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An overview of Dillenia indica and their properties

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Abstract

Elephant apple (*Dillenia indica*) is a tropical tree, distributed in various countries of South Asian region including India. In India, it is not commercially cultivated, but mostly found in Assam, North East India. Nowadays, people have been showing more awareness in the useful effects of consuming fruits and vegetables. Fruits contribute important nutritional and commercial value from the ancient time. Indigenously elephant apple is being used in various food products as sole or contributing ingredient, but there is lack of published works in terms of depth scientific investigations about the fruit. So aims of this review to discuss the ecology, diversity and current level of utilization of this plant.

Keywords: *Dillenia indica*, Phytochemical, anticancer

Introduction

Dillenia indica Linnaeus which belong to family *Dilleniaceae* is commonly known elephant apple a vital medicinal plant readily available in Assam, North East India. This tree available in Assam but most of the fruits of this plant are wasted due to poor handling and lack of utilization. In Assam, commonly the immature fruits are used to make seasoning and sauces because of its acidic taste and mature fruits are used for making sauces, jam and pickles. In 'Kannada,' it is 'Bettakanigalu.' Other popular names are Indian catmon, Hondapara tree, Matad (Hindi: Chalta, Karambel; Malayalam: Punna, Vazchpunna; Sanskrit: Avartaki, Bhavya, Bharija; Tamil: Kattaral, Ugakkay; Telugu: Revadi). Its scientific name is *Dillenia indica* L (Family *Dilleniaceae*) named after German Botanist Johann Jacob Dillenius ('indica' is the Latin word for India).

Uncultivated forest edible fruits hold great importance for improving human diets, especially in rural societies of the un developed world. (A Review on *Dillenia indica* L. plant) With adorning foliage and aromatic blooms, this tree is highly valuable for its medicinal properties. This fruit is popular for apple-shaped yellow-green edible fruits of this tree which are relished by elephants.

The *Dillenia indica* are rich in medicinal and phytochemical properties which can reduce free radical and other type of cancer like breast cancer in women.

The free radicals are generating during normal oxidative metabolism. Free radicals and ROS reactive oxygen species attack digestive system lipids, carbohydrates, proteins, and DNA and induce their oxidation, which may result in oxidative damages, such as membrane dysfunction, protein modification, enzymatic inactivation, and breakage of DNA strands, as well as modification of their bases. Such extensive oxidative damages to the biomolecules by the free radicals and ROS may play a causative role in a variety of diseases, including heart disease, cancer, and other age-related diseases. Breast cancer is known to be the most prevalent cancer in the women of established countries, and now its incidence has been increasing worldwide at an average annual rate of about 2%. It is reported that one in around eight North American women are expected to develop breast cancer at some point during their lifetime. Despite many chemotherapeutic techniques the death rates from breast cancer have not been reduced, also cancers at other sites, including lung, brain, colon, prostate, pancreas, and ovary, account for over two-thirds of such cancer deaths. Evidently, there is an urgent need for more effective anticancer agents. (Felicia V. So *et al.*, 2019) Therefore, the roles of antioxidants, which suppress the oxidative damages, have received increased attention. The *Dillenia indica* plant are rich in antioxidant properties.

This plant is native to wild river banks across tropical Asia to South-East Asia. It is one of important source of food for wild animals like elephants and other animals like monkeys; deer in North-Eastern India, the tree plays a major role in forest ecology.

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It is an introduced tree to gardens and elsewhere from the forests of North-Eastern India.

This fruit is properly used as therapeutic medicinal plants by the natives in South and Southeast Asian countries (Lim, 2012), including India and its neighbouring countries like Sri Lanka, Nepal, Thailand, Bangladesh, Indonesia, Vietnam, Malaysia & Philippines. Each parts of this species are traditionally utilized for purposes of health benefits. The dried and fresh materials of various parts of *Dillenia* plants are processed as juice, mucilage and powder for the treatment of diseases like diarrhoea, wounds, cancer, diabetes, fever, cough, rheumatism, urinary problems, skin-related diseases, and aches similarly as hair tonics. Different preparations of *D. excelsa*, *D. ovata*, and *D. parviflora* are traditionally used to cure diarrhea (Burkill, 1966; Srithi et al., 2009; Quattrocchi, 2012). Various skin-related diseases like leucoderma, skin itches, skin rash, and eczema can be treated using the leaf, fruit, and stem bark of *D. andamanica*, *D. indica*, *D. ovata*, and *D. pentagyna* (Prasad et al., 2008; Quattrocchi, 2012; Boer et al., 2012; Bhat et al., 2014). Also, the stem barks of *D. aurea* and *D. parviflora* and the leaf of *D. suffruticosa*, in the style of paste or poultice can be applied onto skin to heal wounds (Mat-Salleh and Latiff, 2002; Quattrocchi, 2012; Junsongduang et al., 2014).

Elephant apple (*Dillenia indica*), an evergreen tropical tree, is a medium sized tree, height up to 50 ft (approx. 15.2m) in some regions. Elephant apple grows widely in tropical forests in the Western peninsula, Bihar, sub-Himalayan tracts, Assam, Bengal, and central and southern India from Sylhet to Sri Lanka. The mature fruits are acidic in taste and are widely used in the preparation of jam and jellies as a flavouring agent. Sweetened elephant apple juices are consumed as a cooling drink, and fruits are processed commercially to make products such as ready-to-serve beverage and squash. The fruits are known for their laxative properties and they are helpful in relieving abdominal pain. The bark and leaves are astringent.

This species is commonly used in remedial folklore to treat cancers, wounds, jaundice, cough, fever, diabetes mellitus, and diarrhea as well as hair tonics. The plants of the genus produce edible fruits and therefore they are cultivated as ornamental plants. Now flavonoids, triterpenoids, and miscellaneous compounds have been detected in the genus. Their extracts have been stated for their antimicrobial, anti-inflammatory, antidiabetic, cytotoxic, antioxidant, antidiarrheal, and antiprotozoal activities. Mucilage from its fruits can be employed in drug formulations. (Carla W. Sabandar et. al. 2016)

The application of this fruit is very wide as it can be made into many different products. Full complete mature fruit-juice removes flatulence, external application helps suppuration of boil, thickened and fleshy calyx on fruits used as a flavoring agent, or made into products including jams and jellies. The fruit can also be processed to industrial value-added products such as clear beverage and different ready-to-serve beverage and squash. It is used as a drug for the treatment of type-2 diabetes traditionally in Assam. Elephant apple powder helps in improving normal functioning of kidneys and can superfood in clearing kidney stones and regulate the body temperature. The pickle of this fruit has a mouth-watering aroma that adds colour to the boring meal. Elephant apple chutney is a product prepared as a thick paste with home made taste.

Medicinal properties

This plant is rich source of herbal medicines; the tree is popular for divine gift of herbal medicinal properties. It's widely used to human beings and widely used in Ayurveda and Siddha. Its medicinal properties are mentioned in Vedas and Puranas. various folk medicinal plants are used by tribes of entire North-East. The leaves, bark, fruits and other parts possess wide range of antimicrobial, antioxidant activity, analgesic, anti-inflammatory, antidiabetic the fruit pulp are used as tonic and laxative for treatment of chest pain, abdominal disorders mixed with sugar against coughs.

Healthy eatable properties

This elephant apple always treats as Fruits that can be eaten cooked or un cooked. This fruit actually remain with thick sepals, which have a sour taste and used in curry and fish preparations and often mixed with peanuts or coconut and spices to make ketchups pickled also can prepared by uncooked elephant apple. The aromatic fruit can mixed in juicy fruit pulp (jelly like) is bitter-sour and used in curries, jam (ouu khatta), jellies, drinks or fermented into vinegar.

Health benefits

Cure stomach related problems, Protects Kidney, Improved RBC Count, Constant Energy Levels, Delayed Aging, Fights Infections, Good for Eye Health, Lower Blood Pressure
It reduces blood pressure and control hypertension problem
Elephant apple is one of the best alternatives. With these exotic treats, it can be easier to keep high blood pressure at bay.

Increase Good vision

Elephant apples are good sources of vitamins specially in vitamin A, this nutrient known to keep the eyes healthy. Health professional confirmed that there are a number of eye issues that can actually lead to vision loss, and, most of them can be cured by outstanding diet that's rich in vitamin A. Regular used of Elephant apple is considered quite beneficial for taking good care of eyes.

Increase immunity and fight against infection

good amount of vitamin C available in Elephant apples. We all know that vitamin C is very important for maintaining a strong immune system. If you are susceptible to have flu, cold or any other type of infection, then frequent use of vitamin C-rich fruits like elephant apples can work to your utmost advantage. Use it frequently.

Control ageing

Vitamin C is also extremely beneficial for people who want to look young. It is the fact that Vitamin C is essential for the synthesis of collagen, which is a type of protein that helps to make skin firm so that it can become less vulnerable to wrinkling. Furthermore, vitamin C is an antioxidant that fights off free radicals that quicken skin aging.

Increase energy level

Elephant apples contain abundant amounts of B vitamins. If you feel weak quite easily, then consuming these fruits can help you in making you more energetic. Similarly, B vitamins are not only energy generators. They are also significant for keeping your brain and nerve cells in an excellent condition.

Increase RBC count

Iron can also be found abundantly in Elephant apples. Thus, it is recommended to consume elephant apple on a regular basis by those who are suffering from iron-deficiency anemia. Regular use of Elephant apples can also help in flushing out impurities and toxic substances in the bloodstream.

Protect kidney against infection

Elephant Apple is remarkably exclusive in stimulant and safe framework. This organic product helps to secure the kidneys reliably. Antiquated Indian researchers make use of elephant apple as the best typical medicine to expel kidney issues. It is likewise lucrative for liver and heart.

Control stomach ache

As we all know that tannin-containing substances are quite beneficial for endless loose bowels and stomach torment. Elephant Apple blends the bark of the tree along with nectar and plays an important role for such stomach issues. This natural product extracts fills in as a preventive prescription for cholera and many more.

Anticancer Activity

Betulinic acid is a known natural product which has gained a lot of attention in the recent years since it exhibits a variety of biological and medicinal properties Kumar *et al.* [29] isolated betulinic acid from the methanolic extract of *Dillenia indica* L. fruits. The methanolic extract showed significant anti-leukemic activity in human leukemic cell lines U937, HL60 and K562. The isolated betulinic acid showed IC₅₀ of values at 13.73, 12.84, 15.27 mg/ml in U937, HL60 and K562 cell lines, respectively. The stem bark of the Brazilian medicinal plant *Zizyphus joazeiro* was phytochemically investigated by Schühly *et al.* [4]. Betulinic acid was isolated from the dichloromethane extract which showed a considerable activity against Gram-positive bacteria.

Other benefits: Elephant apple is broadly used because of its medicinal values. Its barks and leaves are used as a laxative and astringent. Fruit juice is also used as a cough mixture and a cooling beverage for toning up the nervous system. In Ayurveda Elephant apple is considered as a 'vat' suppressant, 'pitta' supplementing drug. Fruit juice when mixed with sugar and water can be used as a cooling beverage for fevers and cough mixture. Leaf, fruit and bark of the plant are used in the indigenous system of medicine. It helps to relieve abdominal pain and controls the heat in the body. Fruit also helps to tone up the nervous system and take out fatigue. Fruit juice is commonly used as a cardio tonic. Bruised bark can also be used as a cataplasm for patients with arthritis.

Alcoholic extract of the Elephant apple leaves is considered to have central nervous system (CNS) depressant activity. Plant is aphrodisiac and normally promotes virility. Fruit is sweet, acidic, astringent, removes bile, phlegm, fetid and flatulence. Green fruit is acidic, pungent, hot, removes wind, phlegm, but the ripe fruit is sweet, sour, appetizing and beneficial in colic associated with mucous. Decoction of the plant can also be used as widespread antidote for poison. Juice from fruit can also be consumed as a treatment of heart related diseases. In the tribal areas of Mizoram, juices from leaves bark and fruits are combined and given orally for the treatment of cancer and diarrhea. Fruit is kept beneath the bed for prevention of small pox and cholera in Assam. Assamese people use the fruit as natural pesticide during paddy farming. Bodas people use the

fruit to cure stomach related disorders. Fruits are used for curing hair fall and dandruff by Manipuri people. Rajbongshis applied mucilage on wounds and burns.

Fruits are consumed to combat weakness by Mikir people. A fruit is used as anti-dandruff for hair fall treatment and applied on head to control hair fall. Fruit is also useful to control weakness. Decoction of fruit is used to remove dandruff. Small piece of leaf is consumed in the treatment of dysentery.

Root is used as phyto chemical treatment for cholera. Roots are also useful for the treatment of burning sensation in the stomach and chest. Its upper part is used therapeutically to treat the infection of the mouth.

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