:**

Ironwood, Locust bean, African Mesquite  
(E). Arbre de forgerons, Prosopis (F)

### **African names:**

- (a) Arabic: abu suruj
- (b) Bambara: N/A
- (c) Hausa: Kiriya, K'iryta tamata
- (d) Peuhl: Thiélingayi
- (e) Swahili: N/A
- (f) Yoruba: Ayan



### **Brief description of the plant:**

*Prosopis africana* reaches 4-20 m in height; has an open crown and slightly rounded buttresses; bark is very dark, scaly, slash orange to red-brown with white streaks. Foliage drooping; leaves alternate, bipinnate; rachis 10-15 cm long with 3-6 pairs of opposite pinnae (5-8 cm long); 9-16 pairs of leaflets, oblong-lanceolate, 12-30 mm, pubescent; a typical gland between pairs of pinnae and leaflets. Flowers greenish-white to yellow, fragrant, in dense 6-10 cm long axillary spikes; calyx pubescent but petals glabrous; 10 free-standing stamens; anthers with a small apical gland. Pods dark brown, cylindrical, thick and hard, shiny, up to 15 x 3 cm, with woody walls, compartmented; about 10 loose, rattling seeds per pod with a thin, intermarginal line around.

### **Geographical distribution:**

From Senegal to Ethiopia in the zone between the Sahel and savannah forests.

### **Part used:**

Roots.

### **Name of drug:**

Locust bean root.

### **Definition:**

Locust bean root is the dried root of *Prosopis africana* (Guill. & Perr.)Taub. (family, Fabaceae).

### **Description:**

**Macroscopical:** Tree 4.5–12(–21) m. high, unarmed, with grey, rough, scaly or fissured bark. Young branchlets shortly pubescent or puberulous. Leaves: petiole 2.5–6.6 cm. long, pubescent or puberulous as in the (0–)2.7–9.5 cm. long rhachis; pinnae (1–)2–4 pairs, glandular between most of the pairs of leaflets; leaflets opposite, in (5–)7–15 pairs, oblong-lanceolate or elliptic-lanceolate, (1.3–)1.5–3(–4) cm. long, 0.4–1(–1.5) cm. wide, narrowed to an usually acute or subacute apex, inconspicuously appressed-puberulous on both sides. Flowers creamy-white or yellow-green, fragrant, sessile or nearly so, in 3–6

cm. long spikes borne on 1–3.5 cm. long peduncles. Calyx 1.5–2 mm. long, puberulous. Petals free, 3–4.5 mm. long, glabrous or nearly so outside. Stamen-filaments 5.5–6.5 mm. long. Ovary hairy. Pods 10–20 cm. long, 1.5–3.3 cm. in diameter, black or brown, glossy, subcylindrical or slightly compressed, thickened. Seeds ellipsoid, 8–10 mm. long, 4–9 mm. wide, blackish-brown, glossy. Fig. 10, p. 35.

***Chemical constituents:***

Alkaloids: Prosopine and prosopinine

***Tests for identity:***

- (a) Examine the specimen macroscopically to ensure compliance with the descriptions given above
- (b) Extract the powdered root with ammoniacal Chloroform. Treat a portion of the chloroform extract with dilute acid and test the acidic fraction with Mayer's, Dragendorff's, Wagner's or other alkaloid testing reagent. A positive reaction (precipitate) is obtained
- (c) Examine the chloroform extract of the alkaloid (see b above) chromatographically for the presence of prosopine and prosopinine by thin layer co-chromatography.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses :***

Purgative, Analgesic, Anti-inflammatory,

***Storage:***

In air-tight containers .

## Pterocarpus erinaceus Poir.

### Family name:

Fabaceae.

### Synonyms:

- (a) *Echinodiscus erinaceus* Benth. ex Walp.
- (b) *Pterocarpus africanus* Hock.
- (c) *Pterocarpus senegalensis* Vahl ex DC.

### Common names:

African gum, African rosewood, African teak, Gambia gum, Senegal rosewood, barwood; black camwood; African kino; Gambian kino (E). Palissandre du Sénégal, Santal rouge d'Afrique, Veine teck africain (F)

### African names:

- (a) Arabic: N/A
- (b) Bambara: Mgueni
- (c) Hausa: Dorowan kurmi, Madobia, Mai-jini, Shaa-jini
- (d) Peuhl: Bani
- (e) Swahili: N/A
- (f) Yoruba: Osun-dudu, Gbingbin, Apepe



### Brief description of the plant:

Deciduous small tree up to 15(–25) m tall; bole straight, cylindrical and branchless for up to 10 m under good conditions but often twisted, fluted and low-branched under poorer conditions, up to 75(–100) cm in diameter, slightly buttressed; bark surface greyish brown to blackish, fissured and scaly, inner bark yellowish brown, with reddish streaks, exuding a reddish translucent gum on slashing; crown rounded, open; twigs densely short-hairy when young. Leaves alternate, imparipinnately compound with (5–)7–11(–15) leaflets; stipules linear, up to 9 mm long, hairy, falling off early; petiole 3–7 cm long, rachis (7–)10–17(–22) cm long, hairy; petiolules 3–8 mm long; leaflets usually alternate, ovate to elliptical, (4–)6–11 cm × (2–) 3–6 cm, base rounded to obtuse, apex obtuse to slightly acuminate with usually shallowly notched tip, thick-papery, brownish hairy when young but later glabrescent, with 12–20 pairs of lateral veins. Inflorescence an axillary or terminal panicle 7–20 cm long, densely brown hairy; bracts up to 6 mm long, falling off early. Flowers bisexual, papilionaceous; pedicel 4–8 mm long, hairy; calyx campanulate, c. 7 mm long, densely hairy, with 5 triangular teeth 1–2.5 mm long, upper 2 more or less connate; corolla with clawed petals, golden yellow, standard almost circular, up to 15 mm × 13 mm, wings up to 13 mm long, keel up to 10 mm long; stamens 10, fused into a sheath up to 8.5 mm long, the upper stamen sometimes free; ovary superior, stiped, hairy, style up to 5 mm long, almost glabrous. Fruit a circular, flattened, indehiscent pod 4–7 cm in diameter, on a stipe up to 1 cm long and with a papery, finely veined wing with wavy or plaited margin, with prickles on the seed-bearing portion, straw-coloured, 1(–2)-seeded. Seed kidney-shaped, flat to slightly thickened, c. 10 mm × 5 mm, smooth, red to dark brown. Seedling with epigeal germination; cotyledons leafy.

**Geographical distribution:**

It is a native of Senegal. Broad distribution from Senegal to Gabon, up to Sahel border..

**Part used:**

Leaves.

**Name of drug:**

African kino.

**Definition:**

African kino consists of the leaf of *Pterocarpus erinaceus* Poir (family, Papillionaceae).

**Description:**

**Macroscopical:** *Pterocarpus erinaceus* is a medium-sized, generally deciduous tree 12-15 m tall, bole often of poor form, strongly fluted and gnarled, with numerous, plank-like buttresses; bark surface finely scaly fissured, brown-blackish, inner bark thin, producing red sap when cut; crown dense, domed; branchlets often lenticelled; indumentum of simple, usually short and adpressed hairs. Old trees often hollow. Leaves alternate, imparipinnate, up to 30 cm long; stipules generally small, linear or narrowly triangular, usually early caducous; up to 11 leaflets, alternate or sometimes subopposite, entire. Inflorescence paniculate; bracts and bracteoles small, linear to narrowly triangular. Flowers bisexual, irregular; calyx 5 mm long, turbinated to campanulate, 5-lobed, the upper 2 lobes usually larger, sometimes united; petals 5, free, clawed, 10-12 mm, generally yellow, glabrous or sparsely hairy outside, standard obovate to spatulate, keels shorter than the wings and connate at the base. Fruit a compressed indehiscent pod, green when young, disk-like, up to 7.5 cm diameter, broadly winged or rarely slightly keeled, with a thickened central, usually woody or corky seed-bearing portion, with 1-3(4) seeds. Seed kidney-shaped to oblong, usually narrowed and curved near the minute hilum, smooth to undulate, testa brown to blackish, aril, minute.

**Microscopical:** Epidermal cells have straight to undulating anticlinal walls on the adaxial surface and straight on the abaxial; stomata on the abaxial surface consist of anomocytic and paracytic types; transverse section of leaf is isobilateral, epidermis is single layered on both surfaces with thick cuticle, mesophyll is undifferentiated and has many air spaces; multicellular trichomes with glandular heads are present on the two surfaces; they are more on the ventral surface; transverse section through the mid rib region shows protuberances on both ventral and dorsal sides forming an ovoid shape; vascular bundle fan shaped; xylem (5-7 celled) located above phloem; centrally placed in the lamina region are some stone cells.

**Powder:** Parenchymatous cells of the epidermis, straight anticlinal walls, stomata of anomocytic and paracytic, multicellular glandular trichomes and xylem vessels.

**Chemical constituents:**

Alkaloids; tannins, astringents. Homopterocarpin, pterocarpin, angolensin, acetyloleanolic acid, pseudobaptigenin, saponins and flavonoids

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure it complies with the descriptions given above.
- (b) Microchemical test for the presence of alkaloids
- (c) Thin-layer chromatographic examination to confirm the presence of homopterocarpin, pterocarpin or angolensin by co-chromatography.

***Tests for purity:***

Moisture: Not more than 9.2 per cent.

Ash: 13.7 per cent.

Water-soluble extractives: Not less than 14.3 per cent.

Alcohol (70 per cent.) –soluble extractives: Not less than 15.7 per cent.

***Pharmaceutical preparations:***

N/A

***Uses:***

Malaria, dysentery, diarrhea, fever and insomnia. 300g of plant material boiled with 900ml of water until reduced to 600ml. take two tablespoonfuls twice daily.

***Storage:***

In a cool dry place.

## **Punica granatum L.**

### **Family name:**

Punicaceae.

### **Synonym:**

*Punica nana* L.

### **Common names:**

Pomegranate tree, Dwarf Pomegranate (E). Grenadier, Grenade (F).

### **African names:**

- (a) Arabic: الرمان
- (b) Bambara: N/A
- (c) Hausa: Ximani, Rumman, Rummani
- (d) Peuhl: N/A
- (e) Swahili: Mkoma manga, Komamanga, Kudhumani
- (f) Yoruba: N/A



### **Brief description of the plant:**

Shrub that can reach 2.50 m in height, with young quadrangular more or less thorny stalks; linear lanceolate leaves of 4 to 6 cm by 2.5 cm; wide solitary flowers red in colour 4 cm long; spherical fruits 10 cm in diameter, containing numerous reddish fleshy seeds.

### **Geographical distribution:**

Cosmopolitan and widely cultivated in gardens. Widely cultivated in warm regions throughout the world.

### **Part used:**

Bark.

### **Names of drug:**

Cortex Granati, Pomegranate Bark. Pericarpium Granati

### **Definition:**

Pomegranate bark is the dried stem and root barks of *Punica granatum* L. (family, Punicaceae). Pomegranate bark contains not more than 2.0 per cent of wood or other foreign organic matter, and yields not less than 0.5 per cent of total alkaloids of Pomegranate bark.

### **Description:**

Odour, slight; taste, astringent, somewhat bitter and nauseous.

### **Macroscopic:**

STEM BARK: occurs in curved pieces or quills; up to 10 cm long, 0.5 to 2.5 mm thick: outer surface, yellowish to greyish-brown, with occasional greyish patches of lichens, longitudinally wrinkled and marked small, broadly elliptical lenticels; inner surface, light yellow or yellowish-brown, finely striated; fracture, very short and granular.

ROOT BARK: occurs in flat, irregular, curved, or recurved small pieces; outer surface, brownish-yellow, rough, with darker patches and conchoidal depressions due to exfoliation of the outer portion, but no lenticels; inner surface, yellow, smooth, with irregular darker brown patches; other characteristics similar to those of stem bark.

**Microscopical:** Cork, formed of several alternating layers of suberized thin-walled cells and of lignified cells with greatly thickened inner tangential walls. Cortex, consisting of parenchyma containing small starch granules, scattered prisms and occasional cluster crystals of calcium oxalate, and of large sclereids which are isolated, rarely in small groups, with very thick and strongly stratified walls, up to 400  $\mu$  long and 200  $\mu$ -broad. Phloem shows numerous cells containing cluster crystals of calcium oxalate in more or less tangential rows, and parenchyma cells with numerous starch granules or amorphous tannin masses. Medullary rays, one cell wide, with occasional cells containing numerous small prism.

**Powder:** Powdered Pomegranate bark is yellowish-brown to dark brown; characterised by fragments of parenchyma containing numerous starch granules and crystals of calcium oxalate; sclereids with very thick and pitted walls; fragments of cork with prominent, thickened and lignified walls; numerous calcium oxalate crystals, prisms, 6 to 10  $\mu$  long and cluster crystals, up to 15  $\mu$  in diameter; starch granules, abundant, simple, 2 to 10  $\mu$  in diameter, or rarely compound; occasional long wood fibres, 15 to 20  $\mu$  in diameter, associated with pitted vessels; bast fibres absent.

**Chemical constituents:**

The alkaloids pelletierine, isopelletierine, methyl pelletierine, methyl isopelletierine and pseudo-pelletierine. The bark contains about 22 per cent of gallo-tannic acid.

**Tests for identity:**

Macerate 0.5 g of powdered Pomegranate bark with 25 ml of water for one hour, with occasional shaking, and filter; the light-yellow filtrate responds to the following tests:

- (a) To 10 ml of the filtrate, add a drop of ferric chloride T.S.; a bluish-black precipitate is formed.
- (b) To 10 ml of the filtrate, add 1 ml of calcium hydroxide T.S.; an orange brown flocculent precipitate is formed.

**Tests for purity:**

- (a) Pomegranate bark contains no bast fibres (Foreign barks) and not more than occasional fragments of wood elements (wood).
- (b) Ash, not more than 17.0 per cent.

**Assay:**

Mix, in a flask, about 10 g of powdered Pomegranate Bark, module No. 22, accurately weighed, with 5 g of magnesium oxide, add 50 ml of chloroform and shake frequently for one hour. Transfer the mixture to a small continuous extraction apparatus plugged with cotton-wool, and when the liquid ceases to flow, pack firmly and continue the extraction, until complete extraction of the alkaloids is effected. Evaporate the chloroform extract to about 20 ml, transfer the concentrated extract to a separator, cool, add 10 ml of N/10 hydrochloric acid and shake well. Allow to separate and run off the chloroform layer into another separator.

Continue the extraction with successive portions, each of 10 ml of N/10 hydrochloric acid, until complete extraction of the alkaloids is effected.

Mix the acid extracts, make distinctly alkaline with sodium hydroxide T.S., and repeat the extraction with successive portions, each of 10 ml of chloroform, until complete extraction of the alkaloids is effected. Wash the combined chloroform extracts with about

10 ml of water, reject the water, and dehydrate the chloroform with about 2 g of anhydrous sodium sulfate.

Filter through a dry filter into a porcelain dish, wash the sodium sulfate and the filter with a few ml of chloroform, adding the washing to the chloroform extract in the dish. Evaporate the chloroform on a water-bath, add to the residue 2 ml of alcohol and evaporate again. Dissolve the residue in 10 ml of N/10 hydrochloric acid and titrate the excess of acid with N/10 sodium hydroxide, using methyl red T.S. as indicator.

Each ml of N/10 hydrochloric acid is equivalent to 0.0148 g of total alkaloids.

**Uses:**

Taenifuge and vermifuge.

**Storage:**

In well-closed containers, protected from light.

## **Quassia amara L.**

### **Family name:**

Simarubaceae.

### **Synonym:**

N/A

### **Common names:**

Bitter wood tree, Quassia Wood, Surinam Quassia (E).

### **African names:**

- (a) Arabic: Kowashia
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: Kékudié = *Q. undulata*
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Shrub of 3 to 4 m high with composite leaves, winged rachis, opposite leaflets 3 or 4 elliptical pairs; paniculate leaves; obovate-elliptical hard edged fruit.



### **Geographical distribution:**

Originates from tropical America and grown in gardens in tropical Africa.

### **Part used:**

Wood.

### **Names of drug:**

Lignum Quassiae. Quassia Wood.

### **Definition:**

Quassia wood is the dried wood of the trunk and branches of *Picraema excelsa* (SW) Planchon (family, Simarubaceae), known as Jamaica Quassia, or of *Quassia amara* L. known as Surinam Quassia.

Quassia contains not more than 2 per cent of foreign organic matter.

### **Description:**

Odour, very slight, or odourless; taste intensely bitter and persistent.

**Macroscopical:** JAMAICA QUASSIA: Occurs in chips, raspings or shavings, occasionally in logs, varying in size; yellowish-white or bright yellow, sometimes with light or dark-grey patches of the thin bark; tough, but easily split longitudinally; light in weight; diffuse porous, with false annual rings; transverse surface shows numerous white radial lines and irregular concentric rings; tangential surface shows numerous parallel streaks.

SURINAM QUASSIA: Similar to Jamaica Quassia except that the logs are usually thinner.

**Microscopical:** JAMAICA QUASSIA: Elements, in storeyed arrangement. Wood fibres, constituting the main bulk of the wood; long, 750 to 900  $\mu$  in length and up to 18  $\mu$  in width, with thin walls, linear oblique simple pits and fine pointed ends. Wood parenchyma, metatracheal parenchyma in narrow tangential bands, of 2 to 4 up to about 15 cells thick; paratracheal parenchyma, in 1 to several layers, around the parts of the vessels not touching medullary rays; some, being small, short, in files of up to about 15

cells, each containing a prism of calcium oxalate; others, longer and without crystals, in files generally of about 4 cells. Vessels, up to 200  $\mu$  in diameter; isolated or in groups of 2 to 6, and rarely up to 11, with very numerous minute oval bordered pits. Medullary rays numerous, about 6 to 8 per mm of arc, almost homogeneous 2- to 5-mostly 3-cells wide; about 20 per cent of the medullary rays being 1-cell wide; 10 to 25, up to 40 cells high; cells, rectangular, elongated on the edges of medullary rays, with pitted walls; occasional cells with prisms of calcium oxalate. Starch granules, occasional in parenchyma; about 4 to 12, up to 20 microns in diameter; mostly simple, rounded occasionally compound, with 2 components.

**SURINAM QUASSIA:** Similar to Jamaica Quassia except that the medullary rays are mostly 1-cell, sometimes 2-cell wide, and 5 to 20 up to 30 cells high; vessels, smaller in diameter, and calcium oxalate crystals very few or absent.

**Powder:** Powdered Quassia, pale yellow or pale buff; consisting wholly of lignified elements; characterised by numerous fragments of wood fibres with thin walls and oblique linear pits; fragments showing medullary rays in different aspects; fragments of rectangular and lignified wood parenchyma; fragments of vessels with very small oval bordered pits, having linear openings; calcium oxalate sometimes absent in Surinam Quassia only, prisms 6 to 30  $\mu$  long, free or in the parenchyma accompanying the fibres and in some cells of medullary rays; few starch granules, rounded or ellipsoidal, 5 to 15  $\mu$  in diameter or occasionally compound with two components.

**Chemical constituents:**

Bitter amaroids: quassin, isoquassin and neoquassin.

**Test for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- b) Boil gently about 0.5 g of powdered quassia with 5 ml of alcohol for few minutes, filter, add to the filtrate 2 drops of phloroglucin T.S. and 4 ml of hydrochloric acid; a rose-red colour is produced within few minutes.

**Tests for purity:**

- (a) Boil about 1 g of powdered Quassia with 20 ml of water for few minutes, filter, add to the filtrate a drop of ferric chloride T.S.; no change of colour takes place (Tannin containing woods).
- (b) Water-soluble extractive, not less than 3 per cent.
- (c) Ash, not more than 8 per cent for Jamaica Quassia and not more than 4 per cent for Surinam Quassia.

**Uses:**

Anthelmintic, bitter stomachic.

**Storage:**

In well-closed containers, protected from light.

## **Quercus infectoria G. Olivier**

### **Family name:**

Fagaceae.

### **Synonyms:**

- (a) *Q. alpestris* Koch
- (b) *Q. infectoria* subsp *puberula* O.Schwarz
- (c) *Q. lusitanica* Boiss.
- (d) *Q. lusitanica* var. *infectoria* (G.Olivier)  
A.DC
- (e) *Q. lusitanica* subsp *infectoria* (G.Olivier)  
Mouillef.
- (f) *Q. lusitanica* subsp *orientalis* A.DC
- (g) *Q. valentina* Koch.



### **Common names:**

Aleppo Oak, Oak gall, Magin gall, Dyers' Gall, Magic Nut (E).

### **African names:**

- (a) Arabic: Uffes
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

*Quercus infectoria* is an evergreen Shrub growing to 1.8 m (6ft). It is hardy to zone 6 and is not frost tender. The flowers are monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and are pollinated by Wind.

### **Geographical distribution :**

Asia Minor (Irak, Kurdistan, Turkey); Cyprus; Greece;

### **Part used:**

Seed, bark

### **Name of drug:**

Allepo oak

### **Definition:**

Allepo oak is the dried bark of *Quercus infectoria* G. Olivier (family, Fagaceae)

### **Description:**

**Macroscopical:** Growth habit 5-6 m tall; often small shrub less than 2 m tall; Leaves 3-8 x 1.5-5 cm; semi-evergreen; leathery; oblong; base rounded sometimes cordate; apex obtuse; margin dentate 4-9 pairs of teeth) or crenate-dentate often wavy or rarely lobed; hairless, shiny above; paler beneath or glaucous, glabrous or with some stellate hairs; actually very polymorphous; leaves at the base of twigs are often entire; 5-11 vein pairs; intercalary veins present; petiole cylindrical 1 cm long;  
Fruits acorn mucronate, ovoid elongated, 2-3.5 cm long, 1.8 cm in diameter; glabrous, shiny light brown; peduncle as long as the petiole; enclosed 1/5 by cup; cup hemispheric or subconical, 1.5-1.8 cm in diameter, with lanceolate, appressed, tomentose scales.  
Bark, twigs and buds bark grey, scaly, ridged; twig with deciduous pubescence.

***Chemical constituents:***

Tannic acid; Gallic-acid; Gallo-tannic acid; Syringic and ellagic acid.

***Tests for identity:***

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Examine an aqueous extract of the specimen for the presence of tannins by the addition of ferric chloride solution. A blue-black colouration is obtained.

***Test for purity:***

The galls contain 36 - 58% tannin.

***Pharmaceutical preparations:***

N/A

***Uses:***

An ink is made from the tannin-rich galls.

***Storage:***

In a cool dry place.

## **Quillaja saponaria Poir.**

### **Family name:**

Quillajaceae.

### **Synonym:**

*Quilaia saponaria* Mol.

### **Common names:**

Quillaia. Soap Bark-tree (E).

Kilaya (F).

### **African names:**

(a) Arabic: القلاجة الصابونية

(b) Bambara: N/A

(c) Hausa: N/A

(d) Peuhl: N/A

(e) Swahili: N/A

(f) Yoruba: N/A



### **Brief description of the plant:**

Tree of 15 to 20 m high with persistent cariaceous, ovate leaves almost invariably dentate, smooth, glossy on short leaf-stalks; flowers-whitish and terminal either solitary or in clusters of 3 or 5 on the same peduncle; corolla consisting of 5 small petals and fruit of 5 follicles shedding winged Seeds.

### **Geographical distribution:**

Originates from South America (South of Brazil, Chile and Peru) can also grow in the Mediterranean regions.

### **Part used:**

Inner bark.

### **Names of drug:**

Cortex Quillajae. Quillaia Bark.

### **Definition:**

Quillaia is the dried inner part of the bark of *Quillaja saponaria* Nolina and possibly other species of *Quillaja*. (family, Quillajaceae).

Quillaia contains not more than 5.0 per cent of adhering outer bark and not more than 2.0 per cent of other foreign organic matter.

### **Description:**

Odourless, but its powder is strongly sternutatory; taste, very acrid.

**Macroscopical:** Quillaia occurs in flat pieces; varying in size, generally up to about 1 metre long, 20 cm broad, 3 to 10 mm thick, outer surface, pale brownish or yellowish-white, longitudinally striated with occasional reddish-brown patches of incompletely removed rhytidome; inner surface, nearly smooth, white or yellowish-white, hard, tough; fracture, splintery and laminated: the fractured surface showing here and there glittering crystals of calcium oxalate; the smoothed transverse surface has a chequered appearance, showing alternating dark and paler tangential, bands, traversed by radial white lines.

**Microscopical:** The bark consists mainly of secondary phloem, composed of alternating tangential bands of fibres and sieve tissues with parenchyma. Fibres, in irregular groups, occasionally isolated tortuous, with thick, strongly lignified walls and irregularly

enlarged at intervals, up to 1000  $\mu$  long. Phloem parenchyma contains numerous starch granules and large prisms of calcium oxalate. Sieve tubes, 20 to 30  $\mu$  wide and having oblique transverse walls with several sieve areas. Medullary rays, mostly 3 to 4, rarely up to 6 cells wide, parenchymatous, but having the cells abutting on the groups of fibres, generally regularly thickened, pitted and lignified.

The innermost part of the bark consists of unlignified elements and contains no fibres.

Rhytidome, if present, consists of bands of reddish-brown cork cell, alternating with bands of brown parenchyma with groups of fibres and large prisms of calcium oxalate.

**Powder:** Powdered Quillaia is pinkish-white; characterised by numerous fragments of tortuous fibres staining red with hydrochloric acid, occasionally crossed by cells of the medullary rays; few fragments of parenchyma; prisms of calcium oxalate, 35 to 200, mostly 50 to 170  $\mu$  long, 8 to 30  $\mu$ , mostly 10 to 20  $\mu$  wide, usually broken; numerous starch granules, simple or compound, of 2 to 3 components, spheroidal, 5 to 10 or up to 20  $\mu$  in diameter; occasional sub rectangular sclereids and a few brownish-red fragments of cork cells with reddish-brown contents.

**Chemical constituents:**

Saponin glycosides, quillajic acid and quillaia sapotoxin.

**Test for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) When powdered Quillaia is shaken with water, a copious persistent froth is produced.

**Tests for purity:**

- (a) Boil 1 g of powdered Quillaia, module No. 22, with 100 ml of water in a porcelain dish for 5 minutes, cool, filter through cotton-wool and wash with sufficient water to produce 100 ml. Transfer 1 ml of the filtrate to a measuring cylinder of about 150 ml capacity, having a diameter of 3 cm, complete with water to 100 ml and shake vigorously; a voluminous froth is produced which persists for not less than one hour.
- (b) Alcohol (45 per cent) soluble extractive, not less than 28.0 per cent.
- (c) Ash, not more than 18.0 per cent: acid-insoluble ash, not more than 2.0 per cent.

**Pharmaceutical preparations:**

Tinctura Quillajae.

Quillaja Liquid Extract.

**Uses:**

Emulsifying agent for liquid tar.

**Storage:**

In well-closed containers.

## **Rauvolfia vomitoria Afzel.**

### **Family name:**

Apocynaceae.

### **Synonyms:**

- (a) *Rauvolfia stuhlmannii* K. Schum.
- (b) *Rauvolfia senegambiae* A. DC.
- (c) *Rauvolfia congolana* De Wild. & Durand
- (d) *Hylacium owariense* P. Beauv.



### **Common names:**

- (a) Swizzlestick, African Rauwolfia (E),
- (b) Poison devil's-pepper (E)
- (c) Rauwolfia emetique (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Kolijoi, Kolijohi, Kolijoli
- (c) Hausa: Wada,
- (d) Peuhl: Moyatalal, Modatatel
- (e) Swahili: Msesewe = *R. caffra*
- (f) Yoruba: Akanta, Adapopo, Asofeiyeje, Ira-Igbo

### **Brief description of the plant:**

Tree that can attain 15 m in height with dichotomous ramification; whorled leaves in groups of 4 or 5 widely lanceolate and acuminate; inflorescence terminal and corymbose abundantly flowered; small white flowers; fruit, berry, red when ripe.

### **Geographical distribution:**

Dense forest and Guineo-Congolese gallery forests.

### **Parts used:**

Roots and rhizomes.

### **Names of drug:**

Radix Rauvolfia Africana. African Rauwolfia root.

### **Definition:**

African Rauwolfia is the dry transversely cut roots and rhizomes of *Rauvolfia vomitoria* Afzel. (family, Apocynaceae). African Rauwolfia contains not more than 2 per cent of foreign organic matter, and not less than 0.2 per cent of total alkaloids calculated as reserpine.

### **Description:**

Odour, very slight, decreased on aging; taste, bitter.

**Macroscopical:** The subcylindrical very slightly tapering and occasionally branched roots are up to about 30 cm long and 0.15 cm rarely up to 9 cm diameter; outer surface greyish-brown deeply longitudinally cracked or rubbed smooth with a few oblique rootlet stumps; cork; if present, splintery in the wood, short in the bark: the smoothed transversely cut surface shows a narrow pale-brown bark, up to about 3 mm thick, and a buff or yellowish, finely radiate porous wood forms the majority of the drug.

Pieces of rhizome closely resemble the root but can be differentiated by the presence of a small central pith. Pieces of root-stock with attached stem bases may be sometimes found in the drug.

**Microscopical:** Cork, stratified zones of flattened suberized cells, each 3 to 4 layers in radial width, alternating with zones of larger lignified cells, each from one to about 120 layers in radial width, cells isodiametric in surface view, about 10 to 55  $\mu$ , the flattened cells, about 5 to 15  $\mu$ , the larger cells about 14 to 20  $\mu$  in the radial direction; phellogen of about 5 to 16 layers of parenchyma, sclereids about 12 to 18  $\mu$  in width or length, singly or in small groups, occasionally containing small prisms of calcium oxalate; phloem having scattered secretion cells with granular contents and isolated groups of sclereids which in larger roots form several discontinuous bands of sclereids alternating in the outer phloem with collapsed sieve tissue, while the inner region has sieve elements clearly defined; xylem with numerous vessels, about 36 to 180  $\mu$  in diameter, singly or in pairs, subcylindrical with small bordered pits, the vessel elements being about 75 to 1200  $\mu$  long, lignified tylosis occasionally present in the older vessels; fibres, numerous about 200 to 1500  $\mu$  long and up to 32  $\mu$  wide, with oblique slit-like pits; medullary rays up to three cells wide, heterogenous with isolated groups of sclereids; starch granules in all the parenchymatous tissues, rounded, 1 to 10 to 20  $\mu$  in diameter, with central hila or stellate clefts, also some 2- to 4-compound granules, yielding muller-shaped components.

**Powder:** Powdered African Rauvolfia is brownish-grey, characterised by abundant simple and compound starch granules, greyish fragments of cork tissues, yellowish fragments of xylem elements viz. Vessels, fibres and parenchyma, moderate amounts of sclereids. The tissues of the rhizome are similar to those of the root; there is in addition a cortex, a pericycle with non-lignified fibres having an elongated ovoid enlargement near the end. In the periphery of the pith there are about 20 small strands of perimedullary phloem.

#### **Chemical constituents:**

African Rauvolfia contains a number of alkaloids the most active being the ester alkaloid reserpine (about 0.2 per cent) and rescinnamine. Others include reserpoxidine, seridine, ajmaline, alstonine, isoajmaline, isoreserpiline, raumatorine, rauvomitine, reserpiline, serpagine, vomalidine, yohimbine and a-yohimbine.

#### **Tests for identity:**

- Macroscopic and microscopical examination of the specimen to make sure it complies with the descriptions given above.
- Gives a positive reaction when the powdered drug is tested for the presence of alkaloids using the standard reagents (Wagner's, Mayer's etc)
- Thin-layer chromatography to confirm the presence of reserpine by co-chromatography.

#### **Tests for purity:**

Loss on drying; it loses not more than 12 per cent of its weight on drying at 100°C to constant weight.

Ash: 11.89 per cent.

Water-soluble extractives: Not less than 21.9 per cent

Alcohol (70 per cent.) -soluble extractives: Not less than 19.7 per cent.

**Assay:**

Content of reserpine-like alkaloids: Not less than 0.2 per cent, determined by the following method, all operations being carried out in subdued light. Triturate about 2.5 g accurately weighed, in fine powder, with 10 ml of a 5 per cent w/v solution of glacial acetic acid in alcohol (95 per cent), allow to stand for 2 hours, stirring occasionally, transfer to a Soxhlet apparatus, extract for 4 hours with 90 ml of alcohol (95 per cent), and dilute the extract to 100 ml with alcohol (95 per cent).

To 20 ml of this solution add 200 ml of N/2 sulphuric acid; extract with three successive 25 ml portions of trichloroethane, washing each extract with the same 50 ml of N/2 sulphuric acid, retain the washings and discard the extracts; extract the aqueous solution with 20 ml of chloroform, followed by five successive 15 ml portions of chloroform, and extract the washings retained from the first extraction, successively, with each chloroform extract; wash each extract with two successive 10 ml portions of a 2 per cent w/v solution of sodium bicarbonate in water, filter the extracts through a cotton-wool plug, and dilute the combined extracts to 100 ml with chloroform. Evaporate 20 ml to dryness in a boiling tube, add 10 ml of alcohol (95 per cent) and 2 ml of N/2 sulphuric acid, warm to dissolve the residue, cool, and add 2 ml of a 0.3 per cent w/v solution of sodium nitrite in water; maintain at 55°C for 30 minutes, cool, add 1 ml of a 5 per cent w/v solution of sulphuric acid in water, dilute to 20 ml with alcohol (95 per cent) and measure the extinction of a 1 cm layer at 390 μ using a blank (a solution prepared by evaporating to dryness 20 ml alcohol (95 per cent) and following the above procedure, but omitting the addition of the sodium nitrite solution). Calculate the proportion of reserpine like alkaloids present by comparing the values obtained with a calibration curve prepared using a solution of reserpine in alcohol (95 per cent).

**Uses:**

Hypotensive and for the preparation of reserpine.

**Storage:**

Store in well-closed containers and protected from light.

## **Rhamnus frangula L.**

### **Family name:**

Rhamnaceae.

### **Synonyms:**

- (a) *Frangula alnus* Mill.
- (b) *Rhamnus alnus* Mill.
- (c) *Rhamnus frangula* var. *angustifolia* Louden.
- (d) *Rhamnus baeticus* Willk. & Reverchon.

### **Common names:**

- (a) Alderbuckthorn bark. Block Alder bark,
- (b) Tall Hedge Buckthorn (E).
- (c) Bourdaine. Bois noir (F).



### **African names:**

- (a) Arabic: قشر الأوساج الأسود
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Yoruba: N/A

### **Brief description of the plant:**

Shrub reaching 4 m high with non-thorny stalks; with dark red purplish-blue young branches spotted with greenish lenticels; greenish flowers; fruit, red turning black when ripe.

### **Geographical distribution:**

Temperate and Mediterranean regions of Africa.

### **Part used:**

Stem bark.

### **Names of drug:**

Cortex Rhamni Frangulae. Frangula Bark.

### **Definition:**

Frangula bark is the dried stem bark of *Rhamnus frangula* L. (family, Rhamnaceae), collected at least one year before being employed medicinally. Frangula contains not more than 2.0 per cent of foreign organic matter and not less than 6 per cent of hydroxyl-anthracene derivatives calculated as anhydrous glucofrangulin.

### **Description:**

Odourless; taste, mucilaginous, sweetish and then slightly bitter.

**Macroscopical:** Frangula occurs in single or double quills, rarely in channelled pieces; varying in size, usually 15 cm long or more; 0.5 to 2 cm wide and extremely thin, about 1 mm thick; outer surface, greyish-brown or purplish-black, smooth, with numerous transversely elongated whitish lenticels (distinction from *R. cathartica* L.); sometimes bearing patches of foliaceous lichen, with small black apothecia, when gently scratched, the crimson colour of the inner layers of cork becomes evident (distinction from *R. purshiana* D.C.); inner surface, reddish-yellow to dark brown, finely longitudinally

striated, becoming red when moistened with dilute solutions of alkalis; fracture, short in the outer and slightly fibrous in the inner part.

**Microscopical:** Cork, formed of numerous layers of cells with amorphous purplish-red contents. Cortex, yellowish-brown, consisting of thin-walled parenchyma, containing scattered cluster crystals of calcium oxalate and few small starch granules, and showing large cells filled with mucilage and few groups of slightly lignified fibres, each up to 40  $\mu$  wide. Phloem, yellowish-brown, traversed by numerous somewhat wavy medullary rays, 1 to 3 cells wide and 10 to 25 cells high, and showing numerous tangential groups of strongly lignified fibres, accompanied by prismatic crystals of calcium oxalate, in files of cells, forming crystal-sheath around each group; fibre, 121 to 24  $\mu$  wide.

**Powder:** Powdered Frangula is yellowish-brown; characterised by fragments of brownish or purplish cork; fragments of groups of lignified bast fibres, accompanied by crystal-sheath; occasional fragments of slightly lignified fibres; fragments, showing cells of medullary rays, with yellow contents, coloured red with solutions of alkalis or with sodium hypochlorite T.S. cluster crystals of calcium oxalate, 10 to 25  $\mu$  in diameter; prisms of calcium oxalate, 7 to 15  $\mu$  long, few starch granules 3 to 10 microns in diameter.

**Chemical constituents:**

Frangulin glycoside, gluco-frangulin and frangula-emodin.

**Tests for identity:**

- On microsublimation, powdered Frangula gives a yellow acicular crystalline sublimate, which produces a red colouration with dilute solutions of alkalis.
- Boil 0.1 g of the crushed or powdered Frangula with 4 ml of alcoholic potassium hydroxide T.S. for about 2 to 3 minutes, dilute with 4 ml of water and filter. Acidify 5 ml of the filtrate with dilute hydrochloric acid, filter, if necessary, cool and shake well with 5 ml of ether or benzene.

Separate the yellowish ethereal layer into a clean test-tube and shake with 2 ml of dilute solution of ammonium hydroxide; a cherry-red colour is produced in the aqueous layer, while the ethereal remains light yellow.

**Tests for purity:**

- Carry out the method for thin-layer chromatography (volume 2), using Sillicagel G as the coating substance and a mixture of ethyl acetate, methanol and water (100:17:13) as the mobile phase, but allowing the solvent to ascend 10 cm above the line of application. Apply separately to the chromatoplate, as bands 15 mm long and not more than 5 mm wide, 10 ml of each of the following two solutions. For solution (1), heat to boiling 0.5 g, in fine powder with 5 ml of ethanol (70 per cent), cool and centrifuge; decant the supernatant liquid immediately and use within thirty minutes; for solution (2) dissolve 20 mg of barbaloin in 10 ml of ethanol (70 per cent).

After removal of the chromatoplate, allow the solvent to evaporate for five minutes at room temperature then spray immediately with a freshly prepared 0.1 per cent w/v solution of N,N-dimethyl-p-nitrosoaniline in pyridine, using about 10 ml for a 200 x 200 mm plate; no grey-blue bands should appear (anthrones). Spray with a 5 per cent w/v solution of potassium hydroxide in ethanol (50 per cent), heat at 100° to 105° for 15 minutes and examine immediately. The chromatogram obtained with solution (2) shows a

red-brown band due to barbaloin ( $R_f$ , 0.4 to 0.5). The chromatogram obtained with solution (1) shows several red bands, the most important having an  $R_f$ , value about 0.25 to 0.35 (glucofrangulin =emodin rhamnoglucosides). A red band with an  $R_f$ , value of about 0.10 to 0.15 should not be present. When examined under an ultraviolet lamp having a maximum output at about 366 nm, the chromatogram obtained with solution (1) shows no bands with an intense yellow or blue fluorescence (absence of other species of *Rhamnus*).

(b) Powdered Frangula contains no sclereids (*R. purchiana* DC and *R. carniolica* A. Kern.), no knotty twisted fibres and not more than few starch granules (*Alnus*, *Prunus* and other species of *Rahmnus*). Fragments of powdered Frangula are not coloured red with vanillin in hydrochloric acid T.S. (*Prunus padus*).

(c) Not more than 8.0 per cent of ash; acid-insoluble ash, not more than 2.0 per cent.

**Uses:**

Cathartic.

**Storage:**

In well-closed containers, protected from light.

## Rhamnus purshiana DC

### **Family name:**

Rhamnaceae.

### **Synonym:**

- (a) *Frangula purshiana* Cooper
- (b) *Rhamnus anonifolia* Greene
- (c) *Rhamnus ovalifolius* Pursh

### **Common names:**

- (a) Cascara Sagrada, cascara buckthorn, bearberry, Chitien bark, Chittambark (E).
- (b) Écorce sacrée, nerprun cascara, nerprun de Pursh Cascara (F).



### **African names:**

- (a) Arabic: القشرة المقدسة
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Very polymorphous tree of varied forms, dimension and texture. Leaves are generally rigid, ovate, sharp-pointed with pinnated venation and close secondary veins; inflorescence in small umbellar cymes; red berries that become black when ripe.

### **Geographical distribution:**

Originates from California, cultivated in the mountainous regions of East Africa, especially Kenya.

### **Part used:**

Stem bark.

### **Names of drug:**

Cortex Rhamni Purshianae. Cascara Bark, Cascara sagrada

### **Definition:**

Cascara Sagrada is the dried stem bark of *Rhamnus purshiana* DC (family, Rhamnaceae) collected, at least, one year before being employed medicinally. Cascara Sagrada contains 6-9 per cent of anthraquinone glycosides and not more than 4.0 per cent of foreign organic matter.

### **Description:**

Odour, faint, but characteristic; taste, bitter, nauseous and persistent.

**Macroscopical:** Cascara Sagrada occurs in quills, channelled or nearly flat pieces; varying in size, up to 20 cm long, 2 cm broad and 1 to 5 mm thick; outer surface, dark brown, purplish-brown or reddish-brown, smooth or longitudinally ridged, marked with transversely elongated lenticels, usually covered with grey or whitish lichen, and occasionally bearing yellowish-green tufted moss; inner surface, dull yellowish-brown to

dark reddish-brown, longitudinally striated and somewhat corrugated transversely; fracture, short and granular in the outer and somewhat fibrous in the inner part.

**Microscopical:** Cork, frequently bearing dense masses of lichen tissues, and formed of several layers of small, flattened thin-walled cells with yellowish-brown contents. Cortex, narrow, yellowish-grey, consisting of few layers of collenchyma and several layers of parenchyma, containing starch granules and scattered cluster crystals of calcium oxalate, and showing numerous scattered, bright ovoid groups of sclereids, usually encircled by crystal-cells with prisms of calcium oxalate. Phloem, wide, brownish-yellow, traversed by numerous wavy medullary rays, 1 to 5 cells wide and up to 25 cells high; and consists of alternating bands of lignified fibres, surrounded by crystal-sheath with prisms of calcium oxalate and of soft tissue of sieve tissue and parenchyma with scattered cluster crystals of calcium oxalate and starch granules; each fibre, 8 to 15  $\mu$  wide; groups of sclereids are also found in the outer part of the phloem. The sclereids possess thick stratified pitted walls. The parenchyma may contain a yellow substance, changing to crimson with sodium hydroxide T.S.

**Powder:** Powdered Cascara Sagrada is brownish-yellow to olive brown; characterised by numerous fragments of lignified bast fibres; fibres in groups, accompanied by crystal-sheath; sclereids, in groups, sometimes isolated; fragments of yellowish-brown cork; numerous brown fragments of parenchyma; numerous crystals of calcium oxalate, clusters and prisms; cluster crystals, 5 to 20  $\mu$  occasionally up to 45  $\mu$  in diameter; fragments of phloem tissue crossed or traversed by medullary rays; starch granules, spheroidal, 4 to 5  $\mu$  and up to 8  $\mu$  in diameter.

#### **Chemical constituents:**

Several glycosides of emodins (emodin, iso-emodin, aloe-emodin) and of chrysophanol. Also cascarosides A, B, C and D as well as small quantities of break-down products of these glycosides.

#### **Tests for identity:**

- (a) Place a small quantity of the drug, in powder, on a microscope slide. Add one drop of sodium hydroxide solution, and examine. The yellow substance present in the cells of the parenchyma is coloured violet.
- (b) On micro sublimation, powdered Cascara Sagrada gives a yellow crystalline sublimate, which produces a reddish-brown colouration with solutions of alkalis.
- (c) Boil 0.1 g of the crushed or powdered Cascara Sagrada with 4 ml of alcoholic potassium hydroxide T.S. for about 2 to 3 minutes, dilute with 4 ml of water and filter. Acidify 5 ml of the filtrate with dilute hydrochloric acid, filter, if necessary, cool, and shake with 5 ml of ether or benzene. Separate the yellowish-ethereal layer into a clean test-tube and shake with 2 ml of dilute solution of ammonium hydroxide; an orange red to deep orange-red colour is produced in the aqueous layer (distinction from Frangula).

#### **Tests for purity:**

- (a) Water-soluble extractive, not less than 23.0 per cent.
- (b) Ash, not more than 7.0 per cent.
- (c) Moisture, not more than 10 per cent.

#### **Pharmaceutical preparations:**

Extractum Rhamni Purshiana Fluidum.

Cascara and Belladonna Mixture (compound Cascara Mixture),

Cascara Dry Extract.

Cascara Elixir.

Cascara Tablets.

***Uses:***

Cathartic.

***Storage:***

In well-closed containers, in a cool dry place, protected from light.

## **Ricinus communis L.**

### **Family name:**

Euphorbiaceae.

### **Synonyms:**

*Ricinus japonicus* Thunb.

*Ricinus laevis* DC.

*Ricinus sanguineus* hort. ex Groenl.

*Ricinus speciosus* Burm.

*Ricinus viridis* Willd.

### **Common names:**

Castor-oil plant, Castor Bean Palma Christi (E).

Ricin (F).

### **African names:**

(a) Arabic: خروع

(b) Bambara: Tomontigi

(c) Hausa: Zurma, Zurman kulakula,

(d) Cika cida, Dan kwasape, Zurma nasara,  
Zurmataho, Zurma mutane

(e) Peuhl:

(f) Swahili: Mbono, Nyonyo

(g) Yoruba: Lapa-lapa-adete, Lara, Ilara, Ilarun, Ewe laa, Upe-erenla, Upe-elila



### **Brief description of the plant:**

Shrub of 2 to 3 m high; branched at the base, round alternate leaves, palmate on long leaf stalks, palmatilobate with 7 dentate glandular lobes; inflorescence panicled with male flowers preceding female's capsules containing three arillated seeds.

### **Geographical distribution:**

Indigenous to tropical regions of Africa, probably native to Ethiopia, but has been adapted and cultivated in subtropical to temperate areas of the world.

### **Part used:**

Dried ripe seed.

### **Names of drug:**

Semen *Ricinus communis* L. Castor oil seed.

### **Definition:**

Castor oil seed is the dried ripe seed of *Ricinus communis* L. (family, Euphorbiaceae)

### **Description:**

The seeds have a slight odour and a weakly acrid taste.

**Macroscopic:** The seeds are rounded, oblong and somewhat flattened, from 8 to 12 mm long, 6 to 9 mm wide and 4 to 8 mm thick, with an arched, dorsal surface, and a nearly flat, ventral surface. The seed coat, which is thin and brittle, is smooth and glossy, varying in colour from greyish brown to grey, and mottled with reddish-brown or black spots and strips. At one extremity of the seed there is a prominent and usually pale coloured caruncle, from which the raphe runs along the ventral surface as a distinct line to the other extremity, where it terminates in a raised chalaza. The caruncle can be removed easily, disclosing the hilum beneath as a dark spot. A delicate, silvery-white

membrane inside the seed coat surrounds a large, yellowish-white oily endosperm, which encloses the embryo with two large, papery cotyledons. .

**Microscopical:** Epidermis consists of polygonal, pitted cells, some with, and others without, brown contents. The palisade layer of the seed coat, consisting of brown, pitted, and sclerenchymatous cells; the large aleurone grains of the endosperm and the abundant fixed oil. The aleurone grains are round or ovoid, and measure up to about 20  $\mu$  in diameter.

**Powder:** There are polygonal parenchymatous cells; occasional isodiametric, abundant oil cells and starch granules in the field of view; few cluster crystals of calcium oxalate; elongated fibres and vessels re of annular thickening. Tannins are present with yellow and brown colours.

**Chemical constituents:**

Castor oil seed contains about 50 per cent of fixed oil. The cake left after expression of the oil contains a crystalline principle, ricinine, the poisonous phytalbumose, ricin, and a very active lipase and other enzymes.

### CASTOR OIL

Castor oil is a fixed oil obtained by cold expression from castor oil seed. It occurs as a nearly colourless or pale yellow, viscid liquid, having a faint odour and a taste which is bland at first, but afterwards acrid and nauseating.

**Tests for identity:**

- (a) When 1 ml of the oil is shaken with 0.5 ml of light petroleum (B.P. 50-60°C) a clear solution is produced which becomes cloudy on the addition of a further 1.5 ml of the light petroleum.
- (b) It forms a clear solution with an equal volume of absolute alcohol.
- (c) On cooling the oil to 0°C it remains bright, but on cooling to about -18°C it congeals to a yellowish mass.
- (d) The specific gravity is high due to its high acetyl value and its high viscosity.
- (e) Castor oil contains the glycerides of ricinoleic and isoricinoleic acids; the glycerides of stearic and dihydroxy stearic acids are also present in small quantities. Ricinoleic acid is a viscid liquid, yields when acted upon by nitrous acid a crystalline body, ricinelaidic acid; a similar reaction occurs when castor oil is treated with acid.
- (f) Soluble in alcohol (90 per cent) (1 in 3.5);
- (g) miscible with dehydrated alcohol, ether and glacial acetic acid.

**Tests for purity:**

- a) Castor oil has a specific gravity 0.958 to 0.969.
- b) Refractive index at 40°C, 1.4695 to 1.4730.
- c) Acid value, not more than 4.0.
- d) Saponification value, 177 to 187.
- e) Iodine value, 82 to 90.
- f) Optical rotation, not less than +3°C.
- g) It remains bright when maintained at 0°C for three hours.

**Uses:**

Castor oil is a mild purgative. The oil is used as a rectal injection to remove impacted faeces, sometimes with olive oil. Externally, castor oil is sometimes applied, generally mixed with other emollients, for bed sores.

The oil is often used as an ingredient of spirituous hair lotions. It is an excellent solvent for alkaloids, such as cocaine and atropine, when used in ophthalmic surgery. Castor oil is best administered in milk or lemon juice, in capsules, or as Mistura Olei Ricini. The dose should be administered an hour before breakfast, on an empty stomach.

**Pharmaceutical preparations:**

Emulsio Olei Ricini Aromatici, (Emulsion of Aromatic castor oil).

Mistura Olei Ricini (Castor Oil mixture).

Oleum Ricini Aromaticum (Aromatic castor oil).

Unguentum Zinci et Olei Ricini (Zinc and castor oil ointment).

Unguentum Zinci et Olei Ricini Cum Benzoine (Zinc and castor oil ointment with Benzoin).

**Storage:**

In well-closed containers, protected from light.

## **Saccharum officinarum L.**

### **Family name:**

Poaceae.

### **Synonyms:**

- (a) *Saccharum sinense* Roxb.
- (b) *Saccharum violaceum* F. ViiI.

### **Common names:**

Sugar cane (E). Canne a sucre (F).

### **African names:**

- (a) Arabic: Quassab es Sukkar, Quassab
- (b) Bambara: Haussakala
- (c) Hausa: Cíí dà gééró, Arakkr, Rake , Kuburu, Karan sarkii, Dalimi, Gwalagwaji, Gyauron rake
- (d) Peuhl: N/A
- (e) Swahili: Muwa
- (f) Yoruba: Ireke

### **Brief description of the plant:**

Herbaceous plant that can reach 6 m in height; stem characterised by a series of nodes and internodes; propagation by cuttings; ribboned leaves up to 4 cm wide; inflorescence, plumose in terminal pyramidal panicles ranging from 0.5 to 1 m long.



### **Geographical distribution:**

Widely cultivated in the tropics.

### **Part used:**

Dried purified extract.

### **Names of drug:**

*Saccharum*. Sucrose. Sugar.

### **Definition:**

Sucrose is the purified disaccharide which may be obtained from *Saccharum officinarum* L. (family, Poaceae) and other sources.

### **Description:**

Sucrose occurs as colourless crystals, crystalline masses or blocks, or as white crystalline powder; odourless; taste, sweet. Sucrose is stable

### **Tests for identity:**

- (a) 1 g of sucrose is soluble in 0.5 ml of water and in about 170 ml of alcohol. It is insoluble in chloroform and ether.
- (b) Solution of sucrose is neutral to litmus paper.
- (c) To a few ml of an aqueous solution of sucrose, and a few drops of cobalt nitrate T.S. add excess of sodium hydroxide T.S.; permanent violet colour is produced.
- (d) Heat a little sucrose in a porcelain dish. It melts, swells up, and burns, developing an odour of burnt sugar, and a bulky carbonaceous residue is left.
- (e) Add sulfuric acid to a little sucrose; a brown colour is produced and the sugar is rapidly converted to a black carbonaceous mass.

(f) To a few ml of an aqueous solution of sucrose, add a few drops of dilute sulfuric acid, boil for a few minutes, neutralize with sodium hydroxide T.S., add potassium-cupric tartrate T.S., and then heat, a copious red precipitate of cuprous oxide is formed.

**Tests for purity:**

- (a) Specific rotation, determined in a 10 per cent aqueous solution, not less than +66°C and not more than +66.7°C.
- (b) 20 g sucrose completely dissolved in 10 ml of water giving a clear colourless or at least faintly yellow solution, when viewed transversely against a white background in a cylinder of colourless glass, having an inside diameter of about 2.5 cm, odourless and sweet syrup which when kept in well-closed, and completely filled bottle, deposits no sediment on prolonged standing (Foreign admixtures, insoluble salts, ultramarine or Prussian blue).
- (c) Mix 2 ml of the syrup form of the above test with 5 ml of alcohol; the solution remains clear (Dextrin, calcium sulfate and other admixtures).
- (d) Dissolve 10 g of sucrose in 20 ml of water, add 5 ml of potassium-cupric tartrate T.S., and heat to 50°C, not more than a trace of a red colour or yellow precipitate is formed (limit of reducing sugars).
- (e) Dissolve 1 g of sucrose in 10 ml of water and add 1 ml of ammonium oxalate T.S.; the solution remains clear for at least one minute (calcium salts).
- (f) Dissolve 1 g of sucrose in 10 ml of water, add 1 ml of dilute sulfuric acid, and allow to stand for 24 hours; no turbidity is produced (Limit of barium and of strontium salts).
- (g) Dissolve 1 g of sucrose in 10 ml of water, transfer to a Nessler tube and continue as mentioned in volume 2 under "Limit test for chlorides" (Limit of chlorides).
- (h) Dissolve 20 g of sucrose in 20 ml of water, transfer to a Nessler tube and continue as mentioned in volume 2 under "Limit test for sulfates" (Limit of sulfate).
- (i) Dissolve 1 g of sucrose in 10 ml of water, and continue as mentioned in volume 2 under "Limit test for Heavy Metals", in presence of Lead (Limit of heavy metals).
- (j) Dissolve 10 g of sucrose in 10 ml of water, transfer to a Nessler tube, and continue as mentioned in volume 2 under "Limit test for lead", using 2 ml of standard solution of lead limit, for comparison (Limit of lead).
- (k) Make a paste of 10 g of sucrose and 2 g of calcium hydroxide with 5 ml of water in a porcelain dish, and continue as mentioned in volume 2 under "Limit test for Arsenic in Organic Compounds" (Limit of arsenic).
- (l) Sucrose leaves on ignition, not more than 0.05 per cent of residue.

**Pharmaceutical preparation:**

Sirupus Simplex.

**Uses:**

Sucrose is employed in Pharmacy chiefly as a sweetening agent and demulcent preservative. In large quantities it is recommended in wasting diseases as phthisis and cancer, intravenous injection in case of heart failure.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.



## **Scadoxus multiflorus (Martyn) Raf.**

### **Family name:**

Amaryllidaceae.

### **Synonyms:**

- (a) *Haemanthus multiflorus* Martyn
- (b) *Haemanthus coccineus* Forssk
- (c) *Amaryllis multiflora* (Martyn) Tratt.
- (d) *Nerissa multiflora* (Martyn) Salisb.



### **Common names:**

Football lily, African Blood Lily , Powder puff Lily, Blood Flower, Common fire ball, Pom Pom, Blood lily (E)  
Boule de feu, Haemanthe multiflore (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Gatarin kurege = *H. rupestris*, Albásar kwaadíí, Gaatarin kureege; Kureegee jerboa.
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Areyinkosun

### **Brief description of the plant:**

Stout bulb giving rise to a lateral inflorescence 1-2 ft. high with red-blotched scape; flowers numerous, scarlet, in a spherical head; leaves sheathed together at the base into a false stem, fully expanding after flowering; in forest margin, secondary forest and in savanna woodland. The leaves are smooth and dark green in colour and fresh ones appear after flowering. The plant grows to a height of 12-18 inches and blooms only once a year. It is found in forest margin, secondary forest and in savanna woodland.

### **Geographical distribution:**

Widespread in tropical Africa.

### **Part used:**

Roots (Bulb).

### **Name of drug:**

Blood lily.

### **Definition:**

Blood lily is the dried bulb of *Haemanthus multiflorus* Martyn also known as *Scadoxus multiflorus* (Martyn) Raf. (family, Amaryllidaceae).

### **Description:**

**Macroscopical:** A fleshy herbaceous plant with a large bulb bearing leaves to 25 cm long by 8 cm wide which appear during the rainy season. The inflorescence a globular head of red flowers to 15 cm in diameter borne on a spotted scape 20–40 cm long which is produced in the dry season while the bulb is still leafless; of savanna woodland throughout the Region, and widespread in tropical Africa. The flowers are distinctly decorative and the plant is often grown as an ornamental, and also for superstitious

purposes. Most of the species have brush-like flowerheads enclosed in four or more membranous to fleshy spathe bracts which usually match the flower colour and, like sepals, protect the flowerheads from damage and desiccation. The flowers produce abundant nectar and pollen and a faint smell unattractive to humans. Fruits are mostly globose and when ripe, range through bright red, to pink, orange and white, and are usually aromatic. Three of the species, *H. albiflos*, *H. deformis* and *H. pauculifolius* are evergreen; these three species have bulbs that are only partly buried, the exposed section often turning bright green. The winter rainfall region's bulbs on the other hand are mostly from arid habitats and are found fairly deep below the surface, usually flowering before producing leaves. The genus produces relatively large bulbs that act as food and water storage organs, and consist of fleshy leafbases or tunics that may be arranged in two obvious ranks - termed a distichous arrangement. The morphology of the bulbs is useful in taxonomy and identification.

Haemanthus have from one to six leaves, ranging from broad, leathery and prostrate to narrow, crisped or succulent and erect, with a variety of surface textures from smooth to extremely hairy or even sticky. A few species such as *H. unifoliatus* and *H. nortieri*, usually produce only a single erect, broad leaf. *H. coccineus* and *H. sanguineus* were two of the first species in this genus to be described and because of their reddish flowers, gave rise to the generic name, being Greek for 'blood flower'.

**Chemical constituents:**

Xylanase and alpha-amylase inhibitor protein (XAIP).

**Tests for identity:**

Macroscopical examination of the specimen to ensure compliance with the above given descriptions.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

It can be used as stimulants, cardiac tonic.

**Storage:**

In a cool, dry and dark location.

## **Schwenckia americana L.**

### **Family name:**

Solanaceae.

### **Synonyms:**

- (a) *Schwenckia adscedens* Link
- (b) *Schwenckia angustifolia* Benth.
- (c) *Schwenckia guianensis* Benth.
- (d) *Schwenckia guineensis* Schumach. & Thonn.
- (e) *Schwenckia hirta* Benth.
- (f) *Schwenckia americana* var. *hirta* (Klotzsch) Carvalho
- (g) *Schwenckia hirta* Klotzsch
- (h) *Schwenckia hirta* var. *angustifolia* Benth.



### **Common names:**

Schwenckia (E)

### **African names:**

- (a) Arabic: قصب السكر
- (b) Bambara: N/A
- (c) Hausa: Dandana, Farfetsi
- (d) Peuhl: Gérôwil
- (e) Swahili: N/A
- (f) Yoruba: Ale-odan, Igbale-odan, Oju isin

### **Brief description of the plant:**

Slender herb; leaves alternate, simple, ovate-elliptic, base acute, somewhat decurrent on the petiole, margin entire, apex obtuse-rounded; inflorescence a slender panicle; corolla strictly tubular, pinkish-purple; fruit a capsule.

### **Geographical distribution:**

*Schwenckia americana* is native to Central and South America, but it has spread to tropical Africa and India as a weed. In tropical Africa it was restricted to West and Central Africa, but in recent decades it has also reached East and southern Africa.

### **Part used:**

Whole plant, Leaves, roots, stem.

### **Name of drug:**

Scwenckia.

### **Definition:**

Schwenckia is the dried areal parts of *Schwenckia americana* L. (family, Solanaceae).

### **Description:**

**Macroscopical:** Annual or short-living perennial herb, erect or ascending and spreading, up to 70(–100) cm tall; stem grooved, glabrous but young parts sometimes with curved hairs. Leaves arranged spirally, simple and entire; stipules absent; petiole up to 8 mm long; blade ovate to obovate, up to 4 cm × 2 cm, base cuneate to rounded, apex acute to rounded, almost glabrous to densely short-hairy. Inflorescence a lax, terminal panicle, many-flowered; peduncle 2–12 cm long, slightly longer in fruit. Flowers bisexual, slightly zygomorphic; pedicel 2–4 mm long, erect or curved; calyx tubular, 2–4 mm long,

4–5-lobed, lobes acute to acuminate; corolla narrowly tubular, 6–8 mm long, white, greenish yellow, pale blue to purplish, lobes unequal, up to 0.5 mm long; stamens 2, attached to corolla tube, filaments 0.5–3 mm long, staminodes 3, resembling filaments; ovary superior, ellipsoid, 1–2 mm long, style 3–6 mm long, stigma small, exserted. Fruit a globose or ovoid capsule 3.5–4.5 mm × 2.5–4.5 mm, pale brown, dehiscent, many-seeded. Seeds prismatic, 0.5–1 mm long, black or reddish. Seedling with epigeal germination.

***Chemical constituents:***

The plant is reported to contain carbohydrates, reducing sugars, cardiac glycosides, saponins, steroids, triterpenes, flavonoids, cyanogenic glycosides, tannins, alkaloids and resins.

***Tests for identity:***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Anti-inflammatory, analgesic.

***Storage:***

In a cool dry place.

## **Senna alata (L.) Roxb.,**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia alata* L.
- (b) *Senna alata* (L.) Roxb.,
- (c) *Herpetica alata* (L.) Raf.
- (d) *Cassia bracteata* L. f
- (e) *Cassia herpetica* Jacq.
- (f) *Cassia rumpfiana* (DC.) Bojer



### **Common names:**

Candlebush, Candlesticks, Christmas-candle, Emperor's Candlesticks, Ringworm Plant, Winged Senna (E)  
Herbe à Dartres, Fleur à Dartre, Fleur St. Christophe, Dartrier (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Plasco, Rai dore, Majamfari, Sanga sanga,
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Asunwon oyinbo, Asunwon pupa, Asunron oyinbo, Asunrun

### **Brief description of the plant:**

*Cassia alata* L. or *Senna alata* (L.) Roxb. is a shrub, 2-3m high, widely distributed in the tropical countries. It is A shrub 1-5 m tall. Stem marked with leaf scars and persistent stipules. Stipules 6-9 mm long, persistent, auriculate. Petiole 1.5-2.5 cm long, rachis 30-60 cm long, leaflets 8-24 pairs, 3-15 cm long, 2-7 cm wide, oblong-elliptic or oblong-obovate, top rounded or slightly notched. Raceme 15-70 cm long; bracts 2-3 cm long, enclosing the bud, caducous. Flowers yellow. Sepals 1.5-2 cm long, 4-6 mm wide. Petals 1.5-2 cm long, 1 cm wide. Stamens 9 or 10, variable in size, all functional. Pod straight with 2 longitudinal wings, 40-60 seeded.

### **Geographical distribution:**

Widely spread in the Tropics of both hemispheres, though probably only indigenous in America.

### **Part used:**

Leaves

### **Names of drug:**

Emperor's Candlesticks. Alata leaf.

### **Definition:**

Emperor's Candlesticks or Alata leaf is the fresh or dried leaves of *Senna alata* (L.) Roxb. or *Cassia alata* L (family, Fabaceae)

### **Description:**

**Macroscopical:** Perennial, Shrubs, Woody throughout, Stems woody below, or from woody crown or caudex, Taproot present, Stems erect or ascending, Stems less than 1 m

tall, Stems 1-2 m tall, Stems greater than 2 m tall, Stems solid, Stems or young twigs glabrous or sparsely glabrate, Stems or young twigs sparsely to densely hairy, Stem hairs hispid to villous, Leaves alternate, Leaves petiolate, Stipules inconspicuous, absent, or caducous, Stipules conspicuous, Stipules setiform, subulate or acicular, Stipules persistent, Stipules free, Leaves compound, Leaves even pinnate, Leaf or leaflet margins entire, Leaflets opposite, Leaflets 10-many, Leaves glabrous or nearly so, Inflorescences racemes, Inflorescences spikes or spike-like, Inflorescence axillary, Bracts conspicuously present, Bracts very small, absent or caducous, Flowers actinomorphic or somewhat irregular, Calyx 5-lobed, Calyx glabrous, Petals separate, Petals orange or yellow, Fertile stamens 6-8, Stamens heteromorphic, graded in size, Stamens completely free, separate, Filaments glabrous, Anthers opening by basal or terminal pores or slits, Style terete, Fruit a legume, Fruit stipitate, Fruit unilocular, Fruit freely dehiscent, Fruit elongate, straight, Fruit oblong or ellipsoidal, Fruits quadrangular, Fruits winged, carinate, or samaroid, Fruit exserted from calyx, Fruit internally septate between the seeds, Fruit compressed between seeds, Fruit glabrous or glabrate, Fruit 11-many seeded, Seed with elliptical line or depression, pleurogram, Seeds ovoid to rounded in outline, Seed surface smooth, Seeds olive, brown, or black.

**Microscopical:** Epidermal layer consists of polygonal cells covered by a thin, warty and undulating cuticle; stomata are paracytic; epidermal cells wavy and stomata fewer on upper surface; covering trichomes with pointed tips, thick and warty walls, conical and sometimes appressed to the epidermis, present on both surfaces, unicellular with the base surrounded by radially elongated epidermal cells; clusters of calcium oxalate distributed throughout the tissue while prisms are found in the epidermal cells; transverse section presents a dorsiventral leaf arrangement, thick cuticle, papillose on lower surface, cuboidal epidermal cells; thick warty-walled, with a layer of discontinuous mono-layer palisade cells, below the upper epidermis with almost straight anticlinal walls; interrupted in midrib region by spongy mesophyll cells; midrib projects on the lower surface and is traversed by a vascular strand formed by an arch of collateral vascular bundles, endodermis in two semi-circles enclosing the collateral vascular bundle, whole strand surrounded by a sclerenchymatous pericycle followed by the cortex, consisting of 3-5 rows of parenchyma cells and 2-3 rows of collenchyma cells; xylem vessels and the endodermis (fibrous) are lignified while the epidermis and mesophyll cells contain mucilage, the latter also contain round yellowish ergastic substances.

**Powder:** Green in colour with characteristic bitter taste. Consists of fragments of epidermal cells which are polygonal in shape showing paracytic stomata, fragments showing cicatrix with epidermal cells radiating outwards, xylem tissue: reticulate, (lignified) annular, spiral vessels; few phloem fibres non-lignified; characteristic warty-walled covering trichomes, unicellular and uniseriate, appressed, fragments of pitted vessels and groups of fibres with prisms of calcium oxalate crystals which may also be isolated and also occurring as sheaths on veins, Starch grains 26u-42u by 49u-120u.

#### **Chemical constituents:**

Anthraquinones: aloë-emodin, rhein glycoside and aloë-emodin glycoside, sennosides, rhein, crysophanic acid; tannins and mucilage

#### **Tests for identity**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- b) Macrochemical test (Borntrager's test) to confirm the presence of anthraquinone derivatives
- c) Thin-layer chromatographic examination of an extract of the specimen to confirm the presence of aloë-emodin by co-chromatography.

***Tests for purity:***

Moisture: loses not more than 12 per cent. (course powder) when dried at 100°C

Ash: Not more than 10 per cent.

Acid insoluble ash: Not more than 1.6 per cent.

***Pharmaceutical preparations:***

See under Alexandrian senna

***Uses:***

Antidiarrhoeal, antibacterial, antifungal, antiviral.

***Storage:***

In a cool dry place.

## **Senna alexandrina Mill And Cassia angustifolia Vahl.**

### **Family name:**

Fabaceae.

### **Synonyms:**

(a) *Cassia acutifolia* Del.

- *Cassia lanceolata* Collado
- *Cassia lentiva* Brisch.
- *Cassia Senna* L.
- *Senna acutifolia* Link.
- *S. alexandrina* Gars

(b) *Cassia angustifolia* Vahl.

- *Cassia elongata* Lam.
- *Cassia lanceolata* Wight and Am.



### **Common names:**

(a) *Cassia acutifolia* Del.

Alexandrian Senna (E).

Sene d' Alexandrie or Sene de Khartoum (F).

(b) *Cassia angustifolia* Vahl.

Tinnevelly Senna (E). Sene de Tinnevelly or Sene de l'Inde (F).

### **African names:**

(a) Arabic: سنامكي او سنا حجازي

(b) Bambara: N/A

(c) Hausa: Filaskon maka, Ilesko, Rinji

(d) Peuhl: Falajin, Sanjerehi,

(e) Swahili: Msahala

(f) Yoruba: N/A

### **Brief description of the plant:**

*Cassia acutifolia* Del.: Sub-shrub of 40 to 60 cm with erect stalks with paripinnate alternate leaves with 4 or 5 pairs of pinnous leaflets, yellow flowers that blossom in axillary bunches. Bract flat pod.

*Cassia angustifolia* Vahl.: Distinctive feature: 5 to 8 pairs of leaflets.

### **Geographical distribution:**

These species are present in the semi-desert and sudano-sahelian zones of Africa. .

### **Parts used:**

Dried ripe fruits and leaves.

### **Names of drug:**

Fructus sennae. Senna Fruit. Follicule de Sene.

### **Definition:**

Senna fruit or Senna leaf is the dried ripe fruit or leaf of *Cassia Senna* L. (*C. acutifolia* Delile) known as Alexandrian Senna pods or leaf and of *Cassia angustifolia* Vahl., known as Tinnevelly Senna pods or leaf (family Fabaceae). Senna Fruit contains not more than 2 per cent of foreign organic matter.

### **Description:**

Odour and taste, slight but characteristic.

**Macroscopic:** Alexandrian Senna pods: Fruit, legume, entire compressed laterally, almost flat, broadly oblong or subreniform, thin and papery; 3 to 6 cm long, and up to 3 cm wide; pale green to greenish-brown with a brown central area over the positions of the seeds; apex rounded, with a slightly projecting point or a scar left by the style; base, cuspidate,

sometimes ending in a short stalk. Pericarp, dry and membranous. Seeds, 5 to 7 in each fruit, attached to central suture by thin funicles, obovate, wedge-shaped, hard; 5 to 6 mm long and 3 to 4 mm wide, having reticulated, but not transversely ridged whitish-green surface and a short

raised ridge on each of the 2 flat sides at the bluntly-pointed end, where the hilum is situated; embryo, large and straight, with green flat cotyledons and surrounded by a scanty grey endosperm.

Tinnevelly Senna pods: differs from Alexandrian Senna pods in having more extensive central brown area.

Alexandrian Senna leaf: Greyish-green, thin fragile leaflets, lanceolate, mucronate, asymmetrical at the base, 20 to 40 mm long and 5 to 15 mm wide, the maximum width being at a point slightly below the centre, lamina slightly undulant, both surfaces covered with fine, short trichomes. Pinnate venation with lateral veins leaving the midrib at an angle of about 60° and anastomosing to form a ridge near the margin.

Tinnevelly Senna leaf: Yellowish-green leaflets, elongated and lanceolate, slightly asymmetrical at the base, 30 to 50 mm long and 7 to 20 mm wide at the centre. The two surfaces are smooth with a very small number of trichomes, and frequently marked with transverse or oblique lines.

Up to 5 cm long and up to 2 cm wide somewhat straighter and the remains of the style usually more distinct. Seeds, 6 to 8 in each fruit, having reticulate and indefinite wavy transverse ridges on the testa. Tinnevelly Senna pods: Contain not less than 2.2 per cent of hydroxyanthracene

derivatives, calculated as sennosides B while Alexandrian Senna pods contain not less than 3.6 per cent.

**Microscopic:** Outer epidermis of the pericarp consists of isodiametric cells with very thick outer walls, occasional stomata of the rubiaceous type and few unicellular warty hairs. Mesocarp consists of a hypodermis of rounded collenchymatous cells, followed by parenchymatous cells with thin wavy walls, each of the innermost cells contains a prism of calcium oxalate. Endocarp composed of 2 to 4 layers of crossing fibres. Seed-coat consists of an epidermis formed of palisade-like thickened cells, followed by a layer of bearer-cells of horseshoe-shaped outline, thin layers of parenchyma, a layer of thick-walled cells and lastly several layers of collapse parenchyma. Endosperm, of polygonal cells with thickened mucilagenous stratified walls. Embryo and cotyledons, mainly of thinwalled palisade tissue.

**Powder:** Light-green to greenish-yellow. Diagnostic structures: polygonal epidermal cells showing paracytic stomata. Unicellular trichomes, conical in shape, with warty walls, isolated or attached to fragments of epidermis. Fragments of vascular bundles with a sheath of prismatic crystals of calcium oxalate. Cluster crystals isolated or in fragments of parenchyma.

Leaf epidermis with polygonal cells, frequently mucilaginous. Unicellular trichomes, conical, often slightly arched with thick warty walls, up to 250 mm long; paracytic stomata, numerous on both surfaces. Cluster crystals of calcium oxalate distributed throughout the lacunose tissue.

Fibrovascular strands incompletely surrounded by fibres with a crystal sheath containing prismatic crystals of calcium oxalate.

Stomatal index Alexandrian Senna, 10 to 12.5 to 15.

Tinnevelly Senna, 14 to 17.5 to 20.

**Chemical constituents:**

Sennosides A, B, C and D; also rhein, aloe-emodin free and in glycosidal combinations.

**Tests for identity:**

(a) Water-soluble extractive of Senna pods is not less than 25 per cent. (pods) 3 per cent. (leaf)

(b) Heat about 25 mg, in fine powder with 50 ml of water and 2 ml of hydrochloric acid in a water-bath for 15 minutes; allow the mixture to cool, add 40 ml of ether, shake, allow to separate, and dry the ethereal layer with anhydrous sodium sulphate; evaporate 5 ml of the ethereal solution to dryness, allow the residue to cool, and add 5 ml dilute ammonia solution; a yellow or, at most, orange colour is produced. Heat the solution on a water-bath for 2 minutes; a reddish-violet colour is produced.

(c) Ash (pods) not more than 6 per cent., 12 per cent (pods). Foreign organic matter, not more than 1 per cent. (pods) 1 per cent. (leaf). Acid-insoluble ash, not more than 2 per cent. (pods), 2 per cent. (leaf). Moisture, not more than 12 per cent.(pods), 10 per cent. (leaf).

(d) Carry out the method for thin-layer chromatography as described in vol. 2, using silica gel GF 254 as the coating substance and a mixture of propan-1-ol, ethyle acetate and water (ratio 4:4:3) as the mobile phase, but allowing the solvent front to ascend 10 cm above the line of application. Apply separately to the chromatoplate, as bands 15mm long and not more than 5 mm wide, 10 ul of each of the following solutions A and B. For solution (A), heat to boiling 0.5 g, in fine powder, with 5 ml of a mixture of equal volumes of ethanol (96 per cent) and water, centrifuge, and use the supernatant liquid; for solution (B) dissolve 10 mg of sennoside A and

10 mg of sennoside B in 10 ml of the mobile phase, with gentle warming if necessary. After removal of the chromatoplate allow the solvent to evaporate, spray with a 25 per cent w/v solution of nitric acid, heat for 10 minutes at 120°C, allow to cool, and spray again with a 5 per cent w/v solution of potassium hydroxide in ethanol (50 per cent) until the spots appear. The

chromatogram obtained with solution (A) shows two purplish-brown spots, due to sennoside B ( $R_f$  0.1 to 0.2) and sennoside A ( $R_f$  0.3 to 0.35), with  $R_f$  values similar to those in the chromatogram obtained with solution (B). The chromatogram obtained with solution (A) also shows a red spot, due to rhein-8-glucoside ( $R_f$  0.5 to 0.7).

**Test for purity:**

The pods should contain not less than 2.2 per cent of hydroxyanthracene glycosides, calculated as sennoside B when determined by spectrophotometry or by high performance liquid chromatography.

***Pharmaceutical preparations:***

Senna Liquid Extract.  
Senna Tablet.

***Uses:***

Laxative, at a dose of 0.5-2.0 g. at bed time as hot tea. As purgative, 2-4g as hot tea at bed time.

***Storage:***

In well-closed containers, protected from light and moisture.

## **Senna italica Mill.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia obovata* Collado
- (b) *Cassia aschrk* Forsk.
- (c) *Cassia italica* (Mill.) Spreng

### **Common names:**

Dog senna, Italian senna, Spanish senna (E).  
Sene africain. Sene du Senegal (F).

### **African names:**

- (a) Arabic: سنا الكلب
- (b) Ashreq; Senna ghanami, Zenina
- (c) Bambara: Balibali, M'bali mbali
- (d) Hausa: Illesko, Filasko, Filaskoo
- (e) Peuhl: Sanjeréhy, Falajin
- (f) Swahili: N/A
- (g) Yoruba: N/A



### **Brief description of the plant:**

*Cassia italica* Mill. Distinctive characteristic: 5 to 6 pairs of obovate leaflets with mucronated tips. Fruits highly arched on the two sides with seeds having a protruding middle ridge.

### **Geographical distribution:**

This species is present in the semi-desert and sudano-sahelian zones of Africa.

### **Part used:**

Leaf.

### **Names of drug:**

Dog Senna. Senna of Senegal. Sene du Port Royal.

### **Definition:**

Dog Senna is the dry leaflets of *Cassia italica* Mill. (family, Fabaceae).

### **Description:**

**Macroscopical:** Leaves are broadly ovate, apex abruptly tapering, venation pinnate, distinct, pale greyish-green, no odour, slightly bitter taste.

**Microscopical:** Epidermis, of straight walls, polygonal tabular cells, covered with thick, striated cuticle, stomata of paracytic type, hairs are non-glandular, conical, multicellular, uniseriate overed with warty cuticle. The mesophyll is heterogenous, dorsiventral, palisade of 3 rows. Arc

of vascular bundle is surrounded by an arc of lignified pericyclic fibres. Calcium oxalate prisms are absent.

**Powder:** Greyish-green in colour, tasteless, to slightly bitter, without any distinct odour. It is characterised by the presence of epidermal cells, straight-walled, striated cuticle, paracytic stomata, non-glandular multicellular uniseriate conical hairs, lignified fibres, vessels, absence of prisms of calcium oxalate.

***Chemical constituents:***

2.5 per cent oxymethyl anthraquinones; mainly sennosides A and B, mucilage; flavonoids of kampherol, iso-rhamnitol,

***Tests for identity:***

As for Alexandrian Senna.

***Tests for purity:***

Yields 30-40 per cent of water extractives, not more than 2 per cent of stalks, 1 per cent of foreign matter and not more than 12 per cent sulphated ash and 2 per cent of acid-insoluble ash.

***Assay:***

N/A

***Pharmaceutical preparations:***

See under the monograph for Alexandrian senna

***Uses:***

Purgative. Drink one big glass of the infusion of the leaf at night before going to bed.

***Storage:***

In well-closed containers, protected from light.

## **Senna occidentalis (L.) Link**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia occidentalis* L.
- (b) *Cassia caroliniana* Walter
- (c) *C. ciliata* Raff.
- (d) *C. falcata* L.
- (e) *C. foetida* Pers.
- (f) *C. longisiliqua* Schrank
- (g) *C. macradenia* Collad
- (h) *C. obliquifolia* L.
- (i) *C. occidentalis* (L.) Rose
- (j) *C. planisiliqua* L.
- (k) *Ditremexa occidentalis* (L.) Britton & Rose ex Britton & P. Wilson
- (l) *Ditremexa occidentalis* (L.) Britton & Wilson



### **Common names:**

Arsenic Bean , Coffee Senna , Stinking Weed , Negro Coffee (E)Cassia occidentale, Faux kinkeliba, Gros Indigo á Fleurs Jaunes , Gros Indigo Sauvage, Herbe puante, Casse fetide (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Mbala, Nbalan balanfing
- (c) Hausa: Rai'dore, Albarka, Bajamfari, Ba-zanfaree, Kwarkwati, Majamfari,
- (d) Rairai, Yawan-rai, Zark-amo
- (e) Peuhl: N/A
- (f) Swahili: N/A
- (g) Yoruba: Rere, Abo rere, Asun-undegbe, Epooro-iseseope, Papala-omode

### **Brief description of the plant:**

The plant is a variable, branching, erect shrub, up to 1.8 m in height. Leaves pinnate pubescent, leaflets pale green to bluish green, 3 to 9 pairs, lanceolate or elliptic, varying on the same plant, 1.5 to 5 cm. X 0.4 to 2 cm. ; flowers brilliant yellow, in erect, terminal racemes ; pods light green when young to dark brown or black when mature, flat, thin, oblong pubescent, 3.5 to 7 cm. x 0.2 to 2.5 cm. ; seeds dark brown, obovate-oblong, 5 to 7.

### **Geographical distribution:**

A pantropical weed, of disturbed areas, especially damp sandy alluvium along river banks, coastal sand flats, grassland, roadside.

### **Part used:**

Leaves.

### **Name of drug:**

Coffee senna.

**Definition:**

Coffee senna consists of the dried leaves of *Senna occidentalis* (L.) Link. (*Cassia occidentalis* L.) (family, Fabaceae)

**Description:**

**Macroscopical:** Annual, or short-lived perennial, herb or sub-shrub with erect, simple, or sparsely branching stems (0,5-)1-1,8(-2) m high. Stems ridged, glandular, especially in the hollows between the ridges, and subglabrous when young, becoming  $\pm$  terete and glabrous with age. Leaves densely glandular and sparsely pubescent when young becoming sparsely glandular and  $\pm$  glabrous with age; petiole and rhachis 12-15(-20) cm long; stipules asymmetric, ovate-lanceolate, acute,  $\pm$  7 mm long,  $\pm$  3 mm wide, caducous; petiole (4-)5(-7) cm long including basal pulvinus; petiolar gland at distal end of pulvinus, sessile, hemispherical, globose or ovoid, blackish,  $\pm$  1 mm in diameter; rhachis without special glands; leaflets in 4-5 (-6) pairs, ovate to ovate-elliptic, occasionally lanceolate, (2,5-)4-10 cm long, (1,5-)2-4 cm wide, uppermost pair largest, bases rounded to asymmetric, apices acute to acuminate (sometimes obtuse or rounded on very young shoots), margins white-ciliate, almost pectinate, surfaces densely glandular when young, becoming  $\pm$  glandular adaxially and sparsely glandular abaxially with age. Inflorescences in axils of upper leaves, racemes short, almost umbellate, 2-4-flowered; peduncles, at flowering, 3-5 mm long, at fruiting to 8 mm; bracts 9-16 mm long, linear, acuminate; pedicels, at flowering,  $\pm$  5mm long, at fruiting  $\pm$ 15 mm long, sparsely to densely pubescent. Sepals obtuse, usually glabrous. Petals obovate, 0,9-1,5 mm long, 0,5-0,6 mm wide, pale yellow with brown venation that becomes conspicuous with age. Stamens 10: usually 4 staminodal (3 adaxial, 1 abaxial) linear, flattened, 6 functional of which 2 lateral-abaxial are largest, dehiscence porose. Ovaries densely velutinous, hairs white; stigma hooded,  $\pm$ 1 mm long, fringed with short, soft white hairs. Pods linear, straight or slightly curved upwards, 8-13 cm long, 0,5-0,8 cm wide, compressed, septate, sutures thickened, green or yellowish, valves sparsely pubescent with curved, white-appressed hairs, not or tardily dehiscent, many-seeded. Seeds laterally compressed, suborbicular or elliptic in face view, 4,5-5 mm long, 3,75-4,5 mm wide; testa greyish-brown with minute raised dots; areole on each face oblong to elliptic, finely horizontally striated,  $\pm$ 2,5 mm long,  $\pm$ 1,5 mm wide.

**Microscopical:** The testa comprises of an outer cuticularised layer surrounding a vascularised circumscribed layer; within is a monolayer of radially orientated nearly isodiametric cells; followed by an inner tangentially elongated sclerenchymatous tissue; a hyaline layer separates the testa from the endosperm. The leaves have straight walled epidermal cells with numerous paracytic stomata on both surfaces. Few scattered unicellular clothing trichomes.

**Powder:** Roasted seed, colour dark brown; odour aromatic coffee-like; sclerenchymatous tissue; sclereids; parenchymatous cells with oil; starch grains. The leaf powder has straight walled epidermal cells with few unicellular trichomes and scattered starch grains.

**Chemical constituents:**

The main plant chemicals in coffee senna include: achrosine, aloe-emodin, anthraquinones, anthrones, apigenin, aurantiobtin, campesterol, cassiollin, chrysobtin, chrysophanic acid, chrysarobin, chrysophanol, chrysoeriol, emodin, essential oils, funiculosin, galactopyranosyl, helminthosporin, islandicin, kaempferol, lignoceric

acid, linoleic acid, linolenic acid, mannitol, mannopyranosyl, matteucinol, obtusifolin, obtusin, oleic acid, phycion, quercetin, rhamnosides, rhein, rubrofusarin, sitosterols, tannins, and xanthorin.

**Tests for identity**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Microchemical test (Borntrager's) to confirm the presence of anthraquinone derivatives.
- (c) Thin-layer chromatographical examination to confirm the presence of aloe-emodine by co-chromatography.

**Tests for purity:**

Moisture: 8.84 per cent.

Ash: 11.54 per cent.

Water-soluble extractives: Not less than 21.64 per cent.

Alcohol (70 per cent.) –soluble extractives: 21.17 per cent.

**Pharmaceutical preparations:**

See under Alexandrian senna

**Uses:**

Laxative

**Storage:**

Store in airtight containers in a cool dry place.

## **Senna podocarpa (Guill. & Perr.) Lock**

### **Family name:**

Fabaceae.

### **Synonyms:**

*Cassia podocarpa* Guill. & Perr.

### **Common names:**

Podocarpa pod, Podocarpa leaf (E)

### **African names:**

Arabic: N/A

Bambara: N/A

Hausa: Rai dore

Peuhl: Yelok, Bendan, Kafaa

Swahili: N/A

Yoruba: Asunwon funfun, Asunwon anago, Aja-rere, Peiebe



### **Brief description of the plant:**

A glabrous shrub, up to 15 ft. high, with rather dense racemes of yellow flowers and thin flat pods; locally common on old farmland, mainly in forest regions.

### **Geographical distribution:**

Mainly in forest regions

### **Part used:**

Leaves.

### **Name of drug:**

Podocarpa leaf.

### **Definition:**

Podocarpa leaf consists of the fresh and dried leaflets of *Senna podocarpa* (Guill. & Perr.) Lock also known as *Cassia podocarpa* Guill. & Perr. (family, Fabaceae).

### **Description:**

**Macroscopical:** A glabrous shrub or small tree of 15 ft.; branches terete, smooth. Leaves ample 9–14 in. long; leaflets membranous in 4 or 5 pairs, elliptical obtuse mucronulate; the upper larger leaflets 4–6 in. long, 2–2 3/4 in. broad; petiolules 1–2 lines. Common petiole glandular. Stipules ovate-lanceolate, 1/4 in. long, more or less deciduous. Racemes dense, at first strobiliform, solitary from the upper axils on long erect naked peduncles, at length equalling or exceeding the leaves. Bracts imbricate, ovate, obtuse, deciduous. Pedicels 1/4– 1/3 in. Sepals subequal, obtuse, glabrous. Petals obovate or oblanceolate, obtuse, venose, clawed. Two of the anterior stamens with enlarged curved anthers 4–5 lines long. Legumes spreading or the fruit-pedicels recurved, straight or nearly so, broadly linear, flat, thinly coriaceous or firmly papery, shining, 2-valved, the thin pericarp depressed between the (15–20) seeds when dry, 3 1/2–4 1/2 in. long, 6–7 lines broad, tipped with the curved slender remains of the style. Fully developed seeds not seen.

**Microscopical:** Surface view shows warty walled clothing trichomes on epidermal cells with wavy walls on both surfaces, those on lower surface being wavier and smaller; leaf epidermis consists of polygonal epidermal cells with slightly wavy anticlinal walls covered with a thin cuticle showing paracytic stomata on both surfaces, but more

abundant on lower surface, cicatrices present; the epidermal cell measure 35 – 85 $\mu$  by 50-60 $\mu$  for the upper surface, while 60-90 $\mu$  by 40-70 $\mu$  for the lower surface; unicellular covering trichomes are conical in shape, with warty walls and often appressed to the epidermal surface, measuring 320 $\mu$  by 87 $\mu$  towards the middle; cluster crystals of calcium oxalate are enclosed in parenchyma cells, transverse section shows a bifacial structure containing two discontinuous palisade layers, interrupted by spongy mesophyll cells in the midrib region below the collenchymatous tissue in the lamina differentiates the leaf of *S. podocarpa* from *S. alata*. With only one layer of discontinuous palisade in the lamina region below the upper epidermis, mesophyll is differentiated into palisade and spongy tissue, a thin cuticle borders both surfaces; midrib projects on the abaxial surface and is transverse by a vascular strand formed by an arch of collateral vascular bundles; whole strand is surrounded by sclerenchymatous pericycle, followed outwards by the cortex, consisting of 4-6 rows of parenchyma cells and then by 305 rows of collenchyma cells; xylem tissue is lignified; spongy mesophyll contains starch, calcium oxalate, prismatic crystals and mucilaginous epidermis.

**Powder:** Colour, dark green to pale yellowish to deep brown; odour characteristic; taste astringent and slightly bitter. Consists of unicellular covering trichomes; paracytic stomata, cluster crystals of calcium oxalate and palisade cells are characteristic features with fragments of lamina; lignified vascular elements are identifiable in the veins and veinlets;

**Chemical constituents:**

Anthracene glycosides; O- and C- anthraquinone glycosides; free anthraquinones (emodin).

**Tests for identity**

- (a) Macroscopical and microscopical examination of the specimen to ensure it complies with the descriptions given above.
- (b) Microchemical (Bornträger's) test to confirm the presence of anthraquinone glycosides
- (c) Thin-layer chromatographic examination to confirm the presence of emodin by co-chromatography

**Tests for purity:**

Moisture: Not more than 12 per cent. (Course powder)

Ash: Not more than 10 per cent.

Acid-insoluble ash: Not more than 15 per cent.

Sulphated ash: Not more than 16 per cent.

Water-soluble ash: Not less than 3.5 per cent.

Water-soluble extractives: Not less than 17 per cent.

Alcohol (70 per cent.)-soluble extractives: Not less than 15 per cent.

Stomatal index: 2.6-4.5-9.1 9 (upper surface); 12.5-20-28.5 (lower surface)

Stomatal number: 24-46-72 (Upper surface); 306-480-708 (lower surface)

Palisade ratio: 4-5-6.5

Vein-islet number: 18-20-25.5

Veinlet termination number: 17-19.5-24.5

***Pharmaceutical preparations:***

See under Alexandrian senna.

***Uses:***

Treatment of malaria and constipation.

***Storage:***

In well-closed bottles in a cool, dry place protected from light and moisture.

## **Senna siamea (Lam.) H. S. Irwin & Barneby**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cassia Siamea* Lam.
- (b) *Senna sumatrana* (DC.) Roxb.
- (c) *Sciacassia siamea* (Lam.) Britton
- (d) *Cassia arborea* Macfad.
- (e) *Chamaefistula gigantea* G. Don
- (f) *Cassia florida* Vahl
- (g) *Cassia gigantea* DC.
- (h) *Cassia sumatrana* Roxb.
- (i) *Cassia sumatrana* DC.



### **Common names:**

Kassod Tree, Siamese Cassia, Siamese Senna (E)

### **African names:**

Arabic: N/A

Bambara: N/A

Hausa: N/A

Peuhl: N/A

Swahili: mjohoro

Yoruba: N/A

### **Brief description of the plant:**

*Cassia siamea* is a medium sized evergreen tree having a great many branches. The leaves are arranged in cascades and the flowers hang in bunches not unlike grapes. The petals are yellow and are from 5 cm to 7 cm in length.

### **Geographical distribution:**

A native of tropical Asia, now widely spread in the tropics.

### **Part used:**

Leaves.

### **Name of drug:**

Siamese senna leaf.

### **Definition:**

Siamese senna leaf is the dried leaf of *Cassia siamea* Lam. Otherwise known as *Senna siamea* (Lam.) H. S. Irwin & Barneby (family, Fabaceae).

### **Description:**

*Cassia siamea* is a medium sized evergreen tree having a great many branches. The leaves are

**Macroscopical:** *Senna siamea* is a medium-size, evergreen tree growing up to 18 m tall, with a straight trunk of up to 30 cm in diameter; bole short, crown usually dense and rounded at first, later becoming irregular and spreading with drooping branches. Bark grey or light brown, smooth but becoming slightly fissured with age. The root system consists of a few thick roots, growing to considerable depth, and a dense mat of rootlets in the top 10-20 cm of soil, which may reach a distance of 7 m from the stem in 1 year and eventually a distance up to 15 m. Leaves alternate, pinnately compound, 23-33 cm

long, with slender, green-reddish, tinged axis; leaflets 6-12 pairs on short stalks of 3 mm, oblong, 3-7 cm long, 12-20 mm wide, rounded at both ends, with tiny bristle tip. Flower clusters are upright at ends of twigs, large branched, 20-30 cm long, 13 cm broad, with many bright yellow flowers 3 cm across, pentamerous; sepals imbricate, obtuse at the apex; petals subequal to heteromorphic, yellow; stamens 10, accrescent toward the abaxial side of the flower; filaments straight and not more than twice as long as the anthers; ovary superior, linear and curved. Pods numerous, long, narrow, 5-25 cm long, 12-20 mm broad, flat, dark brown, strap shaped, stipitate, terete to compressed, dehiscent, with septae between the numerous seeds; seeds are bean shaped, shiny, dark brown, 8 mm long, with distinct areole.

**Chemical constituents:**

5-acetyl-7-hydroxy-2methyl-chromone, Alkaloids, anhydobarakol, apigenin, apigenin-7-O galactoside, barakol 8-10-11, cassiachromone, cassiamine, chrysophanic acid, anthrone, dianthrone, chrysophanol, p-coumaric acid, 1,2-dimethyl-6,8 dihydroxysoquinol-1-one, physcion, rhein, siamine, β-sitosterol, thalictin.

**Tests for identity:**

- (a) Macroscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Carry out the tests for anthraquinones as described under the monograph for Alexandrian Senna.
- (c) Confirm the presence of chrysophanic acid by co-chromatography using thin-layer chromatography.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

See under the monograph for Alexandrian senna .

**Uses:**

Laxative.

**Storage:**

In a cool dry place.

**Sesamum alatum Thonning**  
**Sesamum indicum L.**

**Family name:**

Pedaliaceae.

**Synonyms:**

- (a) *Sesamum alatum* Thonning
  - 1. *Sesamum capense* Burm.
  - 2. *Sesamum sabulosum* A. Chev.
- (b) *Sesamum indicum* L.
  - 1. *Sesamum orientale* L.
  - 2. *Sesamum africanum* Todaro,
  - 3. *Sesamum brasiliense* Vell.,
  - 4. *Sesamum luteum* Retz.,



**Common names:**

Sesame, Beniseed (E). Sesamier (F).

**African names:**

- (a) Arabic: Sim-sim
- (b) Bambara: Benefin, Bene
- (c) Hausa: Ridin-bareewaa, Nomen-bareewaa, Nonan' barya, Namijin dayi (*S. alatum*)
- (d) Riidii, Li'di, Nome, Nomi, Karkasii, Labto, Tabso (*S. indicum*)
- (e) Peuhl: Berne, Poeuloel (*S. alatum*)
- (f) Swahili: Ufuta
- (g) Yoruba: Yanmoti, Ekuku, Eeku, Beni, Eluru

**Brief description of the plant:**

Annual or suffrutescent herbaceous plants attaining 1.75 m in height; leaves, opposite; stem divided or palmilobate; flowers, axillary, white or pink with purplish-red spots; erect capsules of 5 cm long with a long beak for the *S. alatum* or awl-shaped for the *S. indicum*; seeds muricate and winged (*S. alatum*) ; seeds non-winged, reticulate or smooth, asymmetrical in the case of *S. indicum*.

**Geographical distribution:**

Tropical Africa.

**Part used:**

The dried ripe seeds.

**Names of drug:**

Semen Sesame. Sesame seed. Gingelly seed. Teel seed.

**Definition:**

Sesame seed is the dried ripe seeds of *Sesamum indicum* L. or *S. alatum* Thonning (family, Pedaliaceae).

**Description:**

**Macroscopical:** Seeds are flattened, ovoid, pointed at one end, about 3 to 4 mm long, 2 mm broad and 1 mm thick, buff-coloured or whitish, finely punctate, with 4 delicate longitudinal ridges at the edges of the flat faces; the hilum is at the pointed end, from which the raphe extends as a line along the centre of one flat face to the broader end. The

oily endosperm is very thin and surrounds a large embryo with two large plano-convex cotyledons and a small radicle.

**Microscopical:** The epidermis consists of thin-walled palisade cells, the anticlinal walls being more or less wavy; cells are about 18 to 30  $\mu$  wide and 50 to 95  $\mu$  long and with the exception of the cells constituting the four ridges, each cell has a spherical mass of crystals of calcium oxalate about 12 to 40  $\mu$  in diameter at the apex. The remainder of the testa consists of collapsed cells with yellowish membrane on the inner side. The tissues of the endosperm and cotyledons consist of cellulosic polygonal parenchyma cells containing fixed oil and small aleurone grains measuring 2 to 12  $\mu$ .

Starch is absent.

**Powder:** Powdered Sesame seed is pale yellowish-brown to buff-coloured, odourless, but with bland oily taste. It is characterised by the presence of abundant oil globules, numerous palisade-like cells of the testa containing calcium oxalate spheroided masses; small aleurone grains, no starch.

**Chemical constituents:**

45 to 55 per cent fixed oil, 20 per cent proteins, 4 per cent mucilage. The oil consists of glyceryl esters of palmitic, stearic, myristic, oleic and linoleic acids; also a crystalline substance sesamine and a phenolic compound sesamol.

**Test for identity:**

- (a) Macroscopic and microscopic examination of the specimen to ensure compliance with the above descriptions
- (b) A small amount of the powder gives a red colour with 4 per cent sucrose solution in strong hydrochloric acid.

**Test for purity:**

Ether-soluble extractive, not less than 45 per cent.

**Use:**

Dietetic.

**Storage:**

In well-closed containers, protected from light.

## **Solanum nigrum L.**

### **Family name:**

Solanaceae.

### **Synonyms:**

- (a) *Solanum fistulosum* Rich
- (b) *Solanum nodiflorum* Jacq.
- (c) *Solanum guineense* (L.) Lam.



### **Common name:**

- (a) Black nightshade, Garden nightshade Common nightshade (E)
- (b) Creve chien, Morelle noir, Herbe a magicians, (F)

### **African names:**

- (a) Arabic: عنب الدب أو مغد أسود أو عنب الثعلب:
- (b) Bambara: N/A
- (c) Hausa: Goutan Kadji
- (d) Peuhl: N/A
- (e) Swahili: Mtura, Ndura, Tagunjamito,
- (f) Yoruba: Odu, Ogumo, Igba yirin elegun

### **Brief description of the plant:**

An annual herbaceous plant of 40 to 60 cm in height with whole or tortuous, ovate and briefly ciliated leaves; inflorescence extra axillary white flowers, with berry-shaped fruits of 5 mm in diameter, black when ripe.

### **Geographical distribution:**

The plant is sub-spontaneous or grown in all tropical and subtropical regions.

### **Part used:**

The whole plant.

### **Names of drug:**

Herba Solanum Nigri. *Solanum nigrum* Herb.

### **Definition:**

Herba Solanum Nigri is the dried herb of *Solanum nigrum* L. (family, Solanaceae)

### **Description:**

Odour, faint and characteristic; taste, bitter.

**Macroscopical:** Root, attains up to about 30 cm long and 2.5-3 cm in diameter in its crown region. It bears numerous spreading long tapering lateral roots leaving the tap root either at right angle or at an angle of nearly 45°. Numerous thin wiry and fibrous rootlet come out from the root and its branches. Externally, it is brownish-white in colour with a somewhat rough surface. The stem, erect, solid and with 2-4 ridges. The internodes are 3-7 cm long and 2 cm in diameter. The stem and branches are slightly pubescent, green in colour with a purplish tinge which is more distinct in the apical parts of the stem and branches and intensified at the maturity of the plant. The leaves, alternate, showing adnation with the stem or branches. They are exstipulate, petiolate, symmetric or sometimes asymmetric. The petiole is biconvex but more boldly convex on the lower side. It varies from 2-5 cm in length, 2-4 mm in width and 1-3 mm in thickness. The

lamina is simple, nearly oval and having symmetric or asymmetric decurrent base. It measures from 6-9 cm in length and 4-6 cm in width and the leaves of the older plants are usually smaller in size not exceeding 7 cm in length. The leaf has an acute apex and entire, sinuate or sometimes sinuate-dentate margin. The upper surface is dark green but the lower surface is lighter in colour. The petiole, midrib and lateral veins may show slight purplish tinge, the leaves are slightly hairy on upper surface of the midrib. The main lateral veins are about 6-9, each leaving the midrib at an angle of about 45° and run up to near the margin.

Sometimes the lateral veins anastomose together at a distance of 2-3 mm from the margin. The inflorescence, monochasial scorpid cyme, but the axis is very contracted resulting in the umbellate appearance. It is lateral and 2-10 pedicellate flowers, borne on a slender peduncle, 0.5-2 cm long and about 1 mm in diameter. The flowers are pedicellate. The receptacle, is somewhat enlarged, nearly obconical in shape.

Each flower arises in the axil of a caducous leafy bract falling off early leaving a scar. The flower is 0.8-1 cm in diameter and 0.5-0.6 cm in height hermaphrodite, cyclic actinomorphic. The calyx, cup-shaped about 2 mm diameter and in length. It is formed of 5 sepals which are united to almost half its length. The tube is about 1mm long and terminates with five ovate free lobes which are 1 mm long and broad. The calyx is green and pubescent especially at the margin of the lobes. It is persistent and becomes thicker on the development of the fruit. The corolla, white with slight yellowish tinge at the base and slight purplish tinge at the apex of the lobes.

It is lobate about 3 mm high, formed of 5 petals which are united at the base. The tubular part is about 2-4 mm long and terminates with 5 acute lobes. The lobes are spreading, oblong-lanceolate and each is about 4-7 mm long and 2-4 mm broad. The androecium is five, epipetalous; the filaments being adnate with the corolla and nearly a fifth of the length of the corolla.

The free part of the filament is cylindrical, very short, about 1 mm long or even shorter while the adnated part is broad and flattened, about 2 mm long. The surface of the free part of the filament opposite to the style is covered with long hairs. The anthers are oblong, obtuse, are parallel to each other forming a cylinder around the style. Each is about 2 mm long and 1mm in diameter, basifix, glabrous, bilobed and dehisces by means of two oblique pores at the apex. The Gynaecium, the ovary superior, glabrous, oval and about 1.5-2 mm in diameter. It is bicarpellary, bilocular with numerous ovules attached to axile placentation. The style arises from the apex of the ovary and is about 4-5 mm in length. It is glabrous in the upper half, densely pubescent in the lower one, being covered with long hairs. The style is white in colour and terminates with an obtuse green stigma which is slightly bilobed.

The fruits occur in clusters carried on straight peduncles. Each fruit is borne on a short stalk which is 0.2-1.3 cm long.

The fruit is a berry, globular, 0.7-0.9 cm in diameter having a distinct brown scar of the style at the apex and a persistent calyx. The fruit is glabrous, green, becoming purplish black and soft on ripening. The pericarp is soft and fleshy and having a thin leathery epicarp. The seeds are numerous, attached to an axile placenta which is fleshy and bilobed, each lobe projecting into one of the two locules. The seeds are whitish yellow, reniform or disc-shaped tapering into a pointed end where the hilum and micropyle are situated together in a small depression, and as no raphe is present the seed is thus derived from a campylotropous ovule. The seeds are thicker towards the strongly convex dorsal edge and thinner towards the straight or slightly concave edge. Externally, they are minutely pitted, 1.5-2 mm long 1-1.5 mm across at the wider end and about 0.5 mm thick.

The seeds are hard but easily crushed under the teeth, odourless and with slightly oily taste. The seed consists of a comparatively thick testa, enclosing a copious oily endosperm in which is embedded a coiled, whitish opaque embryo having a radicle pointed towards the micropyle and hilum and two acutely curved cotyledons.

**Microscopical:** The root is formed of few layers of polygonal tabular cells of cork, phellogerm consists of scattered lignified fibres and sclereids having wide lumen, the phloem having groups of fibres in its outer part, and the xylem which is formed of vessels, abundant fibres, few tracheids and tracheidal fibres. The stem, green with slight purplish tinge, about 2 cm in diameter and formed of epidermal cells which are polygonal, straight pitted anticlinal walls and covered with slightly warty occasionally striated cuticle. The stomata of cruciferous and ranunculaceous type.

The trichomes are few of non-glandular, unicellular or multicellular uniseriate 2-6 cells and covered with warty cuticle. The cortex consists of 1-2 layers of chlorenchyma, 2-3 layers of collenchyma, 2-3 layers of parenchyma and starch sheath. Few calcium oxalate as prisms and idioblasts are present. Pericycle formed of 1-2 layers of parenchyma cells with numerous idioblasts of microcrystals of calcium oxalate. The phloem formed of sieve tubes, companion cells, and phloem parenchyma with numerous idioblasts of micro-crystals of calcium oxalate. The xylem consists of vessels of lignified, pitted, reticulate and scalariform, abundant fibres with lignified, straight walls and pointed or blunt apices, lignified iso-diametric or elongated and pitted wood parenchyma, medullary rays of uni- or bi-seriate lignified cells. The pith formed of parenchymatous cells containing starch granules, calcium oxalate and strands of perimedullary phloem accompanied by fibres in the periphery. The leaf having upper epidermal cells of polygonal, straight, curved or wavy anticlinal walls, covered by smooth cuticle and the cells over the midrib are axially elongated covered by slightly warty and longitudinal striated cuticle. The lower epidermal cells are polygonal or elongated with distinctly sinuous walls and covered with smooth cuticle. The stomata are abundant on both surfaces and of cruciferous and ranunculaceous type, some stomata with outgrowths. Non-glandular trichomes are present on both surfaces as those of the stem. The mesophyll formed of one layer of palisade cells with sinuous walls, 72-126-162  $\mu$  in

length and 15-21-28  $\mu$  in diameter, the rest of mesophyll 5-6 layers of spongy parenchyma.

Calcium oxalate of idioblasts are very rarely found. The vascular system formed of an arc of collateral vascular bundle with groups of perimedullary phloem on its upper side and surrounded by starch sheath. Few idioblasts of micro-crystals scattered in the cortical parenchyma and phloem. The flower consists of the calyx having inner epidermal cells axially elongated, rectangular with sinuous walls and smooth cuticle, some cells contain prisms of calcium oxalate, the outer epidermal cells are polygonal with straight, curved or wavy anticlinal walls, covered with warty and striated cuticle.

Stomata are present on both surfaces of cruciferous type. The non-glandular hairs are present on outer epidermis and margin of lobes as those of leaf, while the glandular hairs of solanaceous type are present on both surfaces but more numerous on the inner one. The mesophyll of the calyx is homogenous of 2-3 layers, up to 7 layers in the lobes. The corolla having inner epidermal cells of polygonal, straight, curved or slightly wavy anticlinal walls and covered by smooth cuticle, the cells show long papillae up to 36  $\mu$  long. The lower epidermal cells are polygonal, subrectangular, sinuous anticlinal walls and smooth cuticle, the papillae attain 25  $\mu$  long.

Trichomes of non-glandular on outer epidermis and margin of the lobes, formed of multicellular, uniseriate 2-5 celled with barrel-shaped basal cell and warty cuticle, while the glandular solanaceous hairs are present only on the outer epidermis. The mesophyll of corolla is homogenous and formed of 2-4 layers of parenchymatous cells. The epidermis of the filament is formed of axially elongated cells with straight or curved anticlinal walls and covered by smooth cuticle, non-glandular hairs of multicellular uniseriate, 2-5 celled, with rounded apices and smooth cuticle present.

The epidermis of anther is formed of polygonal, elongated wavy beaded anticlinal walls and striated cuticle. The pollen grains 21-28  $\mu$  in diameter, minutely pitted and having three germ pores. The gynoecium formed of stigma and style having epidermal cells axially, elongated with straight anticlinal walls and longitudinally striated cuticle, the lower half densely covered by papillae of non-glandular hairs; the ovary epidermal cells are small polygonal with straight anticlinal walls and smooth cuticle. The fruit formed of epicarp cells, polygonal with straight or curved anticlinal walls, showing numerous pits or slightly beading and covered with warty or striated cuticle; mesocarp formed of an outer 2-4 layers of slightly thickened cellulosic cells followed by thin-walled parenchyma, calcium oxalate scattered as idioblasts and few prisms; endocarp of polygonal thin-walled cells with straight anticlinal walls. The seed, formed of epidermal cells which are polygonal, mostly elongated, inner tangential and inner part of the anticlinal to about X3-X2 the height of cells thickened, lignified and striated. The remaining outer part of the anticlinal walls are thin with cellulosic thickening in the form of bars 80-97  $\mu$  high, the endosperm formed of polygonal cells with straight cellulosic walls and containing aleurone grains and oil globules.

**Chemical constituents:**

Solanine, solasonine, demisine, solamargine, solasodarnine, tomatine, solauricine, solangustine, etc.

**Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) The plant material when treated with concentrated sulfuric acid followed by formaldehyde solution in the cold gives reddish-violet colouration.

**Assay:**

Macerate 10 g of the plant material with 10 ml alcohol (95 per cent) containing 1 per cent acetic acid with stirring for 15 minutes; transfer to a percolator and continue extracting with alcohol till exhaustion. Evaporate the alcoholic extract to dryness under reduced pressure and extract the residue with 3 per cent acetic acid and filter through cotton wool. Wash the residue and filter with 3 per cent acetic acid till the washings were free from any alkaloid as tested by Mayer's reagent. Mix the acidic solution and render alkaline with concentrated ammonia and leave overnight.

Separate the coagulated gluco-alkaloids by centrifugation, dissolve in a few ml of 1 per cent sulfuric acid and complete with the acid to exactly 25 ml. Transfer 2.5 ml of the solution to 50 ml Erlenmeyer flask surrounded by ice and then add 5 ml concentrated sulfuric acid drop by drop from a burette with the same precautions, add 2.5 ml of 1 per cent formaldehyde.

Allow to stand for 40-45 minutes at room temperature and finally measure the red-violet colour in the spectrophotometer at 560  $\mu$ . The percentage of the solution could be directly known from the standard curve.

**Uses:**

It is used as a source for solasodine which is starting material for steroid hormones synthesis.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Spermacoce latifolia Aubl.**

### **Family name:**

Rubiaceae.

### **Synonyms:**

- (a) *Borreria bartlingiana* DC.
- (b) *Borreria eradii* Ravi
- (c) *Borreria fockeana* Miq.
- (d) *Borreria platyphylla* DC.
- (e) *Borreria splitgerheri* Bremek.
- (f) *Borreria tetraptera* Miq.
- (g) *Borreria latifolia* (Aubl.) K. Schum.
- (h) *Bigelovia elata* Bartl. ex DC.
- (i) *Tardavel latifolia* (Aubl.) Standl.

### **Common names:**

Broadleaf buttonweed, Oval-leaf False Buttonweed (E)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Broadleaf-button weed. Branched herb; stem fleshy, rectangular, ca 60 cm tall. Leaves opposite, elliptical, rather thick, broadest above the middle, tip broadly and shortly pointed, base tapered, variable in size, ca 2.5-5 cm long and 2,5 cm wide, hairy on both sides, short leaf stalk. Leaf-base joined with cup-shaped stipules with bristles on edges. Flower heads from leaf-axils ca 0.6-1.2 cm, through, white, hairy calyx of four sepals, corolla-tube white with lilac petals; stamens and stigma forked. Fruit hairy, splitting into two pairs.

### **Geographical distribution:**

Native of S America and now an established plant in Sierra Leone to Ghana, and in eastern Africa.

### **Part used:**

Leaf.

### **Name of drug:**

Broadleaf buttonweed leaf

### **Definition:**

Broadleaf buttonweed leaf is the dried leaf of *Borreria latifolia* (Aubl.) K. Schum. (family, Rubiaceae).

### **Description:**

Macroscopical Straggling or prostrate annual herb 10–60 cm. long with bright pale yellow green stems and foliage; stems branched or unbranched, square with angles slightly to distinctly winged, glabrous or with sparse to fairly dense short hairs on the

angles or stems hairy all over. Leaf-blades often red margined, elliptic, 1.2–5 cm. long, 0.8–2.9 cm. wide, acute at the apex, cuneate at the base, pubescent or ± scabrid above with tubercle-based hairs, pubescent beneath or almost glabrescent all over save for the scabrid margins; petiole 0.5–3 mm. long; stipule-sheath 1.5 mm. long, with 5–9 setae 1.5–3.5 mm. long. Flowers in axillary clusters ± 8 mm. wide. Calyx-tube pubescent, obconic, 2.5 mm. long; lobes 4, oblong to lanceolate, 1.2–2 mm. long. Corolla whitish, blue or pink; tube funnel-shaped, 5 mm. long; lobes ovate-triangular, 1.5 mm. long and wide. Filaments exserted ± 1 mm. Style exserted 2 mm.; stigma-lobes linear, 1 mm. long. Capsule ellipsoid or subglobose, 2.5–3 mm. long, wrinkled, hairy. Seeds yellow brown, ellipsoid, 2–2.8 mm. long, 1.3–1.7 mm. wide, 0.8–1 mm. thick, reticulate-rugulose, with a deep wide ventral excavation..

***Chemical constituents:***

N/A

***Tests for identity***

Macroscopical examination of the specimen to ensure compliance with the above given descriptions

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Weed!

***Storage:***

In a cool dry place.

## **Spermacoce verticillata L.**

### **Family name:**

Rubiaceae

### **Synonyms:**

- (a) *Borreria verticillata* (L.) G.F.W. Mey.
- (b) *Spermacoce globosa* Schum. et Thonn.

### **Common name:**

Green boreria, African boreria (E).  
Bouleau d'Afrique, Borrerie verticillee,  
Borreria verte (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Som som, Missini koumbere
- (c) tururuwa, Karya garma, Marké
- (d) Peuhl: Samtarde, Gudurdel
- (e) Swahili: N/A
- (f) Yoruba: Irawo-ile



### **Brief description of the plant:**

Perennial bushy sub-shrub, 1m high, that branches out in slightly regular stalks, oblanceolate smooth leaves of 4 cm over 7 mm, inflorescence compact terminal and axillary spheres of 10 to 15 mm in diameter; small white flowers.

### **Geographical distribution:**

Intertropical Africa and Madagascar.

### **Parts used:**

Leaf, aerial parts.

### **Definition:**

African Borreria is the leaf or aerial parts of *Borreria verticillata* (L.) G.F.W. Meyer (family, Rubiaceae).

### **Description:**

**Macroscopical:** Stem: The stem is obscurely angled, glabrous with stipular sheaths which are glabrous or scabrid. The leaves are oblanceolate, 3-5 cm long and 5-10 mm wide, glabrous with faint lateral nerves.

The terminal inflorescence is globose, 1-1.5 cm in diameter, usually with two leafy bracts about 1 cm long which is reflexed beneath. The flowers are usually bisexual. The corolla is epigynous more or less tubular. The lobes 4-12 are contorted, stamens are epipetalous and as many as are

alternate with the corolla tubes. The anthers are mostly separate and 2-celled. The ovary is inferior with two or more cells; an axial and apical or basal placenta. The style is slender.

The fruit is a drupe dry and dehiscent. Seeds are mostly with endosperm which are ruminant. The embryo is either straight or curved.

**Microscopical:** The leaf has nearly straight to straight upper epidermal cells measuring 31.9-116.0 microns by 17.4-52.2 microns; lower epidermal cells are wavy, measuring

38.2-133.4 microns by 20.3-63.8 microns. Calcium oxalate crystals and trichomes are absent while stomata of rubia-ceous type are present on both surfaces with greater abundance on the lower surface. The mesophyll consists of a row of palisade on the upper epidermis only. Special features include oil globules which are small spherical and numerous throughout the mesophyll.

**Powder:** Brownish in colour with characteristic odour, containing fragments of wood from the stem and root; also fragments of leaf lamina with rubiaceous stomata, remains of vascular bundles, parenchyma cells; while calcium oxalate crystals and trichomes are absent.

**Chemical constituents:**

Root: 0.1 per cent alkaloid present as emetine without cephaeline or tetrahydro-B-carboline alkaloids: borrerine and borreverine.

Leaves: Volatile oil which contains hydrocarbon sesquiterpenes, sesquiterpenes lactones, phenolic compounds and aromatic polycarboxylic acids, Azuleneguaine is also present.

Root bark: Iridoids, asperuloside, feretoside daphyloside.

**Test for identity:**

- a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above given descriptions.
- b) It gives positive tests for alkaloids and for indole alkaloids as described in vol. 2.
- c) Thin-layer chromatographical examination of the extract of the specimen to confirm the presence of Borrerine and Borreverine by co-chromatography.

**Test for purity:**

Moisture: Not more than 7.12 per cent.

Ash: 4.06 per cent.

Water-soluble extractives: Not more than 10.48 per cent.

Alcohol (70 per cent.) -soluble extractives: 11.06 per cent.

**Pharmaceutical preparations:**

N/A

**Uses:**

It is used as an antimicrobial in skin preparations.

**Storage:**

Store in a cool dry place.

## **Sterculia setigera Del.**

### **Family name:**

Sterculiaceae .

### **Synonyms:**

- (a) *Sterculia cinerea* A. Rich.
- (b) *Sterculia tomentosa* Guill. et Perr.

### **Common names:**

Sterculia Gum (E). Mbep. Gommier-mbep. Platane du Senegal (F).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Kogurani, Kogosito, Forko, congo serani, congo sera, kungosiranin, kènyèkoro
- (c) Hausa: Kukuko, koukoulé, Kukkuki, Kukkugi, Kukukri, Shafo, Bakin kukkuki
- (d) Peuhl: Bobere, Bobori
- (e) Swahili: N/A
- (f) Yoruba: Omurun, Owun, Iwanran-wanran, Ose aware



### **Brief description of the plant:**

Cylindrical boled tree of 12 to 15m, trunk 2-3 m widened at the base, ovoid or rounded tips; huge tortuous branches with tufts of leaves at the extremities. Alternate, digitilobate leaves with 3 or 5 triangular lobes with acuminate tips and cordate base, 20 cm long and as much wide, the two surfaces are densely covered with star-shaped down. Inflorescence in bundles of terminal racemes. Calyx of 1 cm long with 5 lanceolate lobes densely rugged on the outer surface, pale green with reddish stripes.

Fruits of five carpels formed of brownish beige velvety apiculate follicles of 9 cm in length and 5 cm in diameter.

### **Geographical distribution:**

Tropical Africa.

### **Part used:**

Bark and gum.

### **Name of the drug:**

Sterculia Gum.

### **Definition of the drug:**

Sterculia gum is the dry gummy exudate obtained from the tree *Sterculia setigera* Del. (family, Sterculiaceae)

### **Description:**

The bark is a smooth bark coming away in irregular patches. It is a pale yellow bark resembling platan.

Gum: Colourless, mucilagenous.

**Microscopical:** For bark vessels medium-sized to large, few (1-5 per m); simple perforation; alternate intravascular pitting; small pits to parenchyma sometimes larger and elongated. Parenchyma principally of 2 types: one diffuse vasicentric and another

broad apotracheal to confluent bands, also with some vasicentric parenchyma; terminal sometimes present; storied.

Rays of 2 distinct sizes the layer up to 3-20 cells wide, 1-4 mm.

Uniseriate rays scarce, heterogeneous, with sheath cells; the small cells sometimes storied. Fibres with small pits, storied of medium length to very long. Intercellular canal of the vertical traumatic type.

***Chemical constituents:***

Water	17-16 per cent
Mineral matter	7-12 per cent
Tannin	2 per cent
Acetic acid	15-17 per cent
Galacturonic acid	43 per cent
Galactose	17 per cent
Rhamnose	15 per cent
Uronic acids	42.8 per cent
Oligo saccharides and their acids.	

***Test for identity:***

The gum is very resistant to fermentations and absorbs more than 250 times its volume of water while retaining its jelly form.

***Pharmaceutical preparation:***

Gomme de Sterculia.

***Uses:***

Emulsifying agent used in the preparation of food products, cosmetics, textile industry for the preparation of varnish, also laxative.

***Storage:***

To be kept in well-closed containers and protected from light and humidity.

## **Sterculia tragacantha Lindl.**

### **Family name:**

Sterculiaceae.

### **Synonyms**

- (a) *Sterculia pubescens* Don
- (b) *Sterculia obovata* R. Br.

### **Common names:**

- (a) African tragacanth, Karaya gum, Sterculia, Gum Tragacanth (E).
- (b) Edjefoc, Gomme de Sterculia (F)

### **African names**

- (a) Arabic: N/A
- (b) Bambara: Forko.
- (c) Hausa: Kukukin rafi, Kusuru .
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Alawefon, Okagbo, Omurin, Owun, Olofulofulo, Ilaka-ile, Alafuufuu.



### **Brief description of the plant:**

A tree 40–50 ft. high, with rugged greyish bark; younger shoots as well as the leafstalks, under surface of the leaves, pedicels, calyx, and outer surface of the follicles, clothed with rufous down. Leafstalks 1–2 in. long. Leaves leathery, oblong, obtuse at the base, blunt or subacute at the apex or even slightly 3-lobed, entire or sinuous, unicostate, feather-veined. Flowers small, numerous, in much-branched clusters; pedicels jointed. Calyx funnel-shaped, red, 5-toothed; lobes oblong, cohering at the apex. Column shorter than the calyx. Anthers in 2 rows. Follicles 5, stipitate, oblong acute or slightly cuspidate, covered with close reddish down, 2–4 in. long, 1 1/2 in. across.

### **Geographical distribution:**

Widespread in tropical Africa.

### **Part used,**

Whole plant, root, gum, leaves, ash, bark, fruit, seed.

### **Name of drug:**

African tragacanth.

### **Definition:**

African tragacanth is the dried gum from the stem bark of *Sterculia tragacantha* Lindl. (family, Sterculiaceae).

### **Description :**

**Macroscopical:** Tree 3–24 m tall; bole cylindrical, sometimes with fluted buttresses; bark rough, grey or greyish brown, often deeply fissured; slash pale pink or pale orange, quickly becoming deep orange, exudate clear; ultimate branchlets rough and grey, 5–10 mm thick, the apex rusty tomentose. Leaf-blade elliptic-oblong or slightly obovate, (6.5–)11–21(–30) cm long, (4.7–)6.5–13(–16) cm wide, apex rounded to acuminate, base truncate, rounded, or subcordate, texture papery or leathery, glabrous, sometimes glossy above, tomentose (sometimes tomentellous in shade or on sucker growth) with red-brown 5–6-armed stellate hairs beneath; petiole terete, slightly swollen at base and tip, (2.5–)5–7.5 cm long, 1–2 mm wide, tomentellous with pale brown stellate hairs; stipules

caducous. Inflorescences borne with the leaves, 2–10 per stem, each inflorescence 10–14(–22) cm long, 2.5–5(–8) cm wide, 2–3 mm thick at the base, with 20–25(–30) branches; pedicels 1–4.5 mm long. Flowers with perianth campanulate, rose-pink, pinkish or brownish purple, rarely green tinged with red, 4–7(–8) mm long, 3–5 mm wide, divided into 5 acute lobes 3–4 mm long, 1.5 mm wide, cohering at the apex, margins reflexed, outer surface with a mixture of short, wide, flaccid, ± appressed, colourless hairs and fine, pale brown stellate hairs; inner surface glabrous apart from the extreme base and the lobes which densely covered in long, stout pointed, patent white or purple hairs. Fruit with 3–5 follicles, follicles ellipsoid, 5.7–10 cm long, 2.5 cm wide, dehiscing flat, then 3.6–8.9 cm long, 4–8 cm wide, rostrum rather short, blunt, 3–5(–10) mm long, stipe stout, (0.5–)1(–2) cm long, pericarp thick, woody, 2–3 mm thick, outer surface red, then rusty brown, tomentellous, inner surface yellow-brown, stiffly and thickly tomentose; seeds glossy black, ellipsoid, 10–13(–18) mm long, 7–9(–12) mm wide, hilum white, terminal, elliptic, 1–2 mm long, with a small, globose, orange aril 0.5–1 mm wide on a short margin; seeds sessile, leaving a white scar on the pericarp wall.

**Chemical constituents :**

Tannins and catechins and the presence of a flavonoid substance.

**Tests for identity:**

- (a) Macroscopical and microscopic examination of the specimen to ensure compliance with the above descriptions.
- (b) Test an aqueous extract of the specimen with ferric chloride solution. A dark coloration is produced.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antitumor, antimicrobial, immunogenicity.

**Storage:**

In a cool dry place.

***Strophanthus gratus* (Wall. & Hook.) Baill.**

***Strophanthus hispidus* DC**

***Strophanthus kombe* Oliv.**

**Family name:**

Apocynaceae.

**Synonyms:**

- (a) *Strophanthus gratus* (Hook.) Franch.
- (b) *Rampelia grata* Hook. = *S. gratus* Bail!.

**Common names:**

*Strophanthus* (E, F).

**African names:**

- (a) Arabic: ستروفانتوس
- (b) Bambara: Kuna, Kunade, Kunamkala
- (c) Hausa: Kwan-Kwani, Kwaman kwani, Tantsiya
- (d) Peuhl: Tokere
- (e) Swahili: Mtowe
- (f) Yoruba: Isha gidi; Langba omode, Ishan gere, Isa-ogbugbu, Ololo etu, Isa-kere



**Brief description of the plant:**

The *Strophanthus* trees are ligneous creepers or sarmentose or bushy shrubs; the branches are interlaced and can wind round a tree up to 15 m in height; stems and leaves are smooth with the exception of *S. hispidus* which is covered with long dense awns; leaves: opposite or whorled in groups of 3 ovate leaves; inflorescence axillary cymose of white, yellow, pink or purple flowers, with petals sometimes prolonged by a long filament; follicles are in pairs that can reach 35 cm with rounded tips, flattened or widened; seeds are crested.

**Geographical distribution:**

The *S. Kombe* hails from East Africa; the other *Strophanthus* species originate from Western or Central Africa.

**Part used:**

Seeds.

**Names of drug:**

Semen Strophanthi. *Strophanthus*.

**Definition:**

*Strophanthus* is the dried ripe seeds of *Strophanthus kombe* Oliver, or *S. hispidus* DC or of *S. gratus* Franchet (family, Apocynaceae) deprived of their awns. *Strophanthus* contains not more than 2 per cent of foreign organic matter. 1 g of *Strophanthus* corresponds in potency to not less than 0.055 g of the International Standard Ouabain.

**Description:**

Odour, slight, almost odourless, but characteristic and unpleasant when crushed; taste very bitter.

**Macroscopical:** *S. kombe*: Seed, lanceolate to linear lanceolate, unevenly flattened, with acute or acuminate apex and obtuse base; 9 to 18 mm sometimes up to 22 mm long. 3 to 5 mm broad and 1 to 2 mm thick; greyish-green sometimes with brownish tinge; externally, covered with longitudinal rows of silky very closely appressed hairs (distinction from *S. sarmentosus* DC), not wholly (distinction from *S. courmonti* Sael.), directed towards the apex; hilum, situated just beneath the apex or the broken point left by the removal of the awn; raphe, extending as a distinct longitudinal ridge from the centre of the ventral, nearly flat side to the apex; internally, whitish, oily, showing, besides the thin testa, a narrow oily endosperm completely surrounding the straight embryo which is composed of two plano-convex, almost flat, oily cotyledons and a small radicle pointing towards the apex.

*S. hispidus*: Seed, 10 to 15 mm long, about 3 mm broad; yellowish or reddish-brown to dark brown, and less hairy. *S. gratus*: Seed, 12 to 13 mm long, yellowish-brown and nearly glabrous.

**Microscopical:** Testa, of one integument; outer epidermis of long large elongated, polygonal cells with straight, lignified, thickened anticlinal walls, the outer walls usually prolonged in the centre into long narrow appressed hairs, bent at right angles at the base, up to 0.8 mm long, each with single longitudinal lignified rib on the under side; nutritive layer, of collapsed cells containing occasional cluster-crystals and single prisms of calcium oxalate (absent in *S. gratus*, in *S. nickolsoni* and in *S. emeni*, and abundant in *S. courmonti* and in *S. sarmentosus*) and a few small ovoid starch granules; inner epidermis, of tangentially elongated cells; raphe, with one vascular strand, containing spiral vessels. Endosperm, of thick-walled parenchyma containing oil-plasma, aleurone grains, fixed oil, very occasional ovoid starch granules up to about 10  $\mu$  in diameter, but free from crystals (distinction from *S. sarmentosus*). Embryo, of small thinwalled parenchyma with oil-plasma and aleurone grains. Hairs of *S. hispidus* seeds are alembic-shaped.

**Powder:** Powdered Strophanthus is greenish-yellow, brownish-red or yellowish-brown characterised by numerous fragments of the thin-walled hairs, fragments from testa, showing elongated cells of epidermis with broken hairs; fragments of somewhat thick-walled parenchyma from endosperm; fragments of thin-walled parenchyma from embryo; aleurone grains, 5 to 10, mostly 5 to 7  $\mu$ , in diameter; calcium oxalate, occasional, in clusters and in prisms.

**Chemical constituents:**

Strophanthus contains 8 to 10 per cent of mixture of glycosides known as K strophanthin. The seeds also contain about 30 per cent of fixed oil, together with kombic acid, choline and trigonelline. K strophanthin has been shown to consist of a mixture of four glycosides: cymarin, K-strophanthoside B, K-strophanthoside and cymarol.

**Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) Mount a section of Strophanthus in sulfuric acid (66 per cent v/v); the endosperm acquires a green colour and the embryo a green or reddish colour in *S. kombe* and a red colour in *S. hispidus* and in *S. gratus*.

**Test for purity:**

Ash, not more than 7 per cent.

**Assay:**

Biological: The activity of Strophanthus is determined by comparing its potency with that of the International Standard Ouabain. This potency is expressed in milligrammes of ouabain for each gramme of the powdered drug.

Carry out the assay as directed under *Digitalis lanata*, using for comparison an aqueous solution of the International Standard Ouabain (1 in 1000). The dose of ouabain for use in the frog method is about 0.1 mg per 100 g of body weight.

**Pharmaceutical preparations:**

Tinctura Strophanthi.

**Uses:**

It raises the blood pressure, is an efficient diuretic and a powerful cardiac poison. It is not cumulative and less liable than Foxglove to produce gastro-intestinal irritation, hence it is sometimes substituted for Foxglove when this remedy has failed or is contra-indicated.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Strychnos nux vomica L.**

### **Family name:**

Loganiaceae.

### **Synonyms:**

- (a) *Strychnos lucida* Wall.
- (b) *Strychnos vomica* St. Lag.

### **Common names:**

Nux vomica seed, Poison nut, snake-wood, Strychnine tree (E). Strychnos, Vomique officinale, Pomme de voutac (F).

### **African names:**

- (a) Arabic: جوز مقيء
- (b) Bambara: Grangoro = *S. spinosa*
- (c) Hausa: Kookiya = *S. spinosa*
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

The plant *Strychnos nux vomica* is a shrub with opposite leaves with parallel veins; inflorescence in axillary panicles of small flowers; globulous fruits.

### **Geographical distribution:**

Introduced and cultivated in Africa.

### **Part used:**

Dried ripe seeds.

### **Names of drug:**

Semen strychni. Nux vomica.

### **Definition:**

Nux vomica is the dried ripe seeds of *Strychnos nux vomica* L. (family, Loganiaceae). Nux vomica contains not more than 1 per cent of foreign organic matter, and yields not less than 2.5 per cent of total alkaloids of Nux vomica, and not less than 1.2 per cent of strychnine (Mol. Wt. 334.40).

### **Description:**

Odourless, or almost odourless; taste, intensely bitter, and persistent.

**Macroscopic:** Seed, disc-shaped, compressed, nearly flat, usually concave on one side and convex on the other, sometimes irregularly bent; margin, rounded or somewhat acute; 10 to 30 mm in diameter and 3 to 6 mm thick; grey or greenish-grey; externally, with a satiny sheen due to the closely appressed hairs radiating from the centre to the circumference; hilum, a raised circular scar in the centre of one of the flat sides, and connected by the micropyle, situated on a prominence on the margin, by a raised ridge which is mainly due to crossed hairs; very hard, but softens when soaked in water and can then be easily split into two thin discs; internally, greyish-white horny and translucent, consisting mainly of the endosperm with a central, thin disc-shaped cavity, in which lies the small embryo with 2 small, thin, cordate, 5- to 7-nerved cotyledons and a terete radicle about 7 mm long, adjacent to the micropyle.

**Microscopical:** Testa, of one integument; outer epidermis, of lignified, thick-walled cells with sinuous polygonal outline in surface view, small branched lumina and oblique linear pits; each cell prolonged externally into a closely appressed hair up to 1 mm long, and a wall having about 10 strongly lignified, longitudinal internal ribs of thickening, remainder of testa, consisting of collapsed flattened brown parenchyma cells, appearing in section as brown band, and in the region of the hilum showing a short vascular strand with small spiral vessels. Endosperm, with very thickwalled, non-lignified, hemicellulosic, polyhedral cells showing plasmodesma but no obvious pits, and containing oil plasma and aleurone grains, up to 30  $\mu$  in diameter, with globoids. Embryo, of small parenchymatous cells containing oil and small aleurone grains.

**Powder:** Powdered Nux vomica is yellowish-grey; characterised by the thick-walled lignified, somewhat spirally pitted bases of hairs, which appear, in surface view, with polygonal sinuous outline; numerous arrangements of endosperm with hemicellulosic thick-walled polyhedral cells; numerous lignified rod-shaped fragments of ribs from the hairs, 5 to 15  $\mu$  wide; the irregular aleurone grains being 10 to 30  $\mu$  in diameter, embedded in the oil-plasma of the cells, starch and calcium oxalate, absent.

**Chemical constituents:**

Nux vomica seeds contain 1.54 to 2.8 up to 5.3 per cent of total alkaloids consisting chiefly of strychnine and brucine, from 35 to 50 per cent of the total amount being strychnine. The average amount of strychnine is 1.23 per cent, of brucine 1.55 per cent.

**Tests for identity:**

- (a) Mount a little powdered Nux vomica in 1 or 2 drops of iodine T.S.; a fine granular brown precipitate is formed in the endosperm cells.
- (b) Mount a little of powdered Nux vomica in nitric acid; an orange-red colour is produced in the endosperm cells.
- (c) Mount a little of powdered Nux vomica in sulfovanadic acid T.S.; a pinkish to violet colour is produced especially in the endosperm cells.
- (d) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

**Tests for purity:**

Powdered Nux vomica contains not more than a few small starch granules from adhering pulp tissue (Starch and other starchy seeds); no crystals and no sclereids.

Ash, not more than 3 per cent.

**Assay:**

- (a) For total alkaloids: introduce about 10 g of very finely powdered Nux vomica, accurately weighed, into a flask, and add 100 ml of alcohol. Shake well, set aside for 10 minutes, add 5 ml of dilute solution of ammonium hydroxide, and shake frequently for 2 hours. Transfer the mixture to a small percolator with more alcohol, and when the liquid ceases to flow, pack firmly and continue the percolation for 4 hours, or until complete extraction of the alkaloids is effected. Evaporate the alcohol, add 10 ml of N/10 sulfuric acid, 20 ml of water, and filter into a separator. Wash the receiver and filter, with 3 successive portions, each of 5 ml of a mixture of 5 ml of N/10 sulfuric acid and 10 ml of water, or until the washing is free from alkaloids, transferring each to the separator. Add to the mixed acid liquids in the separator 30 ml of chloroform, shake, allow to separate, run off the chloroform, and repeat the shaking with 2 further portions, each of 5 ml of

chloroform. Mix the chloroform, wash with 2 successive portions, each of 10 ml of N/10 sulfuric acid, and reject the chloroform. Add the acid washing to the first acid liquid, make distinctly alkaline with dilute solution of ammonium hydroxide, and extract the alkaloids by shaking with successive portions each of 20 ml of chloroform, until complete extraction of the alkaloids is effected. Wash the combined chloroform extracts with about 10 ml of water, reject the water, dehydrate the chloroform extract with about 2 g of anhydrous sodium sulfate, filter through a dry filter into a porcelain dish, and wash the sodium sulfate and the filter with a few ml of chloroform, adding the washings to the chloroform extract in the dish. Distill the chloroform, add 5 ml of alcohol, and evaporate to dryness. Dissolve the residue in 5 ml of neutral alcohol, add 10 ml of N/10 sulfuric acid and 10 ml of recently boiled and cooled water, and titrate with N/10 sodium hydroxide, using methyl red T.S. as indicator.

Each ml of N/10 sulfuric acid is equivalent to 0.03344 g of total alkaloids, calculated as strychnine and brucine.

(b) For strychnine: evaporate the titrated liquid on a water-bath to about 10 ml, add about 5 drops of sulfuric acid, cool, then add 2 ml of nitric acid, stir well, and allow to stand for 30 minutes at a temperature between 5°C and 20°C. Transfer to a separator, and rinse the dish with successive portions, each of 5 ml of distilled water, adding the rinsings to the separator.

Then add 20 ml of chloroform, followed by 20 ml or a sufficient amount of sodium hydroxide T.S. to render the solution distinctly alkaline.

Shake the mixture gently for 10 minutes, and allow the liquids to separate.

Draw off the chloroform into another separator, and continue the extraction with successive portions, each of 10 ml of chloroform, until complete extraction of the alkaloids is effected. Wash the combined chloroform extracts, with about 10 ml of water, reject the water, dehydrate the chloroform extracts with about 1 g of anhydrous sodium sulfate, filter through a dry filter, and wash the sodium sulfate and filter with a few ml of chloroform, adding the washings to the chloroform in the dish. Distill the chloroform, add 5 ml of alcohol, evaporate, and dry the residue for 30 minutes at 100°C. Dissolve the residue in 10 ml of N/10 sulfuric acid, and titrate with N/10 sodium hydroxide, using methyl red T.S. as indicator. Each ml of N/10 sulfuric acid is equivalent to 0.03344 g of strychnine.

(c) Multiply the result by 1.02 in order to correct for loss of strychnine.

To 5 ml of the titrated liquid, add 2.5 ml of sodium hydroxide T.S. and 10 ml of ether, shake vigorously for 5 minutes, leave to settle, decant 2.5 ml of the ethereal solution, and evaporate the ether on a water-bath. Add to the residue 0.1 g of powdered potassium chromate R., and mix immediately.

Pass over the mixture a glass rod moistened with sulfuric acid; a violet colour is produced.

#### **Pharmaceutical preparations:**

Extractum Strychni Fluidum.

Extractum Strychni Siccum.

Pulvis Strychni Standardizatus.

Tinctura Strychni.

**Uses:**

Nux vomica is largely used as a bitter stomachic and tonic. It stimulates the muscular coat of the intestine, increasing peristalsis.

**Storage:**

In well-closed containers.

## **Syzygium aromaticum (L.) Merrill et L.M. Perry**

### **Family name:**

Myrtaceae.

### **Synonyms:**

- (a) *Caryophyllus aromaticus* L.
- (b) *Caryophyllus hortensis* Noronha
- (c) *Caryophyllus silvestris* Teijsm. ex Hassk.
- (d) *Eugenia aromaticata* (L.) Baill.
- (e) *Eugenia caryophyllata* Thunb.
- (f) *Eugenia caryophyllus* (Spreng.) Bullock & S. Harrison
- (g) *Jambosa caryophyllus* (Spr.) Nied.
- (h) *Myrtus caryophyllus* Spreng.



### **Common names:**

Clove (E). Clou de girofle, Giroflier (F).

### **African names:**

- (a) Arabic: القرنفل
- (b) Bambara: Benefundi
- (c) Hausa: Kanunfari, Kananfari, Karanho, Kade, Karafuu
- (d) Peuhl: N/A
- (e) Swahili: Karafwu
- (f) Yoruba: Konofuru, Kananfuru

### **Brief description of the plant:**

Tree of 10 to 15 m high, petiolated lanceolate leaves with translucent aromatic glands; inflorescence racemose panicles; the buds which take on the form of nails before blossoming constitute the spice.

### **Geographical distribution:**

Grown specially in the islands of Indian Ocean (the Comoro archipelago, Madagascar, Reunion Island, Zanzibar, etc.).

### **Part used:**

Flower buds.

### **Names of drug:**

Flos caryophylli. Cloves.

### **Definition:**

Clove is the dried flower buds of *Syzvgium aromaticum* (L.) Merrill et L.M. Perry (family, Myrtaceae); Clove contains not more than 5 per cent of its stalks and not more than 1 per cent of foreign organic matter, and yields not less than 15 per cent v/w of volatile oil.

### **Description:**

Odour, strong aromatic, characteristic; taste, pungent and spicy followed by a slight numbness.

**Macroscopical:** Flower bud, 10 to 20 mm long, bright reddish-brown to dark brown; lower part, the hypanthium, solid, cylindrical, somewhat flattened, 4-sided tapering

towards the base and bearing at the apex 4 thick, triangular, divergent sepals, alternating with four rounded, fragile, unexpanded, membranous, imbricated petals forming a pale, nearly spherical head, and enclosing numerous stamens; curved inwards and inserted on a small disc, and a stiff, slender, erect, single style arising from a depression in the centre; externally, wrinkled internally, the hypanthium contains in its upper portion 2-celled inferior ovary with numerous ovules attached to axile placenta, and shows a very large outer zone, with numerous shining oval oil glands near the periphery, numerous vascular bundles in the middle and a dark lacunous layer abutting on the central zone and lamella. Clove readily exudes volatile oil when indented or scratched by the fingernail.

**Microscopical:** Hypanthium possesses an epidermis of small, thick-walled isodiametric cells with very thick cuticle, and showing stomata with no special subsidiary cells: followed by a parenchymatous layer containing numerous large, oval, radially elongated, schizo-lysigenous oil glands, up to about  $200 \mu$  long, arranged in 2 or 3 more or less intermixed layers; a layer of parenchyma and collenchyma containing cluster crystals of calcium oxalate, and traversed by small, irregularly arranged vascular bundles, consisting of delicate spiral vessels, up to  $20 \mu$  wide, accompanied by usually isolated fusiform pericyclic fibres,  $200$  to  $650 \mu$  long and up to  $40 \mu$  in diameter, having strongly-thickened lignified walls.

The lacunous layer, formed of thin-walled parenchyma. The columella consists of a parenchymatous strand with numerous closely-arranged small vascular bundles. Sepals, with epidermis resembling that of the hypanthium, and showing numerous stomata on the outer surface; mesophyll, with rounded or stellate cells, numerous ovoid oil glands and cluster crystals of calcium oxalate, and traversed by a few slender vascular bundles. Petals, with epidermis formed of cells with straight thin walls; stomata, absent; mesophyll, undifferentiated, containing oil glands and cells with cluster crystals of calcium oxalate, and traversed by small vascular bundles. Stamens, with filaments having a central vascular strand and oil glands beneath the epidermis; connective, with a large oil gland in the apex; anther walls, with fibrous layer and minute cluster crystals of calcium oxalate along the line of dehiscence. Pollen grains, triangular, tricolporate,  $10$  to  $20 \mu$  in diameter. Style, with epidermis similar to that of hypanthium, and consisting of small collenchyma cells, with cluster crystals of calcium oxalate, radially elongated oil glands, and traversed by 2 narrow vascular strands.

**Powder:** Powdered clove is dark brown; characterised by abundant fragments of collenchyma and parenchyma with cluster of calcium oxalate, fragments of epidermis with thick-walled cells and few stomata; fragments of vascular or parenchyma tissue showing broken or entire oil glands; numerous fragments of vascular bundles with delicate spiral vessels,  $4$  to  $20$  mostly  $6$  to  $10 \mu$  in diameter; occasional spindle-shaped rather thick-walled fibres,  $6$  to  $45 \mu$  wide; numerous pollen grains, appearing either as equilateral triangles, with truncated somewhat emarginated as pieces or oval in outline,  $15$  to  $20 \mu$  in diameter; fragment of the fibrous layer of the anther wall; cluster of calcium oxalate  $10$  to  $15 \mu$  in diameter.

**Chemical constituents:**

15 to 20 per cent of volatile oil, about 13 per cent of gallotanic acid and caryophyllin.

**Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) Mix a little of powdered clove with a few drops of ferric-chloride T.S.; a deep blue colour is produced in all the elements, except in the fibres which remain colourless.

**Tests for purity:**

- (a) Clove contains no starch granules and no irregular fibrous cells (anthophylli, cereals), not more than few sclereids with thick numerously pitted walls and large lumen, frequently filled with yellowish-brown amorphous contents; no reticulately thickened vessels and no prisms of calcium oxalate.
- (b) Carry out the method for thin-layer chromatography, in vol. 2, using silica gel GF<sub>254</sub> as the coating substance and toluene as the mobile phase, but using an unlined tank closed with an un greased lid, developing the chromatogram immediately after introducing the mobile phase into the tank and allowing the solvent front to ascend 10 cm above the line of application, allowing the chromatoplate to dry, and allowing the solvent front again to ascend 10 cm above the line of application under the same conditions. Apply separately to the chromatoplate, as bands 20 mm long and not more than 3 mm wide, 10 µl of solution (1) and 20 µl of solution (2). For solution (1) shake 0.1 g, in powder sufficiently fine to pass through a sieve with a nominal mesh aperture of 500 nm, with 2 ml of dichloromethane for fifteen minutes, filter, carefully evaporate the filtrate to dryness on a water-bath, and dissolve the residue in 2 ml of toluene; for solution (2) dissolve 20 µl of eugenol in 2 ml of toluene.

After removal of the chromatoplate following the second development allow it to dry in air and examine under an ultra-violet lamp having a maximum output at about 254 nm. A quenching zone, due to eugenol, is seen in the chromatograms obtained with solution (1) and solution (2). A weak quenching zone, due to acetyleugenol, may also be present in the chromatogram obtained with solution (1), immediately below the zone due to eugenol. Spray the chromatoplate with about 10 ml of anisaldehyde solution and heat at 100 to 105°C for 5 to 10 minutes.

In the chromatograms obtained with solution (1) and solution (2) the zones due to eugenol are strongly coloured brown-violet; the zone due to acetyleugenol in the chromatogram obtained with solution (1) is faintly coloured blue-violet. Other coloured zones may be visible in the chromatogram obtained with solution (1), in particular, a faint pink zone in the lower part of the chromatogram and a red-violet coloured zone, due to caryophyllene, in the upper part.

- (c) Foreign matter. Not more than 4 per cent of blown cloves, peduncles and fruits; not more than 2 per cent of fermented cloves; and not more than 0.5 per cent of other foreign matter, see vol. 2.
- (d) Ash, not more than 10 per cent; acid-insoluble ash not more than 1 per cent.
- (e) Moisture. Not more than 12 per cent.

**Assay:**

Carry out the assay as directed under "Determination of volatile oils, in drugs" (see vol. 2) using about 10 g of powdered clove accurately weighed.

Contains not less than 15 per cent v/w of volatile oil.

***Pharmaceutical preparations:***

Aetheroleum Caryophylli.

***Uses:***

An agreeable aromatic stimulant, anti-spasmodic, and carminative, properties that are due to the volatile oil. Oil is largely used to relieve toothache.

***Storage:***

In well-closed containers, in a cool, dry place, protected from light.

## **Tamarindus indica L.**

### **Family names:**

Fabaceae.

### **Synonyms:**

- (a) *Tamarindus occidentalis* Gaertn
- (b) *Tamarindus officinalis* Hook.
- (c) *Tamarindus umbrosa* Salisb.

### **Common names:**

- (a) Tamarind tree, Indian date (E).
- (b) Tamarinier, Tamarin, Tamarin des Bas (F).

### **African names:**

- (a) Arabic: التمر الهندي
- (b) Bambara: Tombi, Ntomi, Tumi
- (c) Hausa: Tsamyia, Tsamia, Busai, Gundagura, Jimbirii, Lalewa, Lototuwa, Tausani, Tamani.
- (d) Peuhl: Dam, Dabe, Dami, Djammi
- (e) Swahili: Ukwaju, Mkwaju, Msisi
- (f) Yoruba: Ajagbon



### **Brief description of the plant:**

Short boled tree with striped shaky dark brown bark; paripinnate leaves with 7 to 12 pairs of opposite leaflets; terminal racemose inflorescence; yellow purple flowers, thick pods with edible fibrous pulp with 5 to 6 seeds.

### **Geographical distribution:**

Spontaneous or cultivated in all intertropical regions.

### **Part used:**

Fruits and seeds.

### **Name of drug:**

Tamarind.

### **Definition:**

Tamarind consists of the dried fruits of *Tamarindus indica* L., (family, Fabaceae), containing about 30 per cent of reducing sugars and 10 per cent of tartaric acid.

### **Description:**

Odour, faint, characteristic, taste, acrid and sweet.

**Macroscopical:** The pod, contains a dozen or more seeds. It reaches up to 20 cm in length. The peduncle is jointed 2 to 3 cm long. The pod is rounded triangular with a main longitudinal bundle in each angle and two or three others embedded between the two ventral angles, all running the entire length of the pod and with numerous fine lateral branches. The harsh, brittle, brown rind, about 1cm thick, may be removed readily from the septate pod exposing the soft mesocarp, from which in turn it may be separated.

The seeds are flattened, more or less rounded quadrilateral brown, strongly lustrous at the edges but with a somewhat dull, slightly depressed and distinctly outlined patch on the centre of each side. The seed is orthotropous, the hilum and micropyle being on opposite

edges. The hilum is recognized by the remnants of a torn-off funiculus and the micropyle by its uniform circular raised border. A faint ridge on the edge of the seed might be mistaken for a raphe but it runs completely around and not to a chalaza.

The hilum is directly over the short, straight (not recurved) radicle which is about one quarter of the length of the fleshy cotyledons, these latter being matched to receive it. Neither endosperm nor perisperm is evident.

**Microscopical:**

**Peduncle:** Cross section shows cork cells brown contents, brown parenchyma and stone cells; pericycle of stone cell and crystal cells, phloem zone with crystal fibres, cambium, xylem zone of vessels and bast fibres and pith.

**Pericarp:** Six layers are present of which the first two form the rind.

Epicarp of cork cells, several thick, often with thickened inner and side walls.

Hypoderm of a dense mass of stone cells with dark contents, increasing in size from out to inward, and narrow radical rows of parenchyma.

Mesocarp of parenchyma containing starch up to 12  $\mu$  and beautiful crystals of potassium (or calcium) bitartrate, also fibre vascular bundles.

Fibres about 15  $\mu$  broad with distinctly beaded walls.

Brown parenchyma with cells smaller than in the mesocarp and endocarp of colourless fibres less than 10  $\mu$  broad with scarcely visible luminae.

**Spermoderm:** On the centre of the dull patches five layers are differentiated.

Palisade cells 135  $\mu$  high and 10  $\mu$  broad, forming the epiderm with a cuticle.

Sub-epiderm of spoon or bone-shaped cells up to 50  $\mu$  high and 25  $\mu$  broad, one to three thick, containing disorganized chlorophyll grains or deep brown content passing into thick-walled parenchyma, varying from isodiametric in the outer or transversely elongated cells in the inner layer.

Radially elongated parenchyma.

Inner epidermis of small cells with thick walls.

The subepidermal cells vary considerably in the different parts. On the edges of the seed all the inner layers are strongly developed.

Perisperm and endosperm appear to be entirely lacking at full maturity.

**Embryo:** Reserve carbohydrate in the cell wall such as is present is here found in the cotyledons, but in the form of amyloid, not mucilage. The cells contain fat and protein in granules of obscure structure.

**Powder:** Powdered Tamarind is yellowish-brown in colour, characteristic odour and acidic taste characterised by the following:

Pulp containing long stringy bundles. Quadrilateral brown seeds, with lustrous margin and dull patches on the sides encased in sacs of endocarp.

Pulp containing bitartrate crystals, starch cells, cork cell, stone cells of various sizes, broad fibres with beaded walls, and narrow fibres with scarcely any lumen. Palisade cells with two bulbs, thick-walled subepiderm of spermoderm and cotyledons with thick, beaded walls, staining blue with iodine.

***Chemical constituents:***

The fruit flesh is highly acid. It is stated to be the most strongly acid of all natural food products. It contains tartaric acid, citric, malic and acetic acids. The pulp contain 12 to 14 per cent of tartaric acid.

The fresh ripe tamarind contained 30 to 41 per cent of reducing sugars and 9.5 to 12.76 per cent of tartaric acid. Unripe tamarind contains little sugar or acid.

***Test for identity:***

Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

***Test for purity:***

Ash, not more than 1.56 per cent.

***Uses:***

It is used for flavouring foods, drugs and drinks. Laxative.

***Storage:***

In well-closed containers, protected from light.

## **Tephrosia purpurea (L.) Pers.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cracca purpurea* L.
- (b) *Tephrosia piscatoria* (Aiton) Pers.
- (c) *Tephrosia ionophlebia* Hayata
- (d) *Tephrosia lanceifolia* Link
- (e) *Tephrosia colonila* (Ham.) Benth.
- (f) *Tephrosia diffusa* (Roxb.) Wight & Arnott
- (g) *Tephrosia wallichii* Grah. ex Fawc. & Rendle
- (h) *Tephrosia purpurea* var. *diffusa* (Roxb.) Aitch.
- (i) *Glycyrrhiza mairei* H. Lév.



### **Common names:**

Fish Poison, Wild Indigo, Purple tephrosia (E). Indigo sauvage, Indigo Rouge, Indigotier Sauvage (F)

### **African names:**

- (a) Arabic: حبيرة أرجوانية
- (b) Bambara: Defe daba = *T. vogelii*
- (c) Hausa: Babababa, Babbaba, Maraguwa, Tutubidi, Baaba mooree
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

It is a highly branched suberect herbaceous perennial, up to 60 m in height with spreading branches; the leaves are imparipinnate, with narrow, oblanceolate leaflets; the flowers are red or purple in extra-axillary racemes, the pods are slightly curved, 3–4.5 cm long, grey, smooth and containing 5–10 seeds per pod.

### **Geographical distribution:**

Widely cultivated in tropics.

### **Part used:**

Root, leaves, seeds and bark.

### **Name of drug:**

Tephrosia herb.

### **Definition:**

Tephrosia herb is the dried tops and roots of *Tephrosia purpurea* (L.) Pers. (family, Fabaceae).

### **Description:**

Erect or spreading annual or short-lived perennial herb, up to 80(–150) cm. tall. Leaf-rachis up to 8 cm. long, including a petiole of under 1 cm., prolonged ± 3 mm. beyond the lateral leaflets; stipules narrowly triangular; leaflets 9–17(–21), elliptic-oblong, ± 2

cm. long and 6 mm. wide, truncate or rounded at the apex, shortly mucronate, sparsely striguloseto silky pubescent beneath; main nerves  $\pm$  7 on each side. Flowers reddish-purple or bright pink, in slender lax leaf-opposed pseudoracemes, a few also in the upper leaf-axils; bracts narrowly triangular,  $\pm$  4 mm. long; pedicels  $\pm$  4 mm. long, pubescent or strigulose. Calyx brown, appressed strigulose to spreading pubescent; tube  $\pm$  1.5 mm. long; teeth narrowly triangular, the lowest  $\pm$  3 mm., others  $\pm$  2 mm. long, upper pair  $\pm$  one-third united. Standard white pubescent outside, 6–9 mm. long and wide; keel glabrous. Upper filament lightly attached, widened, but not bent or callous, 1.5 mm. above the base; filament-sheath  $\pm$  6 mm., free parts  $\pm$  2 mm., anthers 0.3 mm. long. Style glabrous, linear, gently curved,  $\pm$  2.5 mm. long, not penicillate. Pod gently upcurved towards the tip, 4–4.5(–6) cm. long,  $\pm$  4(–6.5) mm. wide, shortly strigulose; distance between the centres of adjacent seeds greater than the width of the pod; pubescent style-base horizontal or gently downcurved. Seeds 6–9, mottled, longitudinal, subcylindrical,  $\pm$  3 mm. by 1.5 mm.; hilum central, hardly arillate.

***Chemical constituents:***

The leaves and seeds contain tephrosin, which paralyzes fish.

***Tests for identity:***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antimicrobial, anti-diarrhoeal, vasorelaxant, antihepatotoxic, diuretic, anti-inflammatory, anti-ulcer, hepatoprotective, antidiabetic, antioxidant, wound healing.

***Storage:***

In a cool dry place.

## **Tephrosia vogelii Hook. f.**

### **Family name:**

Fabaceae.

### **Synonyms:**

- (a) *Cracca vogelii* (J.D. Hooker) O. Kuntze.
- (b) *Tephrosia periculosa* Baker.

### **Common names:**

Fish-poison bean, Fish-poison-tree, Vogel's Tephrosia (E). Bois poison (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Diéfa diaba, Diéfédaba, Tiabi ndiaboy, Tiébi ndiaboy
- (c) Hausa: Magyamfa, Magimfa, Jimfa, Shibi, kini
- (d) Peuhl: N/A
- (e) Swahili: Utupa wa kibaazi, Kibazi, Mibaazi, Mtupa, Utupa wa kibaazi, Utapa, Utupa wa kingindo, Utupa wa mrima
- (f) Yoruba: Lakuta, Agba-odo, Orobeja



### **Brief description of the plant:**

Shrub, 1-3 m tall. Stems and branches covered in brown spreading hairs. Leaves imparipinnate with 6-15 pairs of leaflets and a terminal leaflet; rhachis and petiole covered in dense spreading golden brown hairs; leaflets elliptic-oblong to oblanceolate, up to 6 cm long, thinly appressed hairy above, more densely so below; apex slightly mucronate. Flowers in dense terminal heads, large, white; calyx densely brown or greyish hairy. Pods up to 15 cm long, densely covered in pale brown hairs.

### **Geographical distribution:**

Widespread in tropical Africa and often cultivated.

### **Part used:**

Leaves.

### **Name of drug:**

Fish poison tree leaf.

### **Definition:**

Fish poison tree leaf is the dried leaf of *Tephrosia vogelii* Hook. f (family, Fabaceae).

### **Description:**

**Macroscopical:** A soft, woody branching herb or small tree with dense foliage, 0.5-4 m tall, with velutinous to sericeous indumentum. Stems and branches tomentose with long and short white or rusty-brown hairs. Leaves arranged spirally, imparipinnate; stipules 10-22 x 3-3.5 mm, early caducous; rachis 5-25 cm long, 1.5-5 mm long including petiolule; leaflets in 5-14 pairs, narrowly elliptical to elliptical-oblanceolate, up to 7 x 2 cm, base acute to obtuse, apex rounded to emarginate, venation most distinct on lower surface, silky tomentose. Inflorescence a terminal or axillary pseudo-raceme, 8-26 cm long, rusty tomentose; basal bracts leaflike, peduncle stout, as long as pseudo-raceme; flower 18-26 mm long, fragrant when fresh, white, violet-purple or blue; pedicel up to 23

mm long; bracteoles sometimes present on calyx. Pod linear, slightly turgid, 5.5–14 x 0.8–1.8 cm. Brown or green, woolly to sericeous, 6–18 seeded. Seed ellipsoid to reniform, 5–7 x 3–5 mm, dark brown to black.

It is a shrub 1–3(4) m high, usually much branched and bushy. Stems brown tomentose with long flexuous hairs intermixed among shorter and denser spreading hairs. Leaves with (6)8–13(15) pairs of leaflets; petiole 9–28 mm long, petiole and rachis together (9)11–22(27) cm long, tomentose like the stem; leaflets 2.5–5.5(7.5) x (0.6)0.9–1.7(2.3) cm, elliptic-oblong to oblanceolate, rounded to cuneate at the base, rounded to emarginate at the apex, slightly mucronate, the upper surface rather thinly appressed-pubescent, the lower surface densely appressed-pubescent; stipules 11–20 x 2.5–4.5 mm, narrowly triangular or sometimes markedly falcate, soon falling. Flowers in dense heads up to 10(20 in fruit) cm, or the lowermost sometimes somewhat remote; bracts up to 16 x 13 mm, broadly ovate-acuminate to suborbicular-acuminate, brown or greyish tomentose, conspicuous at bud stage but soon falling as flowers open; pedicels 14–26 mm long, brown tomentose. Calyx 14–20(24) mm long, brown or greyish tomentose; upper and lateral teeth about twice as long as the tube, oblong, ± truncate at the apex, the lower tooth about 1.5 times as long as the lateral, strongly grooved and upwardly curved distally into a keel-like shape. Petals white, rarely the standard purple; standard 24–30(34) mm long, truncate to strongly cordate at the base, the wings and keel petals somewhat shorter. Upper stamen loosely attached to, and easily detachable from, the adjacent stamens about the middle of the filament. Ovary tomentose; style pubescent. Pods 9–14.5 x 1.3–1.7 cm, light brown lanate-tomentose. Seeds numerous (more than 15), 6–8 x 4–4.5 x 2–2.5 mm, black, smooth, with a well-developed white U-shaped aril c.2 mm long.

**Chemical constituents:**

Rotenone and deguelin were found in the leaves (0.044% and 1.13%), Also, Vogeletin, a flavonol was reported in this plant.

**Tests for identity:**

- Macroscopical examination of the specimen to ensure compliance with the above descriptions.
- Use the powdered leaf extract to perform the test for rotenone in powdered drug as described in volume 2.
- Examine the extract of the leaf by High Pressure Liquid Chromatography. See the method of Zeng *et al* (2002). *Se Pu.*;20(2):144-7

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Pesticide, Acaricide, fish poison, anticancer.

**Storage:**

In a cool dry place away from light.

## **Terminalia avicennioides Guill. & Perr.**

### **Family name:**

Combretaceae.

### **Synonyms::**

*Terminalia dictyoneura* Diels.

### **Common names:**

Badamier duveteux (F).

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: wolo, wolojjèni, woloké,  
waraza, wolo toe loemezeiv, volo de, volo  
fi, volo teni, bisoi, bode, volodé, Bodèyi,  
Uolo, Uolodié, Uolofi, Uolotiéni, Wolo-  
dyé, Horo, Wolo, Wolodé, Wolofi, Wolocè, Wolbugun
- (c) Hausa: Baushe, Bawshi, Baushi, Baotché, Baotchi, Báúshe, Baúsheè
- (d) Peuhl: pulemi, buri, volo de, pulume, puulleemi, bôde
- (e) Swahili: N/A
- (f) Yoruba: Idi odan, Idi, Udi



### **Brief description of the plant:**

A small tree with short bole to 10 m high, sometimes bushy, branching from the base. A savanna tree with narrow elongated leaves cover with a felt of very short hairs. The wood is yellowish-brown, hard, tough and durable.

### **Geographical distribution:**

Southern Sahel and Sudan; from Senegal to Chad, Cameroon, Nigeria, Central Africa, West Africa, Ivory Coast

### **Part used:**

Roots, leaves.

### **Name of drug:**

*Terminalia avicennioides* leaf.

### **Definition**

*Terminalia avicennioides* leaf is the dried leaf of *Terminalia avicennioides* Guill. & Perr. (family, Combretaceae).

### **Description:**

**Macroscopical:** Savannah tree, to 30 ft. high; flowers and leafy shoots pinkish when young; mature leaves greyish-green above and white beneath, drying brownish; sometimes extremely abundant.

### **Chemical constituents:**

Flavonoids, terpenoids, tannins or polyphenolic compounds, Sterol, Saponin.

### **Tests for identity:**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

### **Tests for purity:**

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antimalarial, cytotoxic, trypanocidal, antimicrobial.

***Storage:***

In a cool dry place.

## **Theobroma cacao L.**

### **Family name:**

Sterculiaceae.

### **Synonym:**

- (a) *Theobroma leiocarpum* Bernoulli
- (b) *Theobroma pentagonum* Bernoulli
- (c) *Theobroma sativa* (Aubl.) Lign. & Le Bey
- (d) *Theobroma sphaerocarpum* A. Chev.
- (e) *Theobroma cacao* ssp. *cacao* L.
- (f) *Theobroma cacao* ssp. *sphaerocarpum* (A. Chev.) Cuatrec.

### **Common names:**

Chocolate nut. Cocoa. Cocoa tree (E). Cacao, Cacaoyer (F).

### **African names:**

- (a) Arabic: كاكاو
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Kakao.
- (f) Yoruba: Koko.



### **Brief description of the plant:**

More or less branched shrub of 3 to 6 m high; leaves oblong ovate reaching 12 x 6 cm, new leaves vividly coloured; flowers and fruits develop on the trunk: cocoa-pods; yellow or purplish blue when ripe; cocoa beans, violet and bitter.

### **Geographical distribution:**

Cultivated in the intertropical humid forest regions of low and medium altitudes.

### **Part used:**

Seeds.

### **Names of the drug:**

Theobromatis semen. Theobroma seeds.

### **Definition:**

Cocoa consists of the dried seeds of *Theobroma cacao*, (family, Sterculiaceae).

### **Description:**

Odour is agreeable when bruised or heated, taste astringent and bitter followed by a bland oily one.

**Macroscopical:** The seeds are flattened, ovoid, about 22 mm long, 12 mm wide and 6 mm thick; testa, thin, brittle, brownish-red, marked longitudinally with veins radiating from the chalaza; kernel, of 2 irregularly folded brown cotyledons which readily break into small angular fragments and into the folds of which the narrow endosperm penetrates.

**Microscopical:** Epidermis, elongated, polygonal, usually faced with the endocarpal layer and crossing each other at right angles; the hypodermis, large mucilage cells. The sclerenchymatous layer of thick lignified cells; cotyledons, epidermis of thin-walled cells

containing granules of brown pigments and bearing club-shaped multi-cellular hairs. Mesophyll cells are polygonal and containing starch granules.

**Powder:** Powdered theobroma is brown in colour and is characterised by fragments of the polygonal cells of the epidermis of the seed coat being crossed by the cells of the endocarp, large mucilage cells, fragments of the sclerenchymatous layer of the seed coat, fragments of the epidermal cells of the cotyledons with brown pigments, numerous parenchyma cells containing starch granules and brown pigments.

**Chemical constituents:**

The kernel contains 0.9 to 3 per cent of theobromine together with small amount of caffeine; 40 to 50 per cent of solid fat and about 2.5 per cent of sugars, mainly sucrose and dextrose. The shell contains about 0.4 to 2 per cent of theobromine and also mucilage.

**Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Perform the Murexide test under the monograph for *Coffea arabica*. Cocoa gives a positive reaction also.

**Test for purity:**

Ether-soluble extractives not less than 50.

**Uses:**

Suppository base and chocolate.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## Thevetia nerifolia JUSS.

### **Family name:**

Apocynaceae.

### **Synonyms:**

- (a) *Thevetia peruviana* (Pers.) K. Schum.
- (b) *Cascabela thevetia* (L.) Lippold
- (c) *Cerbera thevetia* L.
- (d) *Cerbera peruviana* Pers.



### **Common name:**

- (a) Lucky nut, Milk bush, Yellow oleander,  
Exile tree, Exile oil tree (E)
- (b) Laurier jaune des Indes, Chapeau de Napoléon (F).

### **African names:**

- (a) Arabic: Thefetiah
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Olomiojo

### **Brief description of the plant:**

Latex bearing shrub of 6 m high; alternate quasi-linear lanceolate leaves; terminal cymes of bell-shaped yellow flowers of 7 cm long; fruits, spherical drupes yellow when ripe; seeds enclosed in an angular bilobed shell.

### **Geographical distribution:**

Grown in all intertropical regions.

### **Part used:**

Ripe seeds.

### **Names of drug:**

Semen Thevetiae. Thevetia seeds.

### **Definition:**

Thevetia seed is the dried ripe seeds of *Thevetia nerifolia* Juss. (family, Apocynaceae) containing not less than 2 per cent of total cardenolides calculated as thevetin and not more than 1 per cent of foreign organic matter.

### **Description:**

The seeds are odourless and have an intense bitter taste followed by numbness.

**Macroscopic:** The seed is compressed, wedge-shaped with a triangular to semi-circular outline having a broad end and another pointed end, a flat inner surface and slightly convex outer one. It is buff to pale-brown in colour with minutely pitted surface. It measures 1.4-1.5 cm in length, 1.2-1.3 cm in width and 0.4-0.5 cm in thickness. The micropyle is situated at the narrow end of the seed; while the hilum is at the middle of the flat inner side, around which is irregular scar 5-7 mm in diameter produced by tearing off the part of the testa that is fused with the placenta. In this area several vascular strands are clearly visible, radiating from the hilum and ramifying through the testa. One of these strands is more distinct and running from the hilum to the rounded chalazal end and

representing the raphe. The seed has two lateral thin wings. Internally, the seed is exaluminous with straight fleshy embryo. Each 100 seeds weigh 45-47 g.

**Microscopical:** The testa, epidermis of brown polygonal lignified unequally thickened cells; the radial and inner tangential walls being strongly thickened with distinct wide pile. The outer tangential walls are thin and projecting outwards in the form of curved papillae. The hypodermis is of polygonal, isodiametric cells with reticulately thickened lignified straight walls, followed by the nutritive layer of thin-walled collapsed cells traversed by vascular strands of spiral and annular tracheids. Endosperm of one or two rows of polygonal cells with oil globules and aleurone grains. The cotyledons show a well-defined epidermis, and a ground tissue of thin-walled cellulosic cells full with oil globules and aleurone grains. The aleurone grains are rounded to oval, each with one or two distinct crystaloids and a globoid. In the ground tissue are scattered ramifying laticiferous tubes.

**Powder:** Greyish-buff in colour, odourless with oily strongly bitter taste followed by numbness. It shows numerous oil globules and aleurone grains free or in the embryo cells; fragments of the epidermal cells with thick lignified walls; fragments of reticulate lignified cells; spiral and annular vessels and tracheids.

**Chemical constituents:**

Cardenolides, thevetin A, thevetin B, neriifolin, fixed oil and protein.

**Test for identity:**

- (a) Macroscopic and microscopic examination of the specimen to ensure compliance with the above descriptions
- (b) Macerate 1 g of powdered seed with 10 ml of alcohol 95 per cent for one hour, then filter. To 1 ml of the filtrate add 0.5 ml of alcoholic solution of metadinitrobenzoic acid and 1 ml of 5 per cent alcoholic potassium hydroxide. A violet colour is produced.

**Test for purity:**

Ash, not more than 2.5 per cent, acid-insoluble ash not more than 2 per cent.

**Assay:**

Macerate 2 g of powdered seeds with 15 ml alcohol 70 per cent for 48 hours. Filter the extract and adjust the filtrate to 20 ml. Transfer 2 ml of the filtrate to an Erlenmayer flask, add lead acetate 10 per cent solution drop wise. Dilute with 5 ml of distilled water, filter the precipitated material, delead the filtrate with 10 per cent aqueous solution of disodium hydrogen phosphate, filter the precipitated lead phosphate, adjust the filtrate to 25 ml. Take 10ml of the filtrate and add 10ml of Baldet reagent, leave for one hour at room temperature. Measure the developed colour spectrophotometrically at 495 nm. Calculate the cardenolide content from a standard curve.

**Uses:**

Cardiotonic for treatment of congestive heart failure.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Trema orientalis (Linn.) Blume**

### **Family name:**

Ulmaceae.

### **Synonyms:**

- (a) *Trema guineensis* Ficalho
- (b) *Trema Hochstetteri* Engl.
- (c) *Sponia Hochstetteri* Buching. ex Planch.
- (d) *Sponia orientalis* var. *asperata* Solms-Laub.

### **Common names:**

Indian Charcoal tree, Gunpowder-tree, Elm, Pigeonwood (E). Tréma vert, Tréma nain, bois d'andréze (F)

### **African names**

- (a) Arabic: N/A
- (b) Bambara: Alakra bagbena
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Aferife, Afere, Afe, Ayinyin, Afoforo, Afefe, Ayenyen



### **Brief description of the plant:**

Shrub, small or medium sized monoecious or rarely dioecious tree, up to 12 m. tall, with smooth grey bark. Twigs pubescent to tomentose. Leaf-blades oblong-lanceolate to attenuate-ovate, (2–)7.5–14 cm. long, (1.2–)2.3– 7.2 cm. wide, acuminate, rounded to cordate at the base, evenly and closely serrate from near the base, glabrous to puberulous above, pubescent to tomentose beneath, scabrous, pinninerved; petiole 7–12(–15) mm. long. Stipules lanceolate, 4–7 mm. long, pubescent, caducous. Cymes usually congested, ± 1 cm. long in flower, up to 2 cm. in fruit, many-flowered, mostly ♂, with a few ♀(hermaphrodite) flowers at the top. Calyx-tube short; lobes 5, 1–2 mm. long, pubescent. Ovary pubescent; styles inrolled or divaricate, 0.5–1 mm. long, usually persistent. Drupes black, thinly fleshy, ovoid to globose, 3–5 mm. long when dried, glabrous.

### **Geographical distribution :**

Throughout Africa south of the Sahara, Madagascar, Mascarene Is. and tropical Asia.

### **Part used:**

Bark, leaves, wood, foliage, fruit.

### **Name of drug:**

Elm bark.

### **Definition:**

Elm bark is the dried bark of *Trema guineensis* Ficalho (family, Ulmaceae).

### **Description:**

**Macroscopical:** A coarser-looking plant with generally larger leaves, 3–6 in. long, 1 1/4–2 1/2 in. wide, scabrous on the upper face and pubescent beneath. *Trema orientalis* is an evergreen shrub or tree up to 18 m in height. A short basally swollen bole, heavy branching and rounded to spreading crown. The slender branchlets are covered with white velvety hairs. Bark grey or brown, smooth but marked with parallel longitudinal

lines and corky spots; slash creamy-white to light yellow, fibrous, bright green immediately beneath the bark. It has an extensive root system that enables it to survive long periods of drought. Leaves simple, alternate, stipulate, along drooping branches, to 14 cm long, papery, rough to the touch and dull above, short grey hairs below, the edge finely toothed all round, blade unequal sided. Flowers small, green or greenish-white, unisexual, borne in a crowded inflorescence consisting mainly of male flowers with a few female ones at the top. Fruit small, round and fleshy, glossy black when ripe, 4-6 mm, containing 1 dull black seed embedded in bright green flesh. The name *Trema* is based on the Greek word for a hole and alludes to the pitted seeds. The specific name, 'orientalis' is Latin for eastern-'of the orient.'

***Chemical constituents:***

Tannins, saponins, flavanoids, triterpenes, phytosterols, and several constituents of xanthones.

***Tests for identity:***

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

***Tests for purity:***

N/A

***Pharmaceutical preparations:***

N/A

***Uses:***

Antimicrobial, antimarial, antipyretic.

***Storage:***

In a cool dry place.

## **Trigonella foenum-graecum L.**

### **Family name:**

Fabaceae.

### **Synonym:**

- (a) *Trigonella tibetana* (Alef.) Vassilcz.
- (b) *Buceras foenum-graecum* (L.) All.,
- (c) *Foenum-graecum offi cinale* Moench,
- (d) *F. offi cinale* Moench var. *cultum* Alef.,
- (e) *F. sativum* Med.,
- (f) *Folliculigera graveolens* Pasq.,
- (g) *Tels foenum-graecum* (L.) Kuntze,
- (h) *Trigonella foenum-graecum* L. subsp. *Culta* (Alef.) Gams,
- (i) *T. graeca* St Lag.
- (j) *T. jemenensis* (Serp.) Sinsk.



### **Common names:**

Fenugreek (E). Fenugrec, Sénégtré, Trigonelle (F).

### **African names:**

- (a) Arabic: طبلة
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Uwatu
- (f) Yoruba: N/A

### **Brief description of the plant:**

Erect annual herbaceous plant of 10 to 40 cm, smooth; whitish or purplish blue flowers that blossom solitarily or in groups of 2; pods of 2 to 10 cm with a "beak" of 2 to 3 cm. Aromatic plant.

### **Geographical distribution:**

Temperate and Mediterranean regions of Africa.

### **Part used:**

Seeds.

### **Names of drug:**

Semen Foenugraci. Foenugreek. Fenugrec. Semen Trigonellae Foenugraeci.

### **Definition:**

Foenugreek is the dried ripe seeds of *Trigonella foenum-graecum* L. (family, Fabaceae) Foenugreek contains not more than 2 per cent of foreign organic matter.

### **Description:**

Odour, faint, characteristic but strong when powdered; taste, mucilaginous, and slightly bitter.

**Macroscopical:** Seed, oblong, flattened or rhomboidal; 3 to 7 mm long; dark yellowish-brown; externally, nearly smooth; the whitish hilum and micropyle, in a depression on one of the narrow sides, from which a deep furrow running diagonally dividing the seed into two unequal portions the smaller containing the radicle and the larger, the cotyledons; very hard; internally showing a horny, translucent endosperm surrounding

the radicle and the two yellowish accubent cotyledons; soaked in water the endosperm swells and becomes mucilaginous.

**Microscopical:** Testa with an epidermis of palisade-like cells, about 2 to 6 times as long as they are wide, with thick cuticle, and thick lamellated walls, the lamen being conical at the upper extremity and rounded at the base; subepidermal layer of basket-like cells, with bar-like thickening on the radial walls, followed by the parenchymatous nutritive layer. Endosperm, of several layers of polyhedral cells with stratified mucilaginous contents. Cotyledons, of parenchymatous cells containing fixed oil, and aleurone grains, up to 15  $\mu$  in diameter.

**Powder:** Powdered Fenugreek is yellowish; characterised by fragments of testa showing the palisade-like epidermal cells, the basket-like cells of the subepidermal layer; fragments of endosperm with mucilaginous cells; fragments of the cotyledons with parenchymatous cells containing fixed oil and aleurone grains up to 15  $\mu$  in diameter, starch granules small, very few.

**Chemical constituents:**

Fenugreek contains 28 per cent of mucilage, which occurs in the endosperm. It yields on hydrolysis the sugars mannose and galactose. It contains proteins, 6 per cent fixed oil, a saponin, two alkaloids (trigonelline and choline) and about 1 per cent of diosgenin.

**Tests for identity:**

- (a) Macroscopic and microscopical examinations to confirm that the specimen complies with the descriptions above
- (b) Microchemical tests for the presence of Trigonelline and for Diosgenin
- (c) Thin-layer chromatographical examination of extracts of the seed to confirm the presence of trigonelline and of Disgenin.

**Tests for purity:**

- (a) Cold-water extractives, not less than 30 per cent.
- (b) Ash, not more than 6 per cent; acid-insoluble ash, not more than 2 per cent.
- (c) Moisture, not more than 12 per cent.
- (d) Swelling index, not less than 6.

**Pharmaceutical preparations:**

N/A

**Uses:**

Fodder for animal and occasionally as a spice in curry powder. Source of diosgenin. As an adjunct for the management of hypercholesterolaemia, and hyperglycaemia in cases of diabetes mellitus. Prevention and treatment of mountain sickness.

**Storage:**

In well-closed containers away from heat and light.

## **Uncaria elliptica R.Br. ex G.Don**

### **Family name:**

Rubiaceae.

### **Synonyms:**

- (a) *Uncaria gambir* Roxb.
- (b) *Nauclea gambir* Hunt.
- (c) *Uncaria gambier* Thwaites



### **Common names:**

- (a) Catechu (E).
- (b) Gambier (F).

### **African names:**

- (a) Arabic: قفر هندي أو قوقال هندي أو سسط
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A

### **Brief description of the plant:**

Climber with strong curved thorns (sterile peduncles); opposite leaves, briefly petiolated, ovate or ovate-lanceolate, contracted at the tip into a short tail or acuminate of 10 to 12 cm long, coriaceous and smooth. Yellowish flowers in axillary bunches, pedunculate flowers on tomentose calyx with the corolla of about 12 mm. Fruit, septicidal capsule of two locules containing numerous seeds.

### **Geographical distribution:**

Originates from India, naturalized in Mediterranean Africa.

### **Part used:**

Dried aqueous extract.

### **Names of drug:**

Catechu. Pale catechu. Gambier.

### **Definition:**

Catechu is a dried aqueous extract prepared from the leaves and young shoots of *Uncaria gambier* (Hunter) Roxb. (family, Rubiaceae)

### **Description:**

It is odourless; taste is at first bitter and astringent, but afterwards sweetish.

**Macroscopical:** Gambier occurs in the form of regular cubes measuring from 2 to 3 cm each way or in masses of adherent cubes and sometimes in larger rectangular blocks about 4 cm long or in irregular broken pieces.

It is light in weight, and of a dull, dark reddish-brown colour externally.

The surface of the cubes are even, with a few minute cavities, slightly concave and striated. The cubes or masses break easily and are friable; internally they are porous and pale brown.

**Microscopical:** Powdered drug, exhibits numerous minute acicular crystals of catechin.

**Chemical constituents:**

Catechu contains catechin (7 to 33 per cent), and catechu-tonic acid (22 to 50 per cent), quercetin, wax and oil in small quantities.

**Test for purity:**

Catechu yields not more than 33 per cent of water-insoluble matter, not more than 36 per cent alcohol (95 per cent) insoluble matter, contains not more than an occasional starch grain. Ash, not more than 8 per cent.

**Tests for identity:**

- (a) A 1 per cent aqueous solution gives a dark green colour with 0.1 per cent w/v ferric chloride solution changing to purple when made slightly alkaline with 5 per cent sodium hydroxide solution.
- (b) Mix 2 ml of a filtered and cooled 15 per cent solution in warm alcohol (95 per cent) with an equal volume of sodium hydroxide solution, shake with 2 ml of light petroleum (40-60°) and allow to separate; the light petroleum layer (the upper layer) exhibits a brilliant greenish fluorescence (differ from black catechu).
- (c) Warm catechu with chloroform and filter; a yellowish-green solution is produced.

**Pharmaceutical preparations:**

Pulvis Catechu Compositus - Compound Powder of Catechu.

Tinctura Catechu - Tinctura of Catechu.

Trochisci Catechu - Catechu Lozenges.

**Uses:**

Catechu is a powerful astringent, in diarrhoea and haemorrhage.

Preparations of catechu are incompatible with gelatin, iron salts and alkalis.

**Storage:**

In a cool dry place.

## **Valeriana officinalis L.**

### **Family name:**

Valerianaceae.

### **Synonyms:**

- (a) *Valeriana alternifolia* Ledeb.
- (b) *Valeriana excelsa* Poir.
- (c) *Valeriana sylvestris* Grosch.

### **Common names:**

- (a) Valerian rhizome. Valerian root. Catmint, Garden Heliotrope, Common Valerian, Garden Valerian (E).
- (b) Valeriane officinale. Herbeaux chats (F).

### **African names:**

- (a) Arabic: ناردين طبی
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: N/A



### **Brief description of the plant:**

Perennial plant with stoloniferous underground stems; aerial stalks hollow and cordate attaining 2 m in height; pinnatisected leaves in rosette at the base and opposite along the stem; terminal umbellar cymes pink or white flowers.

### **Geographical distribution:**

Temperate regions but rarely seen in the Mediterranean region.

### **Parts used:**

Rhizome and roots.

### **Names of drug:**

Rhizoma Valerianae. Valerian.

### **Definition:**

Valerian is the dried rhizome and roots of *Valeriana officinalis* L. (Valerianaceae) carefully dried at a temperature below 40°C. Valerian contains not more than 5 per cent of foreign organic matter.

### **Description:**

Odour, distinctive, disagreeable; taste, camphoraceous, somewhat pungent, and more or less bitter.

**Macroscopical:** Rhizome, erect, entire, or usually cut longitudinally, 2 to 5 cm long, 1 to 3 cm thick; externally, dull yellowish-brown or dark brown, sometimes crowned by the remains of stem bases and scale leaves, and bears occasional, short, horizontal branches, and numerous roots or their circular scars; fracture, short and horny; internally, whitish, with an irregular outline, occasionally hollow, and exhibiting a comparatively narrow bark traversed, here and there, by root-traces, and separated by a dark line, the cambium form a ring; small xylem bundles surrounding a central pith.

Roots, numerous, slender, cylindrical, usually plump; 2 to 12 mostly 8 to 10 cm long; 0.5 to 2 mm in diameter; externally, greyish-brown to greenish-yellow, longitudinally striated, with fibrous lateral rootlets; brittle; internally, showing a wide bark and a narrow central stele.

**Microscopical:** Rhizome, with epidermis of polygonal cells, having the outer walls slightly thickened; cork, immediately below the epidermis, of up to 7 layers of slightly suberized, brownish large polygonal cells; cortex, parenchymatous, with rather thick-walled parenchyma, containing numerous starch granules and traversed by numerous root-traces; endodermis of a single layer of tangentially elongated cells containing globules of volatile oil; pericycle, parenchymatous; vascular bundles, collateral, in a ring and surrounding a very large parenchymatous pith, containing starch granules and occasional scattered groups of sclereids with thick pitted walls and narrow lumen; xylem, with slender, annular, spiral, and pitted vessels, in small numbers. Branches, similar to rhizome but with a prominent endodermis and a well-defined ring of vascular bundles showing secondary thickening.

Root, with piliferous layer, of papillosed cells, some being developed into root hairs; exodermis, or a single layer of quadrangular to polygonal cells, with suberized walls, and containing globules of volatile oil; cortex, parenchymatous, with numerous starch granules, the outermost cells containing globules of volatile oil; endodermis, of one layer of cells with thickened radial walls primary xylem, of 3 to 11 arches surrounding a small central parenchymatous pith containing starch granules but no sclereids. Older roots show a pith of starch-bearing parenchyma, vascular bundles with secondary thickening and a periderm originating in the piliferous layer.

**Powder:** Powdered Valerian is light brown to greyish-brown; characterized by numerous fragments of parenchyma cells containing globules of volatile oil and starch granules; fragments of scalariform and reticulate thickened vessels and tracheids and strongly lignified narrow fibres; fragments of periderm and of piliferous layer with root hairs; numerous starch granules, rarely simple, mostly compound of 2 to 6 components, spheroidal, planoconvex, 3 to 20 mostly 8 to 12  $\mu$  in diameter with a central hilum. Starch granules being from 7 to 10 to 25 to 30  $\mu$  in diameter.

**Chemical constituents:**

1 per cent of volatile oil, consisting mainly of bonyl isovalerate. Non-volatile esters, valpotriate I and II.

**Tests for identity:**

(a) To 0.2 g add 5 ml of dichloromethane, shake several times during five minutes and filter, washing the filter with 2 ml of dichloromethane. Heat the combined filtrate and washings on a water-bath for the minimum time required to remove the solvent and dissolve the residue in 0.2 ml of methanol. Reserve 0.1 ml for test for identification (b). To the remainder add 3 ml of a mixture of equal volumes of 6M acetic acid and 7M hydrochloric acid and shake. A blue colour develops within fifteen minutes.

(b) Carry out the method for thin-layer chromatography (volume 2), using silica gel GF<sub>254</sub> as the coating substance and a mixture of hexane and butane-2-one (4: 1) as the mobile phase. Apply the following solutions separately to the chromatoplate in bands each 1.5 cm long and not more than 0.5 cm wide, 10 ml of the solution reserved in test for

identification (a) (solution A) and 5 ml of a solution prepared immediately before use by dissolving 10 mg of vanillin and 10 ml of anisaldehyde in sufficient methanol to produce 10 ml (solution B). Develop twice, allowing the solvent front to ascend 10 cm above the line of application. After removal of the chromatoplate, examine under an ultra-violet lamp having a maximum output at about 254 nm. The chromatogram obtained with solution (A) exhibits a number of dark zones against a light background; the largest of these, corresponding to valtrate, has the same  $R_f$ , (0.5 to 0.6) as the zone due to anisaldehyde in the chromatogram obtained with solution (B).

Spray the chromatoplate with dinitrophenylhydrazine reagent and heat at 100 to 105°C for ten minutes. A number of coloured zones appear in the chromatogram obtained with solution (A); the zone corresponding to valtrate is greyish-green and that corresponding to anisaldehyde is yellow.

The chromatogram obtained with solution (A) exhibits, in the lower part, a blue zone having the same  $R_f$ , (about 0.3) as the yellow area corresponding to vanillin in the chromatogram obtained with solution (B) and between the blue zone and the zone corresponding to valtrate, two much smaller and more faintly coloured zones (dihidrovaltrate and acevaltrate).

(c) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

**Tests for purity:**

- (a) Powdered Valerian contains no calcium oxalate crystals and no foreign starch granules.
- (b) Alcohol (60 per cent) soluble extractives, not less than 18 per cent.
- (c) Ash, not more than 15 per cent; acid-insoluble ash, not more than 10 per cent.

**Pharmaceutical preparations:**

Extractum Valerianaæ Fluidum.

Tinctura Valerianaæ.

**Uses:**

Treatment of nervous disorders.

**Storage:**

In tightly-closed containers, in a cool dry place, protected from light.

## **Vanilla planifolia Jacks. Ex Andrews**

### **Family name:**

Orchidaceae.

### **Synonyms:**

- (a) *Vanilla aromatica* Willd.
- (b) *Vanilla fragans* Salisb.
- (c) *Vanilla planifolia* Jacks. ex Andrews
- (d) *Vanilla sativa* Schiede



### **Common names:**

Common vanilla. Vanilla plant, Least Water-lily, Vanilla Orchid (E). Vanille. Vanillier odorant (F).

### **African names:**

- (a) Arabic: فانيليا او فنيلية
- (b) Bambara: N/A
- (c) Hausa: N/A
- (d) Peuhl: N/A
- (e) Swahili: Lavani
- (f) Yoruba: N/A

### **Brief description of the plant:**

Climbing plant fixed to the support by aerial roots; leaves, thick, flat, oblong lanceolate; inflorescence in 4 to 5 greenish-yellow flowers, fruit in the form of a bean of 15 to 20 cm, brown when ripe, black and aromatic after fermentation.

### **Geographical distribution:**

Intertropical humid regions.

### **Part used:**

Dried fermented fruits.

### **Names of drug:**

Fructus Vanilla. Vanilla fruits.

### **Definition:**

Vanilla is the fully grown, unripe, cured fruits of *Vanilla planifolia* Anfr. (family, Orchidaceae). It contains not more than 2 per cent of foreign organic matter and not less than 2-3 per cent of vanillin.

### **Description:**

Odour, and taste agreeable, fragrant and aromatic.

**Macroscopical:** Fruits slender linear capsules about 15 to 25 cm long, 8-10 mm in diameter, flattened cylindrical, usually curved at the stalk end, nearly black; surface, longitudinally wrinkled covered with minute crystals of vanillin; capsule unilocular with three carpels, contain innumerable minute black seeds embedded in a dark aromatic balsamic fluid secreted by the hair-like cells of the inner epidermis of the pericarp; fruit dehisces imperfectly and somewhat exceptionally by two unequal valves.

**Powder:** Powdered vanilla is dusky brown to nearly black, shows fragments of parenchyma; pericarp with longitudinal, oblique, slit-like walls; calcium oxalate acicular and prismatic crystals, fragments of seed coat with polygonal stone cells and slender crystals of vanillin.

***Chemical constituents:***

Vanillin, vanillic acid, resin.

***Tests for identity:***

- (a) For vanillin, on treating a few of crystals as an efflorescence on the fruit with a drop of phloroglucinol T.S. and a drop of hydrochloric acid the resulting solution immediately acquires a red colour.
- (b) Odour agreeable fragrant, vanillin crystals acicular and stand out at right angles from the surface of the fruit.
- (c) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions

***Pharmaceutical preparation:***

Tinctura Vanilla (1 in 10).

***Uses:***

Vanilla is used solely as a flavouring agent. The tincture is an ingredient of several official preparations.

***Storage:***

Preserve in tight containers in cold place. Do not use vanilla which has become brittle.

**Voacanga africana Stapf. ex Eliot**  
**Voacanga thouarsii Roem. and Schult.**

**Family name:**

Apocynaceae.

**Synonyms:**

(a) *Voacanga africana* Stapf.

1. *Voacanga glabra* K. Schum.
2. *Voacanga magnifolia* Wernham.
3. *Voacanga eketensis* Wernham.
4. *Voacanga glaberrima* Wernham
5. *Voacanga bequaerti* De Wild.
6. *Voacanga boehmii* K. Schum.
7. *Voacanga schweinfurthii* var. *puberula* K. Schum. Pichon
8. *Voacanga schweinfurthii* Stapf
9. *Voacanga puberula* K. Schum.
10. *Voacanga schweinfurthii* var. *parviflora* K. Schum.
11. *Voacanga angolensis* Stapf ex Hiern
12. *Voacanga spectabilis* Stapf
13. *Voacanga lutescens* Stapf
14. *Voacanga lemossii* Philipson
15. *Voacanga africana* var. *glabra* (K. Schum.) Pichon
16. *Voacanga africana* var. *auriculata* Pichon
17. *Voacanga africana* var. *lutescens* (Stapf) Pichon
18. *Voacanga talbotii* Wernham
19. *Voacanga glaberrima* Wernham

(b) *Voacanga thouarsii* Roem. and Schult.

1. *Annularia natalensis* Hochst.
2. *Voacanga obtusa* Schum.
3. *Voacanga thouarsii* var. *obtusa* (K. Schum.) Pichon
4. *Voacanga dregei* E. Mey.
5. *Cyclostigma natalense* Hochst. Hochst. ex Endl.
6. *Piptolaena dregei* E. Mey. A. DC.
7. *Voacanga thouarsii* var. *dregei* E. Mey. Pichon

**Common name:**

Small-fruited Voacanga (E). Voacanga d'Afrique (F).

**African names:**

- (a) Arabic: N/A
- (b) Bambara: N/A
- (c) Hausa: Kokiyar biri
- (d) Peuhl: N/A
- (e) Swahili: N/A
- (f) Yoruba: Ako-dodo, Adapopo, Sinrinpin, Dodo

**Brief description of the plant:**



*Voacanga africana* is a shrub reaching 6 m in height; leaves, opposite obovate and acuminate of 18 over 7 cm terminal corymbs of white flowers in pairs; fruits spherical, mettled green joined in pairs, seeds wrapped in yellow pulp.

*V. thouarsii* can attain 9 m in height with crown of leaves at the tips of branches.

**Geographical distribution:**

*V. africana* is grown all over Africa in drained soils.

*V. thouarsii* also grows in Africa and Madagascar in swampy forests.

**Part used:**

The dried fruit.

**Names of drug:**

Akanga. Voacanga.

**Definition:**

Voacanga consists of the fresh or dried leaf of *Voacanga Africana* Stapf. (family, Apocynaceae).

**Description:**

**Macroscopical:** The fruit is bacciform, spherical, fleshy, the size of a peach which becomes open at the bottom when ripe. The opening reveals numerous seeds spread out in the white pulp which is edible, sweet and bitter. The dark green fruit covered with numerous white dots and contains ribs of lighter green. The fruits usually hang in clusters of two at the top of the same stem. One or two carpels may sometimes secrete an abundant flow of latex from the pericarp.

**Microscopy:** Trichomes are absent. Epidermal cells measure 10.5-45.5um on the upper surface and 3.5-42.0um on the lower surface. Palisade ratio is 3.3-7.0; calcium oxalate crystals are absent. The midrib is abaxially prominent with an arc of xylem and narrow V-shaped phloem. Perimedullary phloem is present and a zone of collenchymas underlies both epidermises in the midrib region. Latex tubes are also present.

**Powder:** fragments of the epidermal cells with or without stomata attached. Few isolated cells of the palisade, fragments of the xylem and phloem vessels elements. Crystals of calcium oxalate are absent so also are trichomes.

**Chemical constituents:**

Alkaloids mainly voacangine also voaphylline, voacamidine, vobtusine. In the stem and root, the following compounds have also been reported: alkaloids, saponins, tannins, vobtusine, voaphylline, desoxy-vobtusine, desoxy-vovtusine lactone, voacangine, voacamidine, voacristine, vobasine, voacryptine, voacorine. In the leaf: benzoic, prptocatechuic, vannillic, caffieic, and p-coumaric acids are present; while voacamidine-N-oxide was obtained from the root bark. Tuberosine was the major alkaloid from the seed. Average total alkaloid yield is 1.5 per cent..

**Tests for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the descriptions given above.
- (b) Microchemical tests on the extract of the specimen for the presence of alkaloids using Dragendorff's and Mayer's reagents.
- (c) Thin-layer chromatographical examination of the extract to confirm the presence of voacangine by co-chromatography

**Tests for purity:**

Moisture: Not more than 7.6 per cent

Ash: Not more than 11.34 per cent.

Acid-insoluble ash: Not more than 1.72 per cent.

Alcohol-soluble extractive: Not less than 2.3 per cent. (moderately coarse powder BP)

Water-soluble extractive: Not less than 13.9 per cent.

Total indole alkaloids: Not less than 0.12 per cent. w/w calculated as reserpine under the assay for alkaloids as in the *Catharanthus roseus* monograph.

**Assay:**

Carry out the assay as described under total alkaloids in volume 2.

**Uses:**

Voacangine is a cardiotonic. The LD<sub>50</sub> by intra-venous route is about 33.75 mg/kg.

**Storage:**

In well-closed containers, protected from light.

## **Ximenia americana L.**

### **Family name:**

Olacaceae.

### **Synonyms:**

- (a) *Ximenia americana* L. var. *microphylla* Welw. ex Oliver;
- (b) *Ximenia americana* L. var. *oxyprener* Chiov.;
- (c) *Ximenia americana* L. var. *sphaerica* Chiov.;
- (d) *Ximenia laurina* Del.;
- (e) *Ximenia rogersii* Burtt-Davy
- (f) *Ximenia inermis* L.



### **Common names:**

Wild olive, Wild lime, Yellow Plum or Sea Lemon, Tallow nut; Seaside plum, Spiny plum, Mountain plum; False sandalwood, Tallow wood, Hog plum, Small sourplum, Sour plum, Wild lime, Wild plum (E). Citron de la mer, Citronnier de la mer, Heymassoliépineux, Macaby, Prune-épine, Prunier canaque, Prunier de mer, Prune bord de mer; Prunellier chimène (F)

### **African names:**

- (a) Arabic: Abu khamier, Abu khamira, Ankwi, Humeid abiad, Kelto, Medica
- (b) Bambara: N/A
- (c) Hausa: Tsaadaa, Tswada
- (d) Peuhl: Tiéni
- (e) Swahili: Mpangi, Mtumbui tumbui, Mtundakula, Timbui timbui
- (f) Yoruba: Igo

### **Brief description of the plant:**

A small sprawling tree of woodlands native to the tropics. Leaves are oval shaped, bright green and have a strong smell of almonds. Flowers are pale in color. Fruits are lemon-yellow or orange-red. It is a shrub like plant found in abundance in the West African region. It flowers usually in the second part of the dry season, producing cream – white to greenish yellow flowers. The fruits are green but turn Golden-yellow or red. The fruit when eaten is very refreshing and has almond acid taste.

### **Geographical distribution:**

Widespread in tropical Africa, Asia and America.

### **Part used:**

Leaves root and seed.

### **Names of drug:**

Wild olive. Wild lemon.

### **Definition:**

Wild olive is the dried leaves of *Ximenia americana* L. (family, Olacaceae)

**Description:**

**Macroscopical:** Bushy and spiny shrub or small tree 4-5m high, with open crown. Bark cracked and scaly. Thorn single, straight very sharp and brown. Flowers cream white to greenish yellow. Fruit an ellipsoid, edible, golden yellow when ripe with a thin skin.

*Ximenia americana* is a semi-scendent bush-forming shrub or small tree 2-7 m high. Trunk diameter seldom greater than 10 cm; bark dark brown to pale grey, smooth to scaly. The lax, usually divergent branching forms a rounded or conical crown. Branchlets purple-red with a waxy bloom and the tree usually armed with straight slender spines. Sometimes semi-parasitic with haustoria on the roots. Leaves alternate, lanceolate to elliptic, 3-8 to 1.5-4 cm, variable thickness (semi-succulent to thin); obtuse or emarginate, 3-7 pairs veins, inconspicuous. Petioles short, slender, up to 6 mm long, canaliculate. Grey-green, hairless and leathery or thin flesh. When crushed, young leaves smell of bitter almonds. The fragrant white, yellow-green or pink flowers occur in branched inflorescences borne on shortly pedunculate axillary racemes or umbels; pedicles 3-7 mm long, both peduncles or pedicles glabrous. Fruits globose to ellipsoidal drupes about 3 cm long, 2.5 cm thick, glabrous, greenish when young, becoming yellowish (or, rarely, orange-red) when ripe, containing a juicy pulp and 1 seed. Seed woody, light yellow, up to 1.5 cm long, 1.2 cm thick with a fatty kernel and a brittle shell..

**Chemical constituents:**

Tannins, saponins, resin and alkaloids.

**Tests for identity:**

Macroscopical examination of the specimen to ensure compliance with the descriptions given above.

**Tests for purity:**

N/A

**Pharmaceutical preparations:**

N/A

**Uses:**

Antiulcer, anticancer, antisickling, anthelmintic, trypanocidal, analgesic, antioxidant, antimicrobial, antimalarial, molluscicidal.

**Storage:**

In a cool dry place.

## **Zanthoxylum zanthoxyloides** Waterm.

### **Family name:**

Rutaceae.

### **Synonyms:**

- (a) *Fagara zanthoxyloides* Lam.
- (b) *Fagara senegalensis* (DC.) A. Chev.
- (c) *Zanthoxylum senegalense* (DC.) A. Chev.
- (d) *Zanthoxylum polyganum* Schum.



### **Common names:**

- (a) Fagara, Senegal prickly-ash,  
Candlewood, Toothache bark (E);
- (b) Fagarier, Fagara jaune (F)

### **African names:**

- (a) Arabic: N/A
- (b) Bambara: Won, Wo, Gozo ngua, Huo,  
Goro ngua
- (c) Hausa: Fasakwari, Fasahuari
- (d) Peuhl: Barkeley, Bulebarkele
- (e) Swahili: N/A
- (f) Yoruba: Igi-holarrhenaata, Ata, Orin ata

### **Brief description:**

Small tree of 6 to 12 cm high, branched near the base; branches bustle with many hooked thorns and imparipinnate leaves with rachis thorny underneath; median ribs of leaflets are also thorny underneath; inflorescence in loose axillary or terminal panicles; small white flowers; spherical capsule of 5 mm in diameter; all organs contain essential oil.

### **Geographical distribution:**

Sudano-Guinean West African regions.

### **Part used:**

Root.

### **Name of drug:**

Fagara root.

### **Definition:**

Fagara root is the dried root of *Zanthoxylum (Fagara) zanthoxyloides* Waterman and other species of *Zanthoxylum*. (family, Rutaceae)

### **Description:**

**Macroscopical:** The leaves are pinnate with 3-5 pairs of shining aromatic leaflets 3.5-10 cm long by 1.5-3.5 cm broad. They are elliptic to elongated, elliptic or slightly obovate, rounded or notched, or very shortly acuminate at the apex; broadly cuneate. They are dark green glossy, glabrous, rather leathery; with a prominent midrib and rather faint and irregular lateral nerves looped near the margin, and connected by an open network of indistinct veins. Leaflets stalks are stout, 0.2-10.5 cm long.

The flowers are small, numerous and greenish-white. The axillaries are narrow and terminal panicles are 5-25 cm long with short spike-like branches. They are glabrous and

usually without thorns. Individual flowers are about 0.2 cm long. The fruits are brown, about 0.6 cm across, splitting into two, to reveal shining blue black seeds within having a spicy taste. The bark is fairly fissured with longitudinal slash, yellow above, mottled with orange beneath, and it is quite rough. The root is cylindrical and tortuous with rootlets attached to it. The wood is yellow, hard and close-grained. The root consists of both the lignified and unlignified cork cells forming alternate bands. Pericyclic fibres are present, but the fibres are less abundant and vessel elements more numerous.

**Microscopical:** the root consists of both lignified and unlignified, thin-walled, rectangular to square, cork cells, forming alternate bands; pericyclic fibres are present; sclereids in the phloem are arranged in 1-3 bands; phloem parenchyma contains starch granules with few phloem fibres; both xylem fibres and vessel elements are present; transverse section shows suberised cork cells (some lignified) with yellow brown content, about 6 to 7 layers thick, exfoliating in some places; wide cortex of parenchymatous cells containing large numbers of starch grains, oil cells and prismatic crystals of calcium oxalate; an endodermis consisting of parnchymatous cells containing large amounts of starch grains delineate the cortex from the vascular tissue consisting of phloem tissue, which is capped by lignified pericyclic fibres; medullary ray 1-2 cells wide and full of starch grains; wood is composed of lignified vessels, pitted tracheids and xylem parenchyma.

**Powder:** Colour pale yellow; taste aromatic; cork tissue; numerous starch grains in parenchymatous cells; prismatic calcium oxalate crystals and lignified fibres present; pieces of cork cells in rectangular or square shapes, fragments of pericyclic phloem and xylem fibres with vessel elements present; Powder shows calcium oxalate crystals and starch granules giving blue black reaction to iodine solution.

**Chemical constituents:**

Alkaloidal constituents, Benzophenanthridines, phenolic benzophenanthridines, furoquinolines, canthinones, aporphines, protopines, acridines, quinolines and atypical alkaloids. Also tannins, flavonoids, saponins, acids, phenols, reducing sugars, calcium oxalate crystals. The major alkaloids are Chelerythrine, Skimmianine, Fagraramide and Fagaronine.

Others are Benzoic acid derivatives (anti sickling acids) including, p- 451ydroxyl benzoic acid, 2-hydroxymethylbenzoic acid and vanillic acid. Also contains gums and essential oil (containing atarine the spicy principle).

**Tests for identity:**

- (a) Macroscopic and microscopical examination of the specimen to comply with the descriptions given above
- (b) Microchemical tests (Dragendorff's and Mayer's reagents) for alkaloids in a total alkaloid extract of the plant
- (c) Thin-layer chromatographical examination to confirm the presence of Chelerythrine, Canthine-6-one and Berberine by co-chromatography

**Tests for purity:**

Moisture: Not more than 7 per cent.

Ash: Not more than 5 per cent.

Acid-insoluble ash: not more than 3.5 per cent.

Water-soluble ash: Not less than 0.25 per cent.

Water-soluble extractives: Not less than 10 per cent. (moderately coarse powder)

Alcohol (70 per cent.) –soluble extractives: Not less than 10 per cent (moderately coarse powder)

***Pharmaceutical preparations:***

N/A

***Uses:***

Antisickling agent, Antimicrobial and Anticancer.

***Storage:***

In a cool dry place.

## **Zea mays L.**

### **Family name:**

Poaceae.

### **Synonyms:**

- (a) *Zea alba* Mill.
- (b) *Zea americana* Mill.
- (c) *Zea vulgaris* Mill.

### **Common names:**

Maize. Indian corn. Turkey wheat (E). Maïs (F).

### **African names:**

- (a) Arabic: ذرة شامية
- (b) Hausa: Masara, Agwado, Ba-gwariya, Burudi, Yaggulumbe, Kwattatwali, Madaraa, Masaraa kwona, Hak'orin karuwa, Gwari
- (c) Peuhl: Swahili: Mahindi
- (d) Yoruba: Agbado, Igbado, Oka, Ijere, Elepa, Erin-igbado, Erinka, Eginrin



### **Brief description of the plant:**

Annual herbaceous plant 3 m high; straw base with aerial roots; linear lanceolate leaves that can reach 1 m long and 10 cm wide; male flowers in racemose terminal panicles; axillary female clusters of 2 to 3 flowers and on longitudinal rows with stigmata coming together at the extremity of clusters; maize seeds of varied colours.

### **Geographical distribution:**

Widely cultivated in all inter and extra-tropical regions.

### **Part used:**

The starch.

### **Names of drug:**

Amylum. Maize starch.

### **Definition:**

Maize starch is prepared from the grains of *Zea mays* L. (family, Poaceae)

### **Description:**

Odourless and with characteristic starchy taste.

**Macroscopical:** Maize starch occurs as a fine white powder or in irregular masses.

**Microscopical:** The granules are polyhedral, subspherical or occasionally muller-shaped, measuring 10 to 20  $\mu$  in diameter. The hilum is centric triangular or 2 to 5 rayed fissure, striations are invisible. The granules show a well marked cross by polarised light.

### **Chemical constituents:**

Amylose, amylo-pectin and amylo-hemicellulose.

### **Test for identity:**

- (a) Macroscopical and microscopical examination of the specimen to ensure compliance with the above descriptions
- (b) Add one drop of Iodine T.S. to the starch mucilage (formed by boiling 1 g of starch in 50 ml of water and cooled); a bluish-violet colour is developed which disappears on warming and reappears on cooling.

**Tests for purity:**

- (a) Starch loses on drying at 100°C not more than 14 per cent of its weight.
- (b) Mount a little of the starch in iodine T.S.; no yellow coloured particles are observed (gelatinised starch).
- (c) Triturate about 0.5 g of starch with 5 ml of water; the mixture is neutral to litmus paper (acidity or alkalinity).
- (d) Mix 0.5 g of starch with 10 ml of water, add 0.5 ml of hydrochloric acid and 3 drops of potassium ferrocyanide T.S., no blue colour is developed within 5 minutes (Iron salts).

**Assay:**

1.5 g accurately weighed of the starch and 90 ml of water, mix well, add 10 ml cone. sulphuric acid, reflux for 2½ hours on a boiling water bath, cool, neutralize with sodium carbonate, complete the volume to 250 ml with water and transfer part of it to a burette. Place 5 ml of each of standard Fehling solutions A and B in a conical flask; add 40 ml of water and boil the mixture. Run about 3 ml of the hydrolysed starch solution into the Fehling solution; after each addition the mixture is boiled and the precipitate allowed to settle before the next addition is made. When the blue colour of the mixture has disappeared add 4 drops of methylene blue indicator to the mixture and titrate with the sugar solution in drops. The end point is reached when the colour of the indicator disappears and record the volume of the sugar solution used. Subtract 0.2 ml from that volume which was required for complete reduction.

Calculate the percentage of starch. Each g of glucose is equivalent to 0.9 g of starch.

**Pharmaceutical preparations:**

Glycerinum Amyli.  
Pulvi Zinci et Amyli.  
Pulvis Zinci et Amyli Compositus.

**Uses:**

Starch soaks up secretions and helps to render injured parts less liable for infection. As a dusting powder it is used for chafings and exfoliated surfaces, it is used alone or mixed with zinc oxide or boric acid. Boiled with water, it may be used as emollient for skin. As a protective application in skin diseases it may be used in the form of Glycerinum Amyli. Mucilage of starch is the basis for many enemas and is an antidote for iodine poisoning, it should be freshly prepared. Boiled with water to form stiff paste, starch forms an excellent poultice.

**Storage:**

In well-closed containers, in a cool dry place, protected from light.

## **Zingiber officinale Roscoe**

### **Family name:**

Zingiberaceae.

### **Synonyms:**

- (a) *Amomum zingiber* L.
- (b) *Zingiber blancoi* Massk.
- (c) *Zingiber majus* Rumph
- (d) *Zingiber zingiber* (L.) H. Karst.



### **Common names:**

Ginger, Garden ginger, Spice ginger (E).  
Gingembre (F).

### **African names:**

- (a) Arabic: زنجبيل
- (b) Bambara: Niamaku, Niamahu, Dugukoro ni amaku
- (c) Hausa: Afu, Chitta, Citta, Citta ahoo, Citaraho, Sakanjabir, Saifa, Zanzabir, Sakan zabur, Cittafo.
- (d) Peuhl:
- (e) Swahili: Tangawizi
- (f) Yoruba: Ata-le, Ata-le funfun, Jinja

### **Brief description of the plant:**

Rhizomatous plant with leafy stems of 1.50 m in height with linear lanceolate sheathing leaves on smaller flower-bearing stems of 20 cm; greenish yellow flowers in clusters; vegetative propagation by rhizomes.

### **Geographical distribution:**

Cultivated in all intertropical regions of Africa.

### **Part used:**

Dried uncoated, unbleached rhizome.

### **Names of drug:**

Rhizoma Zingiberis. Ginger.

### **Definition:**

Ginger is the dried rhizome of *Zingiber officinale* Roscoe (family, Zingiberaceae) deprived of the dark outer tissues and known as unbleached Jamaica Ginger.

Ginger yields not less than 1 per cent of volatile oil.

### **Description:**

Odour, agreeable and aromatic; taste, agreeable, pungent and aromatic.

**Macroscopical:** Ginger occurs in horizontal, laterally flattened, sympodially branching pieces: 4 to 16 cm long, 1.5 to 6.5 cm usually 3 to 4 cm wide, up to 2 cm thick; pale yellowish-buff or light brown externally, longitudinally striated, somewhat fibrous; branches flattish, obovate, short, about 2 cm long, each ending with a depressed stem scar; fracture, short with projecting fibres, or sometimes resinous; internally, yellowish-brown, showing a yellow endodermis separating the narrow cortex from the wide stele, and numerous yellowish points, secretion cells and numerous bigger greyish points; vascular bundles, scattered on the whole surface.

**Microscopical:** Cortex, of isodiametric, thin-walled parenchyma cells with starch granules, and showing scattered secretion cells with suberized walls and yellowish-brown oleo-resinous content, and scattered bundles of the leaf traces accompanied by fibres; endodermis, of pale-brown, thin-walled cells with suberized radial walls; stele, with parenchymatous ground tissue, numerous yellow oleo-resin secretion cells and numerous scattered, closed collateral vascular bundles with non-lignified, reticulate, scalariform, and spiral vessels, often accompanied by narrow cells; containing a dark brown pigment, and supported by thin-walled fibres with wide lumen, small oblique slit-like pits, and lignified middle lamella; some of those fibres being septate.

**Powder:** Powdered Ginger is yellowish-white; characterised by numerous fragments of thin-walled parenchyma containing starch granules; fragments of thin-walled septate fibres with oblique slit-like pits; fragments of non-lignified scalariform, reticulate and spiral vessels, sometimes accompanied by dark pigment cells; numerous starch granules, simple, flat, oval, oblong with terminal protuberance, in which the eccentric hilum is situated, 5 to 60 usually 15 to 30  $\mu$  long, 5 to 40 usually 18 to 25  $\mu$  wide, 6 to 12 usually 8 to 10  $\mu$  thick with somewhat marked fine transverse striations.

**Chemical constituents:**

Ginger contains from 0.25 to 3 per cent of volatile oil possessing the aroma but not the pungency of the drug. The latter property is due to a yellowish oily body, gingerol which is odourless but has an intensely pungent taste.

The drug contains resin and 56 per cent of starch.

**Tests for identity:**

- Macroscopical and microscopical examination of the specimen to comply with the descriptions given above
- Thin-layer chromatographic examination of the specimen to confirm the presence of gingerols by co-chromatography

**Tests for purity:**

- Powdered Ginger contains no gelatinized starch (boiled Ginger); no starch granules less than 10  $\mu$  (Rice) and not more than 30  $\mu$  in diameter (Cereals and Potato); no sclereids or lignified elements, no calcium oxalate crystals and no cork cells.
- Shake 1 g of powdered Ginger with 5 ml of dilute acetic acid, and filter; to the filtrate, add a few drops of ammonium oxalate T.S.; not more than a slight turbidity is produced (Limed Ginger).
- Alcohol -soluble extractives, not less than 4.5 per cent.  
Water-soluble extractive, not less than 10 per cent.
- Ash, not more than 6 per cent; water-soluble ash, not less than 1.7 per cent.
- Foreign organic matter: not more than 2 per cent.

**Assay:**

Carry out the assay in volume 2 as directed under "Determination of volatile oils in drugs". It yields not less than 1 per cent of volatile oil.

**Pharmaceutical preparations:**

Tinctura Zingiberis Forte.

Ginger Syrup (Syrupus Zingiberis).

Weak Ginger Tincture.

**Uses:**

Flavouring agent. Carminative. Minimum dose 0.30 g, Maximum dose 1.0 g.

**Storage:**

In well-closed containers, protected from light.

## PHOTO GALLERY

### **Abrus precatorius L.**



### **Acacia senegal (L.) A Willd.**



### **Acacia seyal Delile**



**Achyranthes aspera L.**



**Adansonia digitata L.**



**Afromosia angolensis (Baker) De Wild**



**Afrormosia laxiflora (Baker) Harms**



**Agave sisalana Perrine**



**Albizia ferruginea (Guill. & Perr.) Benth.**



**Alchornea cordifolia Müll.Arg.**



**Allium sativum L.**



**Aloe ferox Miller**



**Althaea officinalis L.**



**Ammi visnaga (L.) Lamk.**



**Anacardium occidentale L.**



**Anethum graveolens L.**



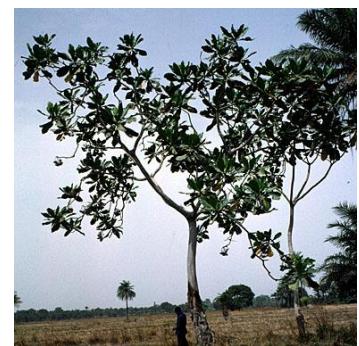
**Annona muricata L.**



**Annona senegalensis Pers.**



**Anthocleista procera Lepr. ex Bureau**



**Antiaris Africana Engl.**



**Arachis hypogaea L.**



**Argemone mexicana L.**



**Areca catechu L.**



**Artemisia absinthium L.**



**Astragalus gummifer Lab.**



**Atropa belladonna L.**



**Azadirachta indica A. Juss.**



**Balanites aegyptiaca (L.) Del.**



x

**Borreria latifolia** (Aubl.) K. Schum.



**Borreria verticillata** (L.) G.F.W. Mey.



**Bridelia ferruginea** Benth.



**Caesalpinia bonduc L. (Roxb.)**



**Cajanus cajan Millsp.**



**Calotropis procera (Aiton) W. T. Aiton**



**Canavalia ensiformis L. (DC.)**



**Capsicum annuum L.**



**Capsicum frutescens L.**



**Carica Papaya L.**



**Carthamus tinctorius L.**



**Cassia absus L.**



**Cassia acutifolia Del. And Cassia angustifolia Vahl.**



**Cassia alata L.**



**Cassia fistula L.**



**Cassia italica (Mill.) Spreng**



**Cassia nigricans Vahl**



**Cassia occidentalis L.**



**Cassia podocarpa Guill. & Perr.**



**Cassia Siamea Lam.**



**Cassia sieberiana DC.**



**Cassia tora L.**



**Catharanthus roseus (L.) G. Don**



**Ceiba pentandra (L.) Gaertn.**



**Centella asiatica (L.) Urb.**



**Cephaelis ipecacuanha (Brot.) Rich.**



**Chenopodium ambrosioides L.**



***Chrysanthemum cinerariaefolium* (Trevir.) Vis.**



***Cinchona calisaya* Wedd.**



***Cinnamomum camphora* (L.) J. Presl**



**Cinnamomum zeylanicum Blume**



**Citrullus colocynthis (L.) Schrad.**



**Citrus aurantium L. (pro. Sp)**



**Citrus limonum Risso**



**Cissus quadrangularis L.**



**Claviceps purpurea (Fr.) Tul.**



xxii



**Cocculus pendulus (J.R.Forst. & G.Forst.) Diels**



**Cocos nucifera L.**



**Coffea arabica L.**



**Cola acuminata (P. Beauv.) Schott et Endl.**



**Combretum aculeatum Vent.**



**Combretum micranthum G. Don**



**Commiphora molmol Engl. ex Tschirch**



**Combretum nigricans Lepr.**



**Convolvulus scammonia L.**



**Corchorus olitorius L.**



**Coriandrum sativum L.**



**Crateva religiosa G. Forst.**



**Crotalaria retusa L.**



**Cucurbita pepo L.**



**Cymbopogon citratus (DC.) Stapf**



**Cynara scolymus L.**



**Datura metel L.**



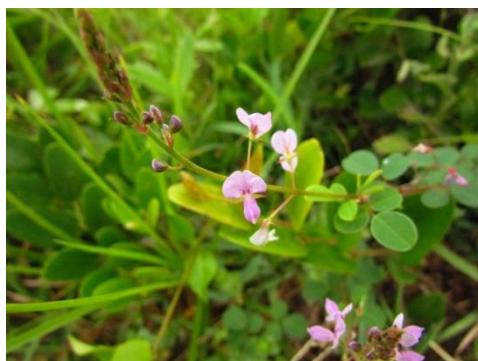
**Datura stramonium L.**



**Derris elliptica (Roxb.) Benth.**



**Desmodium adscendens (Sw.) DC.**



**Desmodium velutinum (Willd.) DC.**



**Digitalis lanata Ehrh.**



**Diospyros mespiliformis Hochst. ex A.DC.**



**Elaeis guineensis Jacq.**



**Elettaria cardamomum (L.) Maton**



**Entada Africana Guill. & Perr.**



**Ephedra sinica Stapf**



**Eucalyptus globulus Labill.**



**Euphorbia hirta L.**



**Erythrina senegalensis DC.**



**Erythrophleum guineense G. Don**



**Erythroxylon coca Lam.**



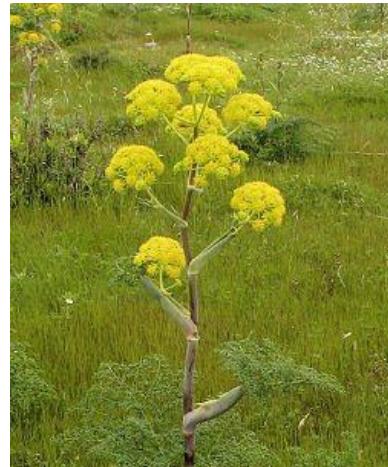
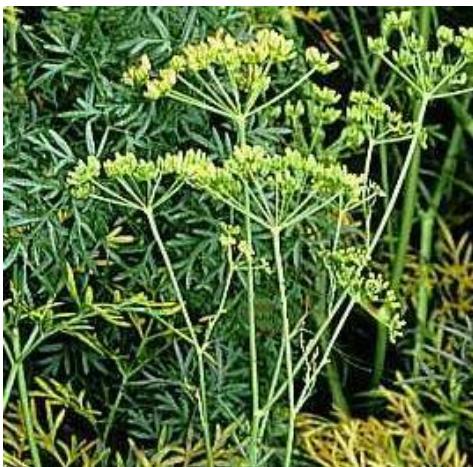
**Eupatorium odoratum L.**



**Euphorbia tirucalli L.**



**Ferula assa-foetida L.**



**Foeniculum vulgare Mill.**



**Gentiana lutea L.**



**Glycine soja Sieb et Zucco**



**Glycyrrhiza glabra L.**



**Grewia bicolor Juss.**



**Guaiacum officinale L.**



**Guibourtia copallifera Benn.**



**Haemanthus multiflorus Martyn**



**Hagenia abyssinica (Bruce) J.F.Gmel.**



**Harungana madagascariensis [Lam. ex] Poir.**



**Heliotropium indicum L.**



**Hippocratea indica Willd.**



**Holarrhena floribunda T. Dur. et Schinz**



**Hydrastis Canadensis L.**



**Hygrophila auriculata (Schumach.) Heine**



**Hyptis suaveolens (L.) Poit.**



**Hyoscyamus muticus L.**



**Lagenaria siceraria (Molina) Standl.**



**Lavandula officinalis Chaix.**



**Lawsonia alba Lam.**



**Lindackeria dentata (Oliv.) Gilg**



**Lippia multiflora Moldenke**



**Lobelia inflata L.**



**Mangifera indica L.**



**Matricaria chamomilla L.**



**Maytenus senegalensis (Lam.) Exell**



**Melia azedarach L.**



**Mentha piperita L. (pro sp.)**



**Mentha viridis L.**



**Mimosa pudica L.**



**Mirabilis jalapa L.**



**Mitragyna inermis (Willd.) Kuntze**



**Momordica charantia L.**



**Morinda geminata DC.**



**Moringa oleifera Lamk**



**Mucuna pruriens (L.) DC.**



**Myristica fragrans Houtt.**



**Ocimum gratissimum L**



**Papaver somniferum L.**



**Pauridiantha callicarpoides (Hiern) Bremek.**

**N/A**

**Peumus boldus Molina**



**Phaseolus vulgaris L**



**Physostigma venenosum Balfour**



**Piliostigma reticulatum (DC.) Hochst.**



**Pimpinella anisum L.**



**Pisum sativum L.**



**Plantago ovata Forssk.**

N/A

**Pogostemon cablin (Blanco) Benth**



**Polygala senega L**



**Prosopis africana (Guill. & Perr.)Taub.**



**Pterocarpus erinaceus Poir.**



**Punica granatum L.**



**Quassia amara L.**



**Quercus infectoria G. Olivier**

N/A

**Quillaja saponaria Poir.**



**Quisqualis indica L.**



**Rauvolfia vomitoria Afzel.**

N/A

**Rhamnus frangula L.**



**Rhamnus purshiana DC**



**Ricinus communis L.**



**Saccharum officinarum L.**



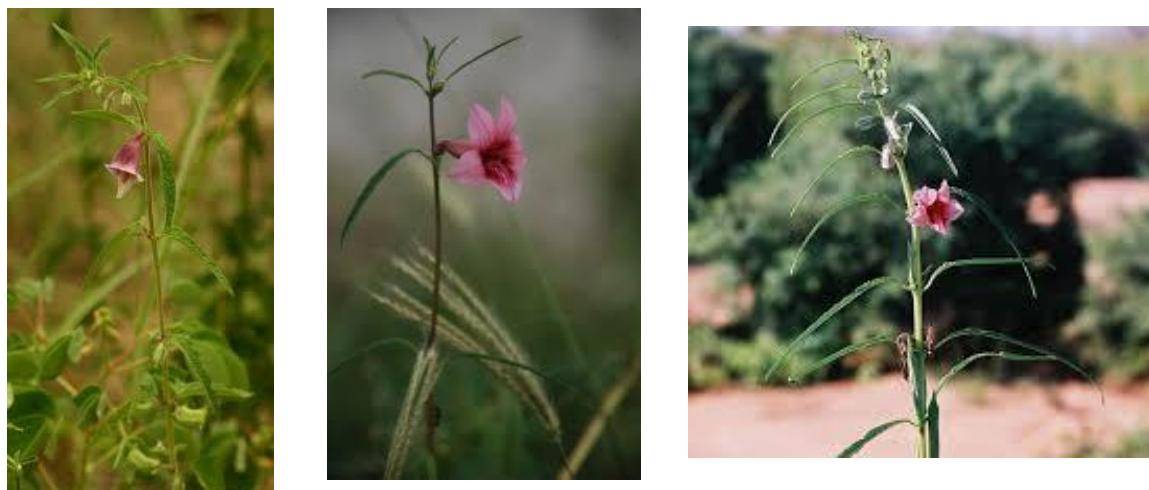
**Schwenckia americana L.**



**Securinega virosa (Roxb. ex Willd.) Baill.**



**Solanum nigrum L.**



**Solanum nigrum L.**



**Sterculia tragacantha Lindl.**



**Sterculia tragacantha Lindl.**



**Strophanthus gratus (Wall. & Hook.) Baill.**



**Strychnos nux vomica L.**



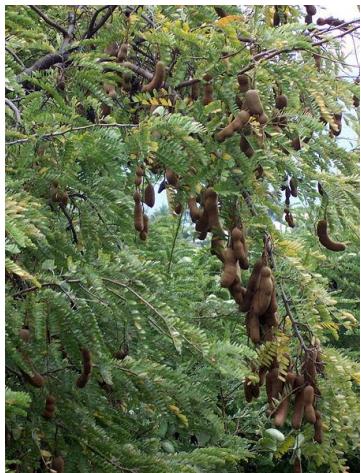
**Swartzia madagascariensis Desv.**



**Syzygium aromaticum (L.) Merrill et L.M. Perry**



**Tamarindus indica L.**



**Tephrosia purpurea (L.) Pers.**



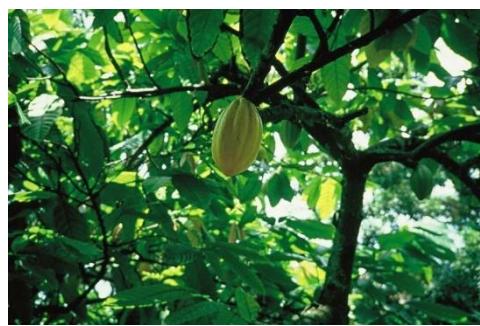
**Tephrosia vogelii Hook. f.**



**Terminalia avicennioides Guill. & Perr.**



**Theobroma cacao L.**



**Thevetia nerifolia JUSS.**



**Trema guineensis Ficalho**



**Trigonella foenum-graecum L.**



**Uncaria gambier Thwaites**



**Urginea maritima (L.) Baker**



**Valeriana officinalis L.**



**Vanilla planifolia Jacks. Ex Andrews**



**Vetiveria nigritana (Benth.) Stapf**



**Voacanga africana Stapf. ex Eliot**



**Ximenia americana L.**



**Zanthoxylum zanthoxyloides Waterm.**



**Zea mays L.**



**Zingiber officinale Roscoe**

