



NUTRITIONAL IMPORTANCE & MEDICINAL PROPERTIES OF ELEPHANT APPLE (*DILLENIA INDICA*)

Mrs. GB Alaka Kar

IMT Pharmacy College, Puri, New Nabakalabara Road, Sai Vihar, Gopalpur, Puri, Odisha

Dr. Susanta Kumar Rout*

Patent Information Centre, Science & Technology Department, Secretariat, Odisha, *Corresponding Author

Mr. Debashisa Mishra

IMT Pharmacy College, Puri, New Nabakalabara Road, Sai Vihar, Gopalpur, Puri, Odisha

ABSTRACT In the present review, an attempt has been made to gather the botanical, phytochemical, ethnomedicinal, pharmacological and toxicological information on *Dillenia indica*. (Elephant apple), a medicinal plant used in the indigenous system of medicine. DI has been adored in almost all ancient ayurvedic texts for its extraordinary medicinal properties. native to south eastern Asia, India, Bangladesh and Sri Lanka. It is growing wild throughout the , forests of India and very much found in Northeastern part of India. The fruit pulp is bitter-sour and used in Indian cuisine in curries, jam and jellies. Elephant apple is rich in carbohydrates, tannins and flavonoids, which make it medicinally important. Chemical Constituents such as Betulinic acid (dillenetin), Sitosterol and Stigmasterol. It is capable of CNS Depressant, Anti-Leukemic, Anti-Inflammatory, Antioxidant, Anti-Diabetic, Antihyperlipidemic, Antimicrobial, Cytotoxic and Anxiolytic activities. This review will definitely help for the researchers as well as clinicians dealing with Elephant apple to know its proper usage as this pulp is seemed to be highly valuable, possessing many pharmacological / medicinal properties.

KEYWORDS : Medcinal property, Antioxidant, Anti-leukemic, *Dillenia indica* Linn

1. INTRODUCTION

Historically, plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well being. Plants have been utilized as a wide source for discovering novel drug or compounds. Now a day's medicines obtained from different parts of the plant have made huge contributions towards human health and well being¹.

Traditional medicines obtained from plant materials are easily available in rural areas. Due to readily available traditional medicines in rural belt traditional medicines are cheaper than the modern medicines. Medical plants and plant products are the oldest and tried health-care products. Their importance is growing not only in developing countries but in many developed countries². The herbal medicines from natural sources with least or no side effect having similar or better therapeutic activity are best.

The herbal medicines have wide therapeutic actions and safety profile. Approximately 80% of the world inhabitants rely on traditional medicine for their primary health care and play an important role in the health care system of the remaining 20% of the population. The World Health Organization (WHO) is encouraging, promoting and facilitating the effective use of herbal medicine in developing countries for health programs³. Different biological activities like anti microbial, anti oxidant, sedative and anxiolytic effects of the plant extracts may be due to presence of the active compounds. Consequently, due to some other biological activities on the same time make excellent leads for new drug development⁴.

2. DESCRIPTION

Botany of Elephant apple - :

It is an underutilized horticultural crop which is cultivated largely in the north-eastern part of India. The plant parts leaf, bark, and fruit have been used in the traditional medicine as they are having good therapeutic values⁵. Normally the plant starts flowering during the month of May to August and the ripening of fruits, begins in September and it continues up to February. The fruit is layered with five closely fitted imbricate sepals enclosing numerous seeds embedded in a gelatinous pulp. Ripe fruits are greenish yellow in colour, succulent with pleasant smell.⁶

Traditional uses-:

The fruit is indigenously used in Ayurveda to treat nervousness, abdominal distress and fatigue Literature reviews have revealed that the plant has great medicinal value including antimicrobial, antioxidant, analgesic, anti-inflammatory and antidiabetic activities.⁷

Phytoconstituents:

Nutritional value per 100 g of edible elephant apple flesh is Protein, FAT, FIBER, Calcium, Phosphorus, Ascorbic acid. It is reported that in 100g of elephant apple contain 82.3% moisture, 0.8% protein, 0.2% fat, 0.8% minerals, 2.5 % fibre, 13.4% carbohydrate, 0.016% calcium and 0.026% phosphorus. The phytochemical constituent of elephant apple of crude extract includes Glycoside, Steroids, Flavonoids, Saponines and reducing sugar. The investigation of the phytochemical constituent indicates that the leaves are provided a rich source of triterpenoids and flavonoids. It also reported to contain various chemical constituents like 3, 5, 7- trihydroxy-3', 4'-dimethoxy flavones (dillenetin), betulinic acid, β -sitosterol and stigma sterol present in the fruit.¹⁴⁻¹⁶

Experimental and clinical studies:

Antidiabetic activity-

Kumar et al., (2011) carried out an investigation to know the antidiabetic activity of bioactive fraction of *D. indica* methanolic extract in experimental diabetic Wistar rats. They induced type-I diabetes in Wistar rats by single intraperitoneal injection of Streptozocin (60 mg/kg body weight) and type-II diabetes was induced by single intraperitoneal injection of Streptozocin (60 mg/kg body weight) followed by intraperitoneal injection of Nicotinamide (120 mg/kg body weight) after 15 minutes. They found a significant reduction in blood glucose level for both the experimental rats. The possible mode of action of the plant extract might be by potentiation of the insulin effect by increasing the pancreatic secretion of insulin from cell of islet of Langerhans or its release from the bound form or regeneration of the cells.¹⁴

Further another experimental work carried out by (Sunil Kumar et al., 2011) investigated the anti-diabetic effect of the bioactive component of *Dillenia indica* methanolic extract in diabetic Wistar rats. The rats were given graded oral dosages of the isolated ethanol extract of *Dillenia indica* methanolic extract for 21 days. Both experimental rats showed a considerable drop in blood glucose levels. The plant extract's mechanism of action could be potentiating of the insulin effect by raising pancreatic secretion of insulin from Langerhans cells, or its release from the bound state, or cell regeneration.¹⁷

Antinociceptive activity Analgesic activity-

It has been reported that *Dillenia indica* Linn. Extract 250mg/kg and 500mg/kg -1 b. wt were compared to the inhibition of writhing of a standard analgesic agent (diclofenac sodium).¹⁷

Antidiarrhoeal activity -

Antidiarrhoeal screening of the *Dillenia indica* Linn. Leaf extract was carried for diarrheal activity by administering 0.3ml castor oil (Hospital pharmacy Khulna Medical College) and those showing diarrhoeal activity were selected for the experiment.¹⁸

Antioxidant Activity–

Antioxidant activity was determined by Phosphomolybdenum Method, β - carotene linoleate method and DPPH method. The total phenolic content was determined by Folin Ciocalteu Method showing highest phenolic content in the order of Methanolic, Ethyl Acetate and Water extracts of *Dillenia indica*.¹⁹

Antibacterial Activity-

It has been reported that the crude extracts from *Dillenia indica* in n-hexane and chloroform extract possesses antibacterial activity against *E.coli*.²⁰

Anti Leukemic Activity-

The methanolic extract of *Dillenia indica* L. fruits showed significant anti-leukemic activity in human leukemic cell lines U937, HL60 and K562.²¹

Anti Inflammatory Activity-

It has been reported that the methanolic extract of *Dillenia* leaves possessed Anti-inflammatory activity by Carrageenan induced edema. Methanolic extract showed significant activity in paw edema test and Acetic acid induced capillary permeability at 200 and 400mg/kg body weight.²²

Increase Good vision-

It has been reported that the 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 use of Elephant apple is considered quite beneficial for taking good care of eyes.

Others-

Elephant apples contain abundant amounts of B vitamins, Vitamin C and others so that it is helpful for Increase immunity and fight against infection, Control ageing, Increase energy level, Increase RBC count, Protect kidney against infection, Control stomach ache etc.²³

Toxicity-

Leaves and fruits of *D. indica* are traditionally used as insect repellents and have insecticidal properties. However, there are no studies on mammalian safety evaluation of products derived from *D. indica* as insecticides. It has been reported that *D. indica* did not cause adverse toxicity and mortality in the experimental BALB/c mice at highest dose of 1600mg/kg bw and 500mg/kg bw in acute and sub-acute toxicity tests respectively. Biochemical and histopathological studies on vital organs suggest mild toxicity on liver and kidney at higher dose. This encourages further in-depth studies of the toxicity on longer days exposure and higher dose of the enriched fraction.²⁴

CONCLUSION

Dillenia indica has been used from many decades in Ayurveda because of its pharmacological importance. The extensive literature survey and recent reports on exploring its activity revealed that *Dillenia indica* is highly regarded as a potential and upcoming candidate in the herbal medicine. The plant has good therapeutic potential and large-scale, controlled pharmacological study is needed to validate these results. The review overall depicts the importance of *Dillenia indica* as a medicinal plant by its various phytochemical compounds and pharmacological activities. Further evaluation needs to be carried out on this plant to explore the hitherto unknown effects and their practical pharmacological and clinical applications, for the welfare of the mankind.

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