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REVIEW ARTICLE

A STUDY ON DIFFERENT PLANTS OF APOCYNACEAE FAMILY AND THEIR MEDICINAL USES

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Abstract



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The apocynaceae family is one of the most medicinally diverse families in the plant kingdom and is a rich source for drugs that have found use both traditionally and in conventional medicine. The medicinal activity of these plants was due to the presence of alkaloids which were either indoline alkaloids or steroidal alkaloids. The family Apocynaceae consists of tropical trees, shrubs and vines. Characteristic features of the family are that almost all species produce milky sap. In traditional medicine, Apocynaceae species are used to treat gastrointestinal ailments, fever, malaria, pain and diabetes, including skin and ecto-parasitic diseases. Some are important timber species while many are planted as ornamentals. Non-medicinal uses include food, poisons, fodder, wood, ornamentals, dye and perfume. A total of 4600 species under 415 genera belonging to the family Apocynaceae were collected and identified. Species of Apocynaceae have been reported to possess anticancer and antimalarial properties. Species having cytotoxic activity include those of Catharanthus, Nerium, Plumeria, Tabernaemontana and Ichnocarpus. Catharanthus roseus is the most medicinally important plant in this family due to its use in the treatment of various types of cancers, other agents that have been derived from this family include the alkaloids reserpine and rescinnamine which have been used against hypertension, and others are the cardiac glycosides.

Keywords: Activity, apocynaceae, medicinal plants, uses.

INTRODUCTION

Plant is an important source of medicine and plays a key role in world health. Medicinal herbs or plants have been known to be an important potential source of therapeutics or curative aids. The use of medicinal plants has attained a commanding role in health system all over the world. This involves the use of medicinal plants not only for the treatment of diseases but also as potential material for maintaining good health and conditions. Many countries in the world, that is, two-third of the world's population depends on herbal medicine for primary health care. The reasons for this is because of their better cultural acceptability, better compatibility and adaptability with the human body and pose lesser side effects¹. From records, most of the used drugs contain plant extracts. Different types of plants used to treat various types of diseases that reveal the most up to date findings in understanding of biological significance of their bioactive compounds used. Recently dramatic changes have taken place in the health care system of world population through the development of science, technology and medical science but till to day 400 crores of people of the world

are totally dependent on herbal medicines². Human beings have depended on nature for their simple requirements as being the sources for medicines, shelters, food stuffs, fragrances, clothing, flavors, fertilizers and means of transportation throughout the ages³. For the large proportions of world's population medicinal plants continue to show a dominant role in the healthcare system and this is mainly true in developing countries, where herbal medicine has continuous history of long use. The development and recognition of medicinal and financial aids of these plants are on rise in both industrialized and developing nations⁴. Some contain active ingredients (bioactive components or substances) obtained from plants. Through recent researches, plant-derived drugs were discovered from the study of curative, therapeutic, traditional cures and most especially the folk knowledge of indigenous people and some of these claims and believe of people are irreplaceable despite the recent advancement in science and technology⁵. In addition, in the USA, more than 40% of the population recently reported using complementary and alternative medicines, including botanical dietary supplements. In the past decade, a remarkable effort has been deployed

leading to the isolation of many bioactive drugs from plants. Generally, the synthetic products are considered as unsafe while the plant products appear to symbolize the safety. Nonetheless, the safety, dosage and potential interactions with standard conventional therapies are categorically needed because the plant material could be toxic due the presence of naturally occurring toxic constituents, heavy metals, toxins, pesticides, or bacteria⁶. The medicinal plants of Bangladesh South Asian countries have a large number of valuable medicinal plants naturally growing mostly in fragile ecosystems that are predominantly inhabited by rural poor and indigenous community. In Bangladesh 5,000 species of angiosperm are reported to occur. The number of medicinal plants included in the 'materia medica' of traditional medicine in this subcontinent at present stands at about 2,000. More than 500 of such medicinal plants have so far been enlisted as growing in Bangladesh Dhaka, Rajshahi, Sylhet and Chittagong division is rich in medicinal plants⁷. Apocynaceae is a large family of flowering plants which includes trees, shrubs, herbs, stem succulents, and vines, commonly known as the dogbane family, (Greek for "away from dog" since some taxa were used as dog poison). The former family Asclepiadaceae (now known as Asclepiadoideae) is considered a subfamily of Apocynaceae⁸ and the Apocynaceae has 43 Genera and 170 species accepted taxa overall. But *Carissa carandas* L.(Christ's Thorn), *Catharanthus roseus* (L.) G. Don (Periwinkle), *Nerium oleander* Linn.(oleander), *Plumeria alba* L. (pagoda tree), *Tabernaemontana divaricata* (L.) R. Br. ex Roem.(wax flower), *Ichnocarpus frutescens* (L.) R. Br. (Black creeper) are important plants of this family because these plants shown different activity for different diseases. These plants have remarkable medicinal and traditional uses.

Medicinal plants are very much related to our health culture. Most of the people of Bangladesh are directly or indirectly depends medicinal plants for health problem. The review aims to understand the possibility of medicinal plant as a sustainable livelihood option. The specific objectives are to explore the use of locally produced medicinal plants, to explore the market of

medicinal plants in Bangladesh, to know about of the habitat, diversity of medicinal plant, to know about the conversation of medicinal plant, to know about the uses of medicinal plant against several diseases.

CARISSA CARANDAS L.

- **Botanical name:** *C. carandas* L.
- **Binomial Name:** *Carissa carandas* L.
- **Local name:** Karamcha
- **Family:** Apocynaceae
- **Status of occurrence:** Common

Taxonomic description

Large armed shrub, with long, stout, sharp, horizontal spines at the base of the branchlets. Leaves 3.8-7.5 cm long, coriaceous, elliptic or obovate, obtuse. Flowers white

Habit: Generally shrubs

Habitat: Dry, sunny place, roadsides and thickets

Flower colour: Red, yellow and pink

Flowering season: March- November



Figure 1: *Carissa carandas* L.

Mode of Action

The plant materials were collected and the leaves were collected for experiment and experimental results have established a pharmacological evidence⁹.

Parts Utilized

Leaves, fruits, flower, root and root bark.

Table 1: Chemical composition of *Carissa carandas* L.

Chemical Constituents	Activity
Lupeol	Anti-inflammatory, antioxidant, antibacterial, and cytotoxicity activity.
Ursolic acid	Analgesic, anti-inflammatory, antipyretic and anti-diabetic activity.
Beta-Sitosterol	Anti-convulsant and anti-diabetic activity ⁸ .
Carinol (Phenolic lignin)	Hypoglycemic, antinociceptive, analgesic, anti-inflammatory and antipyretic activity.
Carindone	Anti-bacterial, anti-diabetic, analgesic, anti-inflammatory and antipyretic activity ⁹ .
Carissone	Hepatoprotective, anti-bacterial, anti-diabetic and anti-convulsant activity.

Medicinal uses

- The root is antiscorbutic, stomachic and anthelmintic. Decoction of the leaves is useful in early stages of remittent fevers.
- Unripe fruit is astringent, appetizer and antipyretic. Ripe fruit is cooling and acid; useful in bilious complaints.

- Root paste is insect repellent; paste of root bark is useful in diabetic ulcer.
- The roots of the plant are heavily branched, making it valuable for stabilizing eroding slopes. It has medicinal value too; it is taken for urine-related problems.

CATHARANTHUS ROSEUS L.

- **Botanical name:** *C. roseus* (L.) G. Don.
- **Binomial Name:** *Catharanthus roseus* (L.) G. Don
- **Local name:** Nayantara
- **Family:** Apocynaceae
- **Status of occurrence:** Very common

Taxonomic description

Habit: Herb or sub-shrub.

Habitat: Gardens where it is cultivated as an ornamental plant.

Flower colour: White and pink

Flowering season: Flowering almost throughout the year.

Mode of Action

Healthy plant Red Periwinkle was collected and this used for further phytochemical analysis¹⁰.

Parts Utilized

Whole plant, flowers leaves and roots.



Figure 2: *Catharanthus roseus* (L.).

Medicinal uses

- The plant has been used as a folk remedy for diabetes.
- The root is considered tonic and stomachic.
- Alkaloids also possess hypertensive, sedative and tranquillizing properties. They also cause relaxation of plain muscles and depression of the central nervous system.

- Leaves and latex are given for blood dysentery and piles.

NERIUM OLEANDER L.

- **Botanical Name:** *N. oleander* Linn
- **Binomial Name:** *Nerium oleander* Linn
- **Local name:** Korobi
- **Family:** Apocynaceae
- **Status of occurrence:** Common

Taxonomic description

Habit: Shrub

Habitat: Grows in the clayey, loamy and sandy soil

Flower colour: red, purple, pink, and orange colour

Flowering season: Flowering: January-July



Figure 3: *Nerium oleander* Linn.

Mode of Action

The samples including leaves and stems of *N. oleander* were collected. The plant materials were used for phytochemical analysis and antimicrobial activity¹¹.

Parts Utilized

Leaves, flowers, roots and seeds.

Medicinal uses

- All parts of the plants are poisonous.
- Leaf decoction is used to reduce swellings.
- Macerated leaves are used for itch and fall of hair.
- The flowers are good for inflammations, chronic pains in the muscles and the joints, lumbago, headache, and scabies.

Table 2: Chemical composition of *Catharanthus roseus* (L.).

Chemical Constituents	Activity
Ursolic acid	Anti-diabetic and anti-oxidant activity.
Daucosterol	Leukemia, anti-oxidant, anti- diabetic, cyto-toxic, biological activity.
Tetrahydroalstonine	Antinoradrenergic, ATPase activity, anti-convulsant, enzyme activity.
Beta- sitosterol	Hypoglycemic activity, metabolic activities, pharmacological activity, anti-diabetic activity, cortisol lowering activity and antiproliferative activity.
Vindoline	D4H enzyme activity, AVLB synthase activity, dimerization activity, peroxidase activity, enzymatic activity secologanin synthase activity, antioxidant and antidiabetic activity ¹⁰ .

PLUMERIA ALBA L.

- **Botanical Name:** *P. alba* L.
- **Binomial Name:** *Plumeria alba* L.
- **Local name:** Kathgolap
- **Family:** Apocynaceae

- **Status of occurrence:** Common

Taxonomic description:

Habit: Evergreen shrub

Habitat: Grown in rich, dry to medium moisture, coastal thickets and limestone forests.

Flower colour: White

Flowering season: May-November

Mode of Action

The stem bark were collected. This extract showed the antibacterial activity¹².

Parts Utilized

Seed, leaves, flowers and roots.

Medicinal uses:

- In addition, the flowers are edible and eaten as fritters, while the heart of the wood is part of a traditional medical preparation taken as a laxative.
- The root bark is depurative and purgative, causing thirst. It is used in the treatment of herpes and syphilis.
- The root bark is used externally as a lotion on syphilitic ulcers, administered as powder macerated in sugar-water, wine.
- The latex from the stem is caustic. It is used for treating ulcers, darts (skin diseases) and scabies.

- The seeds are used in the treatment of dysentery.



Figure 4: *Plumeria alba* L.: Leaves, flowers.

Table 3: Chemical Composition of *Plumeria alba* L.

Chemical Constituents	Activity
Linalool	Antioxidant activity, antimicrobial activity, peptidase and keratinase activity, antibiofilm activity and cytotoxic activity.
n-nonanal	Biochemical activity, wound-healing activity, anti-ulcer activity and antimicrobial activity.
Phenyl acetaldehyde	Biological activity, anti-inflammatory activity, synthesis and cytotoxic activity, antibiotic activity, antioxidative activity, antifungal activity, anti-ulcer activity.
Neryl acetone	Antifungal activity, protective activity, cytotoxic activity, antimicrobial activity, optical activity, antioxidant, and hypolipidemic activity ¹¹ .

Table 4: Chemical composition of *Tabernaemontana divaricata* L.

Chemical Constituents	Activity
Alpha-amyrin	Anti-diarrheal activity, anti-cancer activity, anti-proliferative activity, anti-bacterial activity.
Alpha-amyrin acetate	Anti-diarrheal activity, anti-inflammatory activity.
Alpha amaryl octadecanoate	Anti-asthmatic activity, antidiabetic activity, cytotoxic activity, catalase activity and anti-oxidant activity ¹² .
Taraxasterol acetate	Anti-oxidant activity, anti-diabetic activity.

TABERNAEMONTANA DIVARICATA L.

- **Botanical Name:** *T. divaricata* (L.) R. Br ex Roem
- **Binomial Name:** *Tabernaemontana divaricata* (L.) R. Br ex Roem
- **Local Name:** Tagar
- **Family:** Apocynaceae
- **Status of occurrence:** Rare



Figure 5: *Tabernaemontana divaricata* (L.)

Taxonomic description

Habit: A Small shrub with milky juice.

Habitat: Grown as brushwoods, sparse forests, house/glasshouse plant.

Flower colour: White

Flowering season: May-January.

Mode of Action

The leaves of Wax Flower were collected and the extract showed anticancer activity¹³.

Parts Utilized

Root, bark, leaves, sap and flowers.

Medicinal uses

- Grape jasmine is widely used as a medicinal herb in the tropics and the plant may well be classified as a panacea for gastro-intestinal and skin affections.
- The roots are astringent
- A decoction is used in the treatment of diarrhoea and abdominal complaints.
- The roots, leaves, and flowers are all used in the treatment of snake and scorpion poisoning. An infusion is applied as a remedy for jungle fever.
- The roots are used in modern medicine to treat hypertension, headache and scabies.

CONCLUSIONS

The present study is to explore medicinal aspects of this family and focusing on medicinal plants and their local uses for the healthcare. The ethnobotanical also point out some specific medicinal plant species and their properties to the local inhabitants who are unknown from value of medicinal plants in the environment. The use of herbal medicine for treatments is one component of balancing body systems. In conclusion, it was obtained that different plant of this family have showed different activities like anti-microbial, antioxidant, anti-bacterial, antidiabetic, anti-tumor, anti-inflammatory, anti-asthmatic activity, anti-cancer activity, anti-ulcer activity, wound healing activity, anti-convulsant activity, biological activity, anti-diarrheal activity, anti-pyretic activity, pharmacological activity etc. in human being and animal.

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AUTHOR'S CONTRIBUTION

Islam MS: writing original draft, methodology. **Lucky RA:** investigation, formal analysis, conceptualization. Final manuscript was read and approved by all authors.

DATA AVAILABILITY

The data and material are available from the corresponding author on reasonable request.

CONFLICT OF INTEREST

Authors have declared that no conflict of interest is linked with this work.

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