

# A Review of Selected Plants Used in the Maintenance of Health and Wellness in Ethiopia

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**Abstract.** The therapeutic, Orthodox Christian liturgical/ceremonial, aromatic, and medicinal uses of some selected members of the following genera of plants (*Aloe*, *Artemisia*, *Boswellia*, *Coffea*, *Commiphora*, *Echinops*, *Foeniculum*, *Jasminum*, *Lawsonia*, *Linum*, *Myrtus* and *Olea*) and their products by rural and semi-urban Ethiopians is highlighted. This is compared with their uses elsewhere in the world and, in some cases, a review of the biological and chemical information is provided to highlight similarity and/or correlation of use. The need on focusing on these biological resources by researchers and entrepreneurs is highlighted. A few of the species are endemic, some are regionally distributed while others are introduced species. An attempt is made to show the basic structure of organic molecules and the derivation of macromolecules within cells from them. The central dogma of life, as revolving and evolving units of energy embodied or trapped in chemicals, is given as a cursory introduction to show relationships, in terms of energy, between the organism and the units it is made up of.

**Key words:** Aromatic, therapeutic, medicinal plants, primary and secondary metabolites, organic compounds, energy.

## The Ethiopian Flora and Medicinal Plants

The Ethiopian Flora is estimated to consist of between six and seven thousand species distributed in about 245 plant families. A large number of the species, i.e., about one-third of the families, have been employed in traditional medicinal practices (Mesfin Tadesse & Sebsebe Demissew 1992). Modern studies on traditional medicinal plants in Ethiopia started in 1973 when the then Haile Selassie 1<sup>st</sup> Prize Trust provided the fund for Addis Ababa University to employ a traditional healer to work with botanists. Initially, the work involved the collection, identification and recording of the uses of medicinal plants. This resulted in a departmental publication with a limited copy (Tewolde-Berhan Gebre-Egziabher *et al.*, 1976) which was later expanded into a book (Gelahun Abate, 1989). Ever since this time, quite a lot has been written about medicinal and other useful Ethiopian plants. The Department of Biology of Addis Ababa University has continued to engage its staff and graduate students in this activity. The Department of Chemistry and the School of Pharmacy have also contributed to the elucidation of the chemical constituents and reported medicinal properties of some selected plants and plant products. It is essential at this moment to screen the available data and to begin selecting those species with potential for large scale cultivation and/or exploitation, taking also into consideration their continued survival in the wild. Many of the selected genera, e.g., *Aloe*, *Boswellia*, *Commiphora* and *Echinops*, are hardy, abundant and grow sufficiently easily and can readily be exploited. Others, like *Linum* are crop plants and they are easily propagated. *Lawsonia* can easily be propagated along lowland river margins and could generate income for people living in low-lying areas of the country. *Myrtus*, although not easy to obtain, can be maintained at mid altitudes even as a hedge plant in towns and cities.

The **primary objective** of this review is to bring the information on some selected plant species and their parts or products that have been utilized in the maintenance of health and wellness of particularly Ethiopian women in rural Ethiopia up to date. Available information on the local or traditional use of the selected species is followed by data obtained from international trade of the same or related species. Basic biodiversity data is also provided on the selected genera in Ethiopia. A **secondary objective** is to direct the focus and attention of researchers, for enhanced and further work on them, and that of entrepreneurs to bring some of these to large-

scale or commercial cultivation, so that they could be developed for local use. This will, undoubtedly, reduce dependency on imported products.

**Aromatherapy**, the use of volatile oils for the physical and emotional well being of humans is a big industry today and it relies on this empirical knowledge. Essential oil, oil that is distilled from fresh leaves, stem, bark, roots, flowers, seeds, and fruits using water or steam is gradually being replaced by fragrance or perfume oil, oil that is synthesized from usually petroleum products, which essentially are artificial products. Synthetic products have often been associated with allergy in human beings. Thus, using the oils and other chemicals obtained from the natural products are encouraged by the medical world.

**Essential oils** are generally clear (colorless) liquid, except for a few such as patchouli, orange and lemon grass which are not oily. They are often used after dilution with carrier oils such as apricot oil, grape seed oil, sweet almond oil. But, in the traditional setting in Ethiopia, these are freshly produced daily from plants that are grown in the home garden or from nearby sources. See also <http://www.aritiherbal.com/>

Local vernacular names, particularly in the national language of Ethiopia (Amharic) are provided, in upper case, and, wherever appropriate, other names, including diseases, are also given.

## **Sources and Derivation of Organic Molecules**

### **Bacteria and Energy**

The fossil record indicates that the earliest forms of life, starting some 4.6 billion years ago, were bacteria. Like all other living things, bacteria use carbon to synthesize organic [that is, carbon (C) and hydrogen (H) containing] molecules. Organic molecules are involved in many cellular activities like reproduction, growth, repair, etc. Starting with the simplest forms, larger and more complex molecules that are involved in many important biochemical processes are produced by cells. Three important elements that constitute organic molecules are carbon, hydrogen, and oxygen.

**Bacteria** are known to utilize the energy from sunlight or from chemical compounds to reduce carbon found in a simple molecule like carbon dioxide ( $\text{CO}_2$ ) and generate complex molecules that could be utilized as food. Thus, generation and transformation of energy from one form of chemical to another has sustained life on earth for billions of years. Living things, including the tiniest forms of life, bacteria, could not have existed without such energy.

### **Green Plants and Energy**

The energy from sunlight captured by green plants as well as by certain forms of algae (mainly green algae) and bacteria (*Cyanobacteria*) plays a major role in the complexity of life. Plants, particularly green plants, are the primary sources of energy for all living things. By using the potential energy stored or trapped in the atoms of smaller molecules like carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ), plant cells synthesize larger molecules, such as glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ), which are the basic building blocks of many carbohydrates. Glucose, by combining with other glucose molecules, creates a more complex molecule such as sucrose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ , table sugar), lactose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ , found in milk), starch ( $(\text{C}_6\text{H}_{10}\text{O}_5)_n$ , found in potato), glycogen ( $(\text{C}_6\text{H}_{10}\text{O}_5)_n$ , found in animal cells), etc. Thus, carbohydrates are key compounds in the metabolic activities of green plants. They generate the basic energy for many living things. All other compounds, particularly the other large molecules (i.e., lipids and proteins), can be derived from them, and the derivatives have different functions in living things including provision of various forms and amounts of energy.

## **The Building Materials of Organic Molecules**

### **Molecules and Macromolecules**

Glucose is produced in small organs in plant cells called chloroplasts which carry the lipid or fat molecule, chlorophyll ( $\text{C}_{55}\text{H}_{72}\text{O}_5\text{N}_4\text{Mg}$ ,  $\text{C}_{55}\text{H}_{70}\text{O}_6\text{N}_4\text{Mg}$ ,  $\text{C}_{35}\text{H}_{30}\text{O}_5\text{N}_4\text{Mg}$ ,  $\text{C}_{35}\text{H}_{28}\text{O}_5\text{N}_4\text{Mg}$ ), that traps the energy from sunlight. In each plant cell, mitochondria, other small organelles in both plant and animal cells, convert glucose and other organic compounds into energy and by products such as carbon dioxide. Thus, green plant cells can be compared with small and efficient factories that transform energy and generate useful organic compounds, such as carbohydrates. Other organic compounds include fats (chains of carbon and hydrogen with

**functional groups** at one or both ends of the chain) and proteins (chains of carbon and hydrogen with **functional groups and nitrogen** as additional components). Some plants store these organic compounds as reserve food, such as sugar cane which stores sucrose in their aerial stems, potato which stores starch in underground stems, onion which stores glucose in leaves, banana, coconut, tomato in fruits, etc. Many plants store fats, oils, and proteins mostly in nuts, fruits and seeds such as peanuts, almond, flax, sunflower (usually called sunflower seeds), etc. Many of these metabolic products have served mankind as food plants throughout human history. Other metabolic products of many plants, called secondary metabolites, have had their uses intensified only over the last few hundred years.

### **Secondary Metabolites**

Plants as well as bacteria, fungi, algae, molds, and lichens (which are fungi and algae living together in harmony) also produce compounds that are combinations of both organic and inorganic parts. These are often regarded as secondary metabolites, that is, they are by-products of major biochemical pathways. These metabolites are stored in the plants. Plants, unlike animals, do not have excretory systems except those plants that produce secretory canals which ooze out gums and resins. These secondary metabolites, therefore, accumulate in the cells and tissues of plants.

It is understood that plants and other living things synthesize secondary metabolites as defensive mechanisms against attack by other organisms or to carve out a territory that is free of competition. For instance, growing *Escherichia coli* Migula (a bacterium) and *Penicillium chrysogenum* Thom. (= *Penicillium notatum*; a fungus) on an agar plate will always reveal a clear zone around the fungus indicating that the fungus produces compounds that inhibit the growth of bacteria near or around it. **Allelopathy** is a term applied to such defensive use of secondary metabolites by certain plants.

Likewise, many trees have rough persistent bark but a few, such as the **KOSSO** tree in the tropics (*Hagenia abyssinica* Gmel.) and the plain tree in the temperate world (*Platanus occidentalis* L.) have smooth and/or flaking bark. Both types of bark protect the inner food containing transport tissues of the plant, the phloem. Damage to the phloem, such as major and

ring-like debarking of trees, sometimes encountered on trees found in national forests and parks, and which is prosecutable offense in many countries, will deprive the roots of food and other essential nutrients. The entire tree will starve and die.

Many secondary compounds produce a pharmacological reaction in the human body, and they have been utilized by both professionals, in health sciences, and non-professionals alike. While the use of these secondary plant products, as drugs, in modern medicine is well documented and regulated, their use outside of this sphere seems to be expanding and unregulated, for example, the use of steroids, supplements, recreational drugs, etc. Despite this, however, the attempt to derive new and useful secondary metabolites from particularly plants in the tropics has continued unabated. There are many promising and untapped traditional medicinal and aromatic plants.

### **Some Selected Medicinal Plant Genera and Species**

#### **Aloe**

Ermias Dagne *et al.* (2000) reviewed the chemistry of *Aloe* and stated that it is “one of the most important sources of biologically active compounds.” Despite this, only a few of the species, viz. *Aloe vera*, *Aloe ferox* Mill. (Found in South Africa), *Aloe arborescens* Mill. (South Africa, Malawi, Mozambique, and Zimbabwe) and *A. marlothii* Berger (South Africa) have been of commercial interest.

Members of the genus *Aloe* are easy to distinguish from other succulent or fleshy plants. They produce many yellow, orange, or red flowers on stems or branches that often arise from the leaf rosette, i.e., base of the stem. In many of the species, the leaves are mostly flattened with often prickly or spiny margins. When a fresh cut is made into any part of the leaf, slimy, clear, or yellowish fluid oozes out along the cut area. For a long time, the collection and export of dried exudates of *Aloes* from Kenya to the United States of America was so intense that the country was forced to promulgate that “...commercial exploitation of aloes must be only from plantations established for that purpose.” (Newton, 1994).

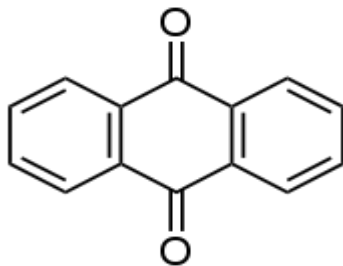
The major secondary metabolites in many of the aloe species have been identified as anthraquinones, pre-anthraquinones, and bi-anthraquinoids, although alkaloids, anthrones, benzene, naphthalene, furan derivatives, coumarins, pyrans, pyrones, flavonoids, and sterols have been documented (Ermias Dagne *et al.*, 2000: see Table 1), who also warn "... that it is important to screen for alkaloids prior to recommending use of an *Aloe* species as medicine"). One of these compounds, anthraquinone, is illustrated to indicate its fundamental chemical structure (Fig. 1)

**Traditional use.** In Ethiopia, there are about 38 species of *Aloe* (Sebsebe Demissew & M. G. Gilbert, 1997) with many of them occurring in the drier parts of the country. Of these species, only six endemic or near-endemic species, viz. *Aloe trichosantha* Berger, *Aloe pubescens* Burger, *Aloe citrina* Carter & Brandham, *Aloe bertemariae* Sebsebe & Dioli, *Aloe eumassawana* Carter, Gilbert & Sebsebe and *Aloe schoelleri* Schweinf. have been used in a "... wide range of skin and hair care products, and also [they] form the basis of health drinks and tonics" (Sebsebe Demissew *et al.*, 2003: 21). In rural parts of Ethiopia, this mucilaginous fluid is applied to cuts and wounds to prevent infections and bring about healing. The gel, when applied alone, is known to cause drying of the skin and hence its traditional application in wound healing in rural Ethiopia. The dried and powdered roots, together with the dried leaves of other species are applied for the treatment of **CHIEFE** (a skin lesion probably caused by viral infection, cf. Mesfin Tadesse 1994: 286). *Herpes simplex* is known to cause skin lesion.

**International commercial use.** One of the well-known species of *Aloe* in world-wide commerce, as constituent of cosmetic and medicinal products, is *Aloe vera* (L.) Burm. f. Among other uses, it is added to commercial creams and lotions to soften and moisturize skin and to other products for a variety of reasons. Currently it is also used "for the treatment of dry eye syndrome, inflammations, ulcerations, alkaline or acid burns, infections, and cataracts" (<http://www.patentstorm.us/patents/6013259>). When noticing heavy decline in the populations of *Aloes* in the country, Kenya declared species of *Aloe* as protected plants throughout the land. (Newton, 1994).

**Anthraquinones** is a crystalline solid with the chemical formula of  $C_{14}H_8O_2$ . The structural formula is shown below. It is an important member of the quinone family of organic compounds with a major use in the dye industry. It is also used to bleach paper.

**Vernacular names:** **ERET** (Amharic); Aloo, Aloe.



**Figure 1.** Fundamental structure of anthraquinone (source Wikipedia, extracted on 8/21/10)

### Artemisia

The genus *Artemisia*, one of the largest genera of the plant family called **Compositae** particularly in China and western North America, is also of great economic importance. *Artemisia annua* L., a plant that has been in use for a long time in Chinese traditional medicine, is the source of the drug **artemisinin** (Fig. 2) which is currently commercially used in the treatment of malaria. Taragon, *Artemisia dracunculus* L., has also been used to soothe the nervous system.

Of the four species of *Artemisia* found in Ethiopia, three are native while one is assumed to have been introduced a long time ago (Mesfin Tadesse, 2004). Among the native species, *Artemisia abyssinica* Sch. Bip. ex A. Rich. has been commonly used in traditional medicine and in rituals especially during festivities on the Ethiopian new year (September 11 or 12 during leap years) and **MESKEL** (September 27 - the finding of the ‘true cross’).

Another species that is widely cultivated, especially in the northern and central parts of Ethiopia for its aroma, is *Artemisia rehan* Chiov. (This is probably synonymous with *Artemisia absinthium* L., although the chemistry does not support it). It is also applied in rituals called “ADBAR”. In <http://www.answers.com/topic/rehan>, it is reported that ‘rehan’ is an “Arabic



word meaning "fragrant one". It is a common Muslim name for a male in Pakistan, India, and Bangladesh; however, in Turkey (as Reyhan) and Morocco, it is a female name. It is used in the Qur'an in the Sura Ar-Rahman (the "scented herb" in line 12). The taxonomic identity of this plant is still in question as the original type specimen (the specimen on which the name *A. rehan* was established) and all available specimens from Ethiopia are cultivated plants.

*Artemisia absinthium*, or wormwood, is native to the Mediterranean region but it is widely cultivated in the temperate world for the active ingredients used in the alcoholic drink called **absinthe**. Known by its common English name, wormwood was widely introduced in temperate countries as a medicinal, aromatic, and ornamental herb. About a hundred years ago, the alcoholic drink called absinthe, prepared from the essential oils of this species, was widely used in the temperate world. Kowalchik and Hylton (1987) wrote, "if you want to see what that beverage [absinthe] did to people, you need look no farther than the nearest reproduction of Edgar Degas's painting *The Absinthe Drinkers* [...] A whole history could be written about the rise and fall of absinthe as an addicting and deteriorating drink that led to serious mental disturbance, to seizures, and sometimes to death. It is no wonder then that absinthe is illegal in most countries of the world, including the United States and Canada. France, which was the leading producer of absinthe, was also one of the last countries to ban it in 1915. Wormwood, however, is still used to flavor alcoholic beverages, including vermouth and Campari."

**Traditional use.** *Artemisia abyssinica* is reported as a remedy for heart troubles, as cough cure and as a fumigant. The leaves are also boiled with milk for consumption. *Artemisia rehan* is used in flavoring a locally distilled alcoholic drink called **AREKI** (Amharic) and in easing the menstrual cycle. Both species are also used as fumigants during festive celebrations. *Artemisia afra* Jacq. is reported in the treatment of Epistaxis and uvular infection (Mesfin Tadesse & Sebsebe Demissew, 1992).

**International commercial use.** Although there is no documented study, known to the authors, on the industrial use of *A. absinthium* in Ethiopia, its use in local **AREKI** or **KATIKALA**, in case it is the same as *Artemisia rehan*, should be discouraged. The Food and Drug Administration of the United States of America (FDA) records this as unsafe since it

“contains a volatile oil which is an active narcotic poison”. The fundamental structure of **absinthine**, one of the two bitter ingredients in *A. absinthium* is illustrated below (Fig. 3).

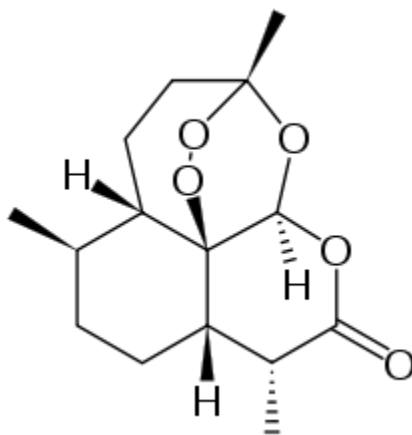
Berhanu Abegaz and P.G. Yohannes (1982) studied the chemistry of *Artemisia rehan* and reported that the major ingredients are camphor (ca. 26%) and davanone (ca. 41%). The chemistry of this plant suggests that it may be different from *Artemisia absinthium* which has the fundamental structure as shown in Figure 3. The chemical structure of davanone is described by Morrison et al. (2009), who also report antifungal and antispasmodic properties for davanone. Mulatu, A., and Mekonnen Y. (2007) studied the effects of aqueous extracts of *Artemisia rehan* and *Artemisia afra* in laboratory mice and reported that “the plants possess spasmolytic property and also support the traditional folk use of the aerial and root parts of the plants for stomach pains and intestinal cramps.”

**Vernacular names** applied to species of *Artemisia* in Ethiopia:

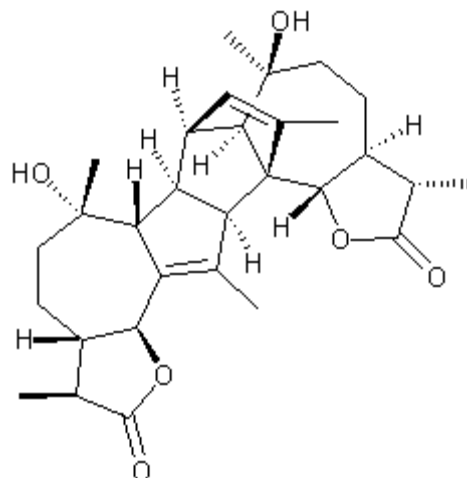
*Artemisia abyssinica*: **JUGUN** (Orominya); **CHENA BEDBADO** (Tigrinya); **SHUUKINDOO** (Kefinya).

*Artemisia afra*: **AA’IMACOO** (Kefinya), **CH’IRAKOT** (Guragenya), **CUQQUN, JUKKUN** (Orominga), **JUKANI** (Aderinya), **KAPPANI** (Orominya in Bale), **K’ODDO, KODDO-ADI** (Orominya), **NATIRIYA & AGOPIA** (Welaytinya), **NATRARA** (Hadiyinya), **SEROTIKFOA** (Afarinya).

*Artemisia rehan*: **ARRITY** (Amharinya); **ARIITTI** (Orominya).



**Figure 2.** Fundamental structure of artemisinin (source Wikipedia, extracted on 8/21/10).



**Figure 3.** Fundamental structure of absinthine (source Wikipedia, extracted on 8/21/10)

### **Boswellia**

Members of this genus occur in dry lowlands often in association with thorny species of *Acacia* and *Commiphora*. The gum-resins particularly from *Boswellia papyrifera* (frankincense), are collected extensively from northern Ethiopia, Sudan, and Eritrea while those obtained from particularly *Boswellia rivae* and *Boswellia microphylla* are collected from eastern Ethiopia. This has been going on for many centuries. Five grades of frankincense are reported from Ethiopia (Kindeya, G. *et al.*, 2002).

The exploitative harvest of gum-resins in Sudan, Ethiopia, and Eritrea for centuries, has led to a severe decline in populations of particularly *Boswellia papyrifera* and the need for its conservation and regeneration has recently been addressed (Gebrehiwot, K. *et al.*, 2003).

**Traditional use.** The resins are used as incense as well as to ‘soothe the nerve’ during prayer and in Orthodox Christian liturgical services and/or ceremonies. In eastern Ethiopia, the gums are also chewed to ease “tooth ache”. The leaves and roots are used in the treatment of lymphadenopathy (Mesfin Tadesse and Sebsebe Demissew, 1992).

**International use.** Gum-resins obtained from several species of *Boswellia* and *Commiphora* have been in international trade, as incense, for over two millennia with Arabia, Ethiopia, Somalia, and Sudan being the centers of proliferation of this trade. In laboratory studies, essential oils of *B. papyrifera* were shown to have anti-molluscicidal properties on two species of snails (Hatil Hashim El-Kamali *et al.*, 2010). Methanol extracts of *B. papyrifera* also

showed high antibacterial activity (Emad M. Abdallah *et al.*, 2009). Glycosides (Atta-ur Rahmann *et al.* 2005) are among the important chemicals reported in *Boswellia*.

**Vernacular names:** ETAN (Amharic).

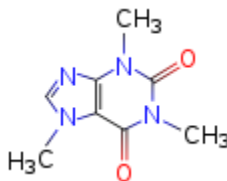
### Coffea

Caffeine (Fig. 4), an alkaloid stimulant, is the major ingredient that people are after when they take such beverages as coffee (fruits), tea (leaves), cacao (seeds), cola (seeds) and mate (leaves). Except for mate (obtained from *Ilex paraguayensis* in the family **Aquifoliaceae**), the others are well known economic products all over the world. Mate is a traditional South American (Argentina, Bolivia, southern Brazil, Paraguay, and Uruguay) infused drink made by steeping dried leaves of yerba mate (*Ilex paraguariensis*) in hot water (Mabberly, D. J., 1987).

**Traditional use.** In eastern Ethiopia, particularly in the major towns and cities like Harar, Dire Dawa and Jijiga, the leaves of coffee are probably more used than the beans (fruits). The sun-dried and mildly roasted leaves are infused in hot water and the resulting fluid, called **QUTI**, is consumed as a stimulant. Residents of Hararge often claim that the infused leaf chemical or chemicals has/have soothing and calming effects on the nervous system unlike the stimulating effects of caffeine. This needs to be investigated since there has been no attempt to study the claim up to now.

**International use.** None reported so far. In spite of its wide use in eastern Ethiopia, Jerry Baldwin (co-founder of Starbucks in Seattle, USA, and also the first roaster and coffee buyer) wrote “don’t bother to try this at home” (in: <http://theatlantic.com>: Coffee Leaves: A Whole Different Cup of Coffee). This phrase is most probably addressed for tea enthusiasts.

**Vernacular names:** BUNNA (Amharic); BUNN (Orominya).



**Figure 4.** Structural formula of caffeine (source Wikipedia, extracted 8/21/10).

## Commiphora

Compared to *Boswellia*, *Commiphora* is more abundant and widespread in Arabia, tropical Africa, Madagascar, and India. Like *Boswellia*, the gum-resins are heavily used in international trade but, unlike it, a few of the species are known to produce gum-resins that are “extremely poisonous for both humans and animals and are used for arrow poison.” (Vollesen, K., 1995). Six to seven types of sesquiterpenoids were described from *C. myrrha* (Nanqun Zhu *et al.*, 2001, 2003).

**Traditional use.** The gum-resins of *Commiphora erythraea* (Ehrenb.) Engl., *Commiphora kua* (R. Br. ex Royle) Vollesen, and *Commiphora habessinica* (Berg) Engl. are used by the Borana people of southern Ethiopia to heal burn (in human beings), wound (in cattle), and to eradicate cattle ticks (Gemedo-Dalle, T., *et al.*, 2005). In addition to the above cited uses, the gum-resins from *Commiphora* are also used by followers of both the Orthodox Christian (in church and at home) and Moslem religions during their prayers, essentially to ‘calm and collect’ their nerves. It is also used as incense during coffee ceremonies at home (mostly Orthodox Christian homes). The flowers and leaves of *Commiphora africana* (A. Rich.) Engl. have been used in the treatment of **Elephantiasis** and the leaves of *Commiphora* sp. for an, as of now, unidentified sickness, called “AKOSHITA” (Mesfin Tadesse and Sebsebe Demissew, 1992).

**International use.** The best quality gum-resins, often known by the trade name ‘myrrh’ is obtained from *Commiphora myrrha* (Nees) Engl. They are used as “astringent, antiseptic, emmenagogue, carminative, expectorant and stimulant; for spongy gums, pyorrhea, and all throat diseases.” and “judged by pharmacognosists to be safe and effective.” (Kowalichik and Hylton, 1987). Two species of *Commiphora* are reported as providing edible resins and one species for flavoring tea in Kenya (Maundu, P. M., 1994).

**Vernacular names:** ETAN, KERBE (Amharic).

## Echinops

The genus **Echinops** is composed of about 12 species inhabiting usually degraded and dry land in Ethiopia. It is commonly referred to as “globe thistle” in Europe because of the spherical arrangement of the flowers. Several of the species are weedy and difficult to eradicate due to the high seed-set and the presence of spines on almost all leaves and stems, thus making it difficult to apply hand weeding.

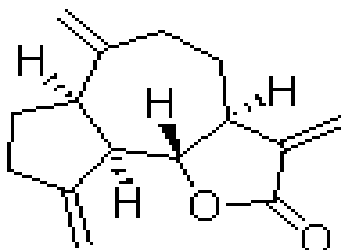
Berhanu Abegaz (in Mesfin Tadesse and Berhanu Abegaz, 1990) studied the chemistry of eight Ethiopian species of **Echinops** and reported sesquiterpene lactones and polyacetylenes. Berhanu Abegaz *et al.* (1991) studied an endemic species from Ethiopia, **Echinops kebericho** Mesfin, in depth and reported “... copious amounts of sesquiterpenes (10%) of which the dehydrocostus lactone is the major constituent.” Acetylenic thiophenes were reported from the roots of **Echinops ellenbeckii** O. Hoffm., another endemic species in Ethiopia (Ariaya Hymete *et al.* 2005).

**Traditional use.** The roots and flower heads (capitula) of four species of **Echinops** are used in the treatment of headache and hemorrhoids (Mesfin Tadesse and Sebsebe Demissew, 1992; Mesfin Tadesse, 1994). One species, **Echinops kebericho** Mesfin, has been used as a fumigant, particularly after childbirth, and as a medicinal plant to treat leprosy for centuries (Mesfin Tadesse and Berhanu Abegaz, 1990; Mesfin Tadesse, 1994). The large tuberous roots are sold either cut up as small pieces or in whole in many open markets in Shewa, Gojjam and Wellega regions.

How are women in Ethiopia using this fumigant? How does it work? These were some of the questions asked by several people in the past and some answers have been obtained lately. In a study of Borana pastoralists in southern Ethiopia, Gemedo-Dalle, T. *et al.* (2005) described the purpose (hygienic and perfumery), facilities used, and processes associated with traditional fumigation techniques and readers are encouraged to read this article. Although **KEBERICHO** is not reported in the pastoralist area described in the above work, the resins, and gums of **Acacia** and **Commiphora**, which are found abundantly in the area, are employed in cleansing a woman’s body and clothes. Fumigation using **KEBERICHO** is particularly important after childbirth in large areas of rural Ethiopia, and it may be utilized in much the same way as in the Borana region.

**International use.** None reported for *Echinops kebericho*. Chemical and laboratory studies have been conducted on a number of European and middle eastern species. Some of these studies reported anti-inflammatory properties in rats and mice (*Echinops echinatus*, by Sing *et al.*, 1991), antifungal activity (*Echinops ritro*, by Nikolas Fokialakis *et al.*, 2006a), termiticidal activity against termites (four *Echinops* species from Greece and Kazakhstan, by Fokialakis N. *et al.*, 2006b).

**Vernacular names:** QEBERICHO (Amharic), QEREBICHO (Orominya).



**Figure 5.** Dehydrocostus lactone, a sesquiterpene lactone (source: [www.ChemBlink.com](http://www.ChemBlink.com), An online Database of Chemicals from Around the World, extracted on 8/30/10)

### Foeniculum

A beloved child has many names and is always sought after. Likewise, a beloved plant is used everywhere, and all its parts are utilized for some purpose, and none is wasted. One of these plants is '*Foeniculum vulgare* Mill., a widely cultivated odoriferous plant with considerable cosmetic value. The dry fruits are powdered and used as spice in stew (**WOT**). The fruits, young stems and leaves are used, in combination, in the preparation of local drinks such as **ARAKEI**, **KATIKALA** and **TEJ**.

A variety of oils including fenchone, limonene and camphene (Shamina Azeez, 2008) are reported from fennel.

**Traditional use.** Ethiopian women apply the aqueous extract from the leaves and young stem particularly on the face and exposed body parts to cleanse the skin and make it shiny (**FIT MATRYA**) and during childbirth to increase lactation as well as to ease menstrual problems. It is reported as being used to treat "**SHINT MAT**" – any disorder of the urinary tract and

especially when it is associated with failure to urinate (Mesfin Tadesse and Sebsebe Demissew, 1992). As a dye, it may be used alone or with **HENNA** (*Lawsonia inermis* L.) to stain wool obtained from sheep. The fresh bark has medicinal value.

**International use.** Fennel is used as carminative, a diuretic, and as a stimulant. The sweetly aromatic oil is used in aromatherapy and is found in creams, perfumes, and soaps. It is also added to liqueurs for its aroma. Steam from the ground seeds is used to cleanse facial skin in women. “The Greek physicians Hippocrates and Dioscorides both recommended fennels to increase the flow of milk in nursing mothers.” (Kowalichik and Hylton, 1987).

**Vernacular names:** **ENSELAL** (Amharic); Fennel.

### **Jasminum**

There are seven native species in Ethiopia (Greene, 2003) and possibly two introduced species, including *Jasminum officinale* as garden ornamentals. Of these seven species, *Jasminum abyssinicum* Hochst. ex DC. and *Jasminum grandiflorum* L. subsp. *floribundum* (R. Br. ex Fres.) P.S. Green have “sweetly scented” flowers and they are quite widespread in the country. Singers in rural Ethiopia, associate the scent of these plants with beauty of the feminine body and one comes across the affectionate use of the word “**TEMBELEL**” in verses in traditional songs.

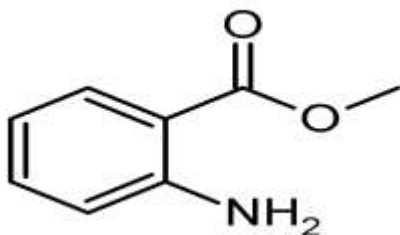
**Traditional use.** As medicinal plants, the leaves, flowers, and roots of *J. grandiflorum* subsp. *floribundum* are used in the treatment of conjunctivitis, hemorrhoids, and wound healing (“KUSIL MADREKIA” - Mesfin Tadesse and Sebsebe Demissew, 1992; Mesfin Tadesse, 1994) while the leaves of this subspecies as well as those of *J. abyssinicum* are used in the treatment of leprosy (SIGA DEWE, Mesfin Tadesse, 1994). As aromatic plants, girls and women in rural Ethiopia decorate their hair and clothes with the sweetly scented white flowers. These will generate the sweet aroma associated with the flowers which will be sources of attraction to lovers, close associates, and passersby.

**International use.** *Jasminum officinale* L. (Jasmine) is the source of the well-known aphrodisiac, jasmine oil. It is employed in international trade in skin care as cream, lotion, and bath oil to “smooth the skin”.



Jasmine oil is an essential oil with the major constituent being Methyl anthralilate and a molecular formula of  $C_8H_9NO_2$  (Fig. 6). It is common in several food plants including orange, lemon, grape, etc., and it is also used to add flavor to candy, soft drinks, gums, and drugs. Other components of jasmine oil are indole, benzyl alcohol, linalool, and skatole (source Wikipedia, extracted 8/21/10).

**Vernacular name: TEMBELEL** (Amharic).



**Figure 6.** Structure of Methyl anthranilate (source Wikipedia, extracted on 8/21/10).

### Lawsonia

*Lawsonia* is a genus with a single species, *Lawsonia inermis* L., which is currently widely grown as a dye plant throughout the warmer parts of the tropics. It is native to North Africa and southern Asia, particularly in India, where it is still heavily utilized. Indian scientists have produced many scholarly articles about it (e.g., Devendra K. Bhardwaj *et al.*, 1977; Kumar S. *et al.*, 2005). The Egyptians employed it to dye the clothes in which the mummies (bodies of important people) were preserved. Today, it is commercially available as “**Heena or Hina**”.

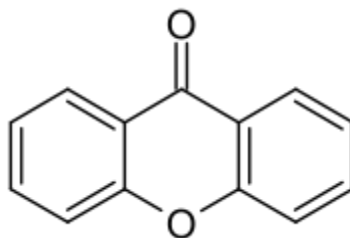
In Ethiopia and Eritrea, the plant is grown at lower altitudes (from sea level to about 1100 meters) on alluvial soils along river margins and ground water holes in the Afar region, Keffa, Sidamo, Bale and Harerge.

**Traditional use.** The crushed or green powdered leaves of *Lawsonia inermis*, when mixed with lemon juice or brown tea, produce a red dye. This is used by married men and women to dye their hairs and body parts. It is copiously applied to the hair, beard, nails, palm of the hands and the soles of the feet. Apparently, it is used for its cosmetic value.

**International use.** When applied to the hands and feet, Heena is considered to have anti-inflammatory properties (Chopra, R. N., 1958). Although unsubstantiated by research, this latter application is also assumed to have antifungal and antiperspirant properties. Heena may be adulterated with other chemicals and care should be exercised when applying commercially available products. One such example is “**Black Heena**” which is based on para-phenylenediamine (PPD)-based black hair dye (Van den Klybus *et al.*, 2005; Stante *et al.*, 2006). Black Heena is made from partly fermented black indigo (from a plant genus called *Indigofera*).

**Xanthone** is the main ingredient in *Lawsonia inermis*. It has a molecular formula of  $C_{13}H_8O_2$  and the structural formula as shown in Figure 7 (source Wikipedia, extracted 8/21/10).

**Vernacular names:** HEENA or HINA (Amharic).



**Figure 7.** Structural formula of Xanthone (source Wikipedia, extracted on 8/21/10).

## Linum

Of all *Linum* species, *Linum usitatissimum* L. is probably the most economically useful plant throughout the world for providing strong fibers used in making linen cloth and edible oil. In Ethiopia, it is cultivated throughout the highland mostly as an edible oil crop plant, but it is also used as a medicinal plant. Ethiopia is the fifth largest producer of flax seeds in the world.

**Traditional use.** A measured amount of the mildly roasted seeds is mixed with a glass or cup of warm water and given to women, as a drink, particularly right after childbirth. This is done in both rural and urban Ethiopia. The assumption, when doing this, is that it would “cleanse the birth canal”. Lately, it has also been reported that taking flax oil, which is rich in omega-oil will replace the oil lost or transferred to the fetus during pregnancy or gestation and that it has

tendency to ease “hot flashes” in women. Aqueous mixture of the powdered seeds is also used in the treatment of various kinds of skin diseases and gastric problems (Mesfin Tadesse and Sebsebe Demissew, 1992; Mesfin Tadesse, 1994).

**International use.** Flax seed as well as olive oil, nut oils, fish oils and avocados “contain heart-healthy mono-unsaturated fats” and taking these on a regular basis is supposed to lower real age by “3.4 years” (Roizen & Oz, 2005).

**Vernacular names:** Flax; **TELBA** (Amharic)

### **Myrtus**

The genus *Myrtus* is a member of the family of plants that includes *Eucalyptus* (BAHIR ZAFF) a widely known and cultivated plant genus in Ethiopia and other parts of the world except Australia, where it is native. Other members in this family, known mostly for one or a few species of food or spice plants are *Eugenia* (Clove, **QRINFUD**), *Psidium* (Guava, **ZEITUN**), and *Syzygium* (Black Olum tree, **DOQMA**).

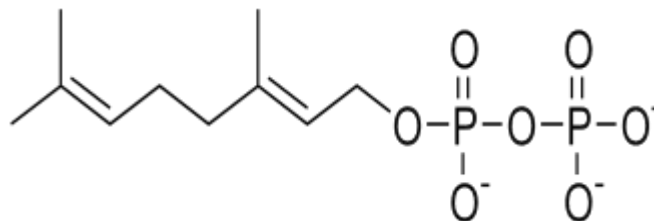
Common myrtle, *Myrtus communis* L. is a shrub whose leaves are often mixed with butter and boiled at low temperature to improve its flavor.

**Traditional use.** Rural women in Ethiopia mix the aqueous extract of the leaves with raw butter and apply it to their hair for improved bodily scent or fragrance and to treat dandruff (Mesfin Tadesse and Sebsebe Demissew, 1992). Proses containing *Myrtus communis* are commonly heard in Ethiopian music when the singer is enthralled about the scent of a woman.

**International use.** Although known from ancient times, the name itself and the use of the plant, *Myrtus communis*, have been associated with myth and various rituals in many societies. Currently it is known more as a decorative hedge plant in Europe. In Sardinia and elsewhere in the Mediterranean region, it is used in to make a liqueur called Mirto and as a culinary herb. It is known to have antioxidant properties (Rosa A. *et al.*, 2003).

Monoterpenes with a chemical formula of  $C_{10}H_{16}$  and a structural formula as shown in Figure 8 are the “predominant compounds” (Neda Mimica-Dukic, 2010) in *Myrtus*.

**Vernacular names:** **ADES** (Amharic, Gurageniya, Tigrinya); **ADDISAA, CODDOO** (Orominya); **WOBATTAA** (Welaitinya).



**Figure 8.** Geranyl pyrophosphate, a type of monoterpene (source Wikipedia, extracted on 8/30/10).

### **Olea**

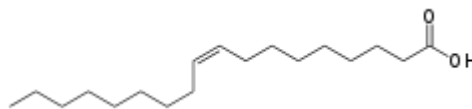
**Olea** is a tree genus with one species and two sub-species in Ethiopia, one of which has been identified as a distinct African olive tree and kept as *Olea africana* Mill. for a long time. Today, plant systematists consider it as a geographical variant of the European species and keep it as *Olea europaea* subsp. *cuspidata* (Wall. Ex G. Don.) Cif. The other geographical variant, *Olea europaea* subsp. *europaea*, the source of olive oil, is restricted to the Mediterranean area.

**WOIRA** is a highly valued plant in Ethiopia. However, it has declined in abundance due to over-utilization and exploitation that is not accompanied by a sound conservation strategy.

**Traditional use.** The wood from the trunk (stem), which is hard, is used to make farming utensils including the plough and to provide the corner planks in the construction of wooden and earthen houses or huts. The leaves, twigs and pieces of wood are used to fumigate pots and as fumigants during childbirth and to ward off insects (as insect repellants). The roots are used to treat hemorrhoids (Mesfin Tadesse and Sebsebe Demissew, 1992).

**International use.** None reported so far on the African plant. Oleic acid, derived from the Mediterranean plant and a major ingredient of olive oil, is important in the food industry. It is known by the molecular formula of  $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$  and the structural formula shown in Figure 9.

**Vernacular name: WOIRA** (Amharic).



**Figure 9.** Structural formula of oleic acid (source Wikipedia, extracted on 8/21/10).

**Conclusion.** In concluding this short review, the authors wish that articles like this will motivate or encourage others working in related fields to contribute knowhow or knowledge and share their insights, particularly on how to develop and expand the empirical knowledge in a meaningful way to benefit the owners of the information, the Ethiopian farmers, and traditional healers.

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