



## A review on traditional and medicinal properties of *Dillenia indica*

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### Abstract

Elephant Apple (*Dillenia Indica*) is a most edible species in wild fruit. The natural product is layered with five intently fitted imbricate sepals encasing various seed inserted in thick mash. The developments of *Dillenia Indica* are enormous and hard which are open just to the mega herbivores. The aim of present review paper is to give historical, traditional and physical uses of *Dillenia Indica*.

**Keywords:** *dillenia indica*, sub-himalayan tract, phytochemical constituent and medicinal use

### Introduction

Elephant Apple (*Dillenia Indica*) is a *Dillenia* animal category local to Southeast Asia through India, Bangladesh and Sri Lanka east to Southwest China and Vietnam and south to Malaysia and Indonesia by means of Thailand. *Dillenia* is the soggy and evergreen backwoods of sub-Himalayan tract, Uttarakhand to Assam, West-Bengal and Orissa. The most edible species is *Dillenia Indica* Linnaeus (family: *Dilleniaceae*). It has excellent white fragrant blossom, toothed leaves and globose organic product with little earthy colored seeds. The plant parts leaf, bark and natural product utilized in customary medication as they have great helpful qualities. This plant begins blossoming in the long stretch of May to August and maturing of natural product start in September and it proceed up to February. The natural product is layered with five intently fitted imbricate sepals encasing various seed inserted in thick mash. Ready natural products are greenish yellow in shading with unsavory smell. The ready natural products are assembled while the sepal's thickness which is sharp in taste and generally utilized in flavorings of curries and readiness of jam and jam.

### History of *Dillenia Indica*

Blossoming is found in the period of June-August and fruiting occurs in the long stretch of December-April. Reproduction happens in seeds. The fertilization is finished by creepy crawlies. Seed are scattered by barochory for example gravitational dispersal. The developments of *Dillenia Indica* are enormous and hard which are open just to the mega herbivores. Seeds from both old and delicate organic products which can develop well. The tree is autonomous on the mega herbivore for the endurance. Development is finished by seeds and cutting. Seed are gathered during the period of October to December. From the seeds the new plants are raised.

Organic product, the physical or aged ovary of a bloom, carnal or nuts. Organic products are refined just as wild refined organic products are developed by rancher for their monetary profit while wild organic products are discovered distinctly in their regular habitat. Because of the expansion in populace the territory of estate and timberlands are utilized for humankind. As number of plants decline the

wild plants losing their personality and diminishing in number. Wild natural product plants are huge in number the spot which are not influenced by human impact due to their diverse geological and climatic condition which can't be utilized for the human reason (Tiwari J.K). The palatable parts of 16 eatable wild natural products were dissected for dampness, protein, fat rough fiber, debris and minerals (Ca, Mg, Fe, P, K and Na). (V.S.R Deshmukh) It has remedial properties. Organic product treats anxiety, stomach agitates and exhaustion. The bark and squeeze from the leaves are given as a treatment for loose bowels and disease when the organic product's sticky substance is scoured into the scalp; it treats dandruff and decreases hair shedding.

Specialized and safeguarding strategies assume a significant job in natural products quality and advancement in the wake of collecting., for the long time organic product conservation has represented an issue to natural product cultivators( Barbosa-Canovas G.V 2003), however now they have available to them diverse improved techniques for protection after reap.

Elephant Apple (*Dillenia Indica*) is the sodden and evergreen timberlands of sub-Himalayan tract, structure Kumaon and Garhwal eastwards to Assam, West-Bengal and Orissa (N. Rai *et al* 2005) <sup>[12]</sup>. The class *Dillenia* has 60 species for which *Dillenia Indica* Linnaeus (family: *Dilleniaceae*) is the most palatable species (J. Janick *et al* 2008). It has lovely white fragrant bloom, toothed leaves and globose natural product with little earthy colored seeds. The plant parts leaf, bark and organic product utilized in customary medication as they have great restorative qualities. This plant begins blooming in the long stretch of May to August and aging of natural product start in September and it proceed up to February. The natural product is layered with five intently fitted imbricate sepals encasing various seed implanted in thick mash. Ready natural products are greenish yellow in shading with undesirable smell. (M.C Rai, 1994) <sup>[11]</sup>. Elephant apple has wide scope of utilization in various documented. The natural product is wealthy in supplements and it has properties like antibacterial and hostile to mutagenic movement, cell reinforcement action and it has therapeutic incentive to forestall certain types of malignancy, diabetes and cardiovascular infections and so on (S. Jaiswal *et al*, 2014)

[7]. The natural product could be prepared to business items, for example, clear drinks and prepared to serve refreshments and squash (Saikia. L and Saikia. J, 2002) [15]. The organic product juice of this plant has cardio tonic impact utilized as cooling drink in fever and furthermore utilized in hack blend.

These plants are found to have great helpful qualities in different various infections. Various parts are utilized customarily and pharmacologically to fix afflictions and maladies. *Dillenia Indica* utilized in the event of fever as a love potion and furthermore advances virility; and furthermore, be utilized as an all-inclusive remedy. (K.R Kartikar and B.D Basu, 2003).

These plants are found to have great helpful qualities in different various infections. Various parts are utilized customarily and pharmacologically to fix afflictions and sicknesses. *Dillenia Indica* utilized in the event of fever as a sexual enhancer and furthermore advances virility; and furthermore, be utilized as a widespread counteractant.

Organic products have been perceived as a decent wellspring of nutrient and minerals and for nutrients and minerals and for their job in forestalling nutrient C and nutrient An inadequacies. Individuals who eat natural product as a feature of a general sound eating regimen for the most part have a decreased danger of interminable maladies. (Upadhyay *et al.* 2017) [19]

Wild organic products are rich profoundly esteemed natural products crops for their extraordinary flavor, surface and shading. Lately, wild organic products have been indicated give huge medical advantages due to their cancer prevention agent substance, nutrients and minerals, fiber, folic corrosive and so forth notwithstanding new utilization, wild palatable natural products are broadly utilized in drinks, frozen yogurt, yogurt, jams, jams and numerous other food items. Various wild consumable natural products are utilized by rustic and ancestral populace and altogether add to their occupation. The utilization of non-developed nourishments, of which wild organic products from a section, as an eating routine enhancement, or as an editing instrument in the midst of food deficiency, gives a significant wellbeing net to the provincial poor particularly in immature nations (Redzic, S.J. 2007) [8].

The origin of *Dillenia Indica* is southern Asia, Sri Lanka east to southern western China (Yunnan) and Vietnam and south through Thailand to Malaysia and Indonesia (Lim, 2012) [10]. *Dillenia Indica* and *Dillenia petagyna* are widely distributed in many Asian countries (Lim, T.K. 2012) [10].

In the current investigation, the antibacterial and against mutagenic exercises of the products of the soil concentrates of *Dillenia Indica* were assessed and the impact of their inhibitory fixations on cell divider, nucleic corrosive spillage and pathogenic qualities of the microscopic organisms was contemplated. The foods grown from the ground separates acquired by 70% fluid CH<sub>3</sub>2CO extraction demonstrated least inhibitory focus (utilizing agar weakening technique) against various microorganisms in the scope of 2000–10,000 and 1250–5000 mg (Negi, P. S. & Sakariah, K. K. *et al* 1999) [13]. Individually, showing higher antibacterial movement for bark remove. The capacity of these concentrates to cause the deterioration of cell divider and spillage of hereditary material is well on the way to be the factor for their antibacterial action. Further the concentrates had the option to hinder the pathogenic qualities present in tried microorganisms. The *D. Indica*

products of the soil watery CH<sub>3</sub>2CO concentrate may discover application in nourishments and pharmaceuticals inferable from their inhibitory properties. Natural products fill in as cancer prevention agents inside the body just as bio utilitarian segments.

*D. Indica*, along with Assam, is one of the widely used herbs of different clans all through the North-East (Sandipan D, 2009). It is one of the evergreen woods plants found in nature. The jam like substance inside the natural product has regularly been utilized to treat dandruff and dropping hair. Traditionally it has additionally been seen in various pieces of north-eastern India the leaf, bark and root juices are solidified and taken intravenously for disease care and looseness of the bowels (Sunil K, 2011). The leaves and bark are utilized as an enemy of - provocative specialist and barbiturate (Sharma HK, 2001) [5].

The investigation of various examinations recommends that the leaves, bark, organic products or the particular bit of *D. Indica* has impressive helpful benefits. It has different purposes, for example, Antimicrobials (Badrul Alam *et al* 2010) [2] Antioxidant (Nazma P, *et al* 2009), Analgesic (Rita A, *et al* 2007) Anti-inflammatory (Badrul AM, *et al* 2012), Dysentery (Yeshwante SB, *et al* 2009), Anti-diabetic (Ajit Kumar D, *et al* 2009) etc. What's more, as such the *D. Indica* has a wide assortment of exercises that make the natural product, or the whole plant, a blessing to individual. Elephant apple has wide scope of use in various documented. The natural product is wealthy in supplements and it has properties like antibacterial and against mutagenic movement, cell reinforcement action and it has restorative incentive to forestall certain types of malignancy, diabetes and cardiovascular sicknesses and so on. The organic product could be prepared to business items, for example, clear refreshments and prepared to serve drinks and squash. The natural product juice of this plant has cardio tonic impact utilized as cooling refreshment in fever and furthermore utilized in hack blend.

*Dillenia indica* is an evergreen bush or little to medium estimated semi deciduous, branches spreading tree developing to 15 m tall. Leaves are fascicled toward the finish of the branches, elongated lanceolate, sharpen, 20-30 cm long and pointedly serrate Antimicrobials (Badrul Alam *et al* 2010) [1] Antioxidant (Nazma P, *et al* 2009), Analgesic (Rita A, *et al* 2007) Anti-inflammatory (Badrul AM, *et al* 2012), Dysentery (Yeshwante SB, *et al* 2009), Anti-diabetic (Ajit Kumar D, *et al* 2009) etc. The leaves are dull green, weathered, frequently minutely toothed and obtuse or noted at the pinnacle, are specked with oil organs and marginally lemon-scented when reviled, the bloom are white in shading and enormous up to 15cm in measurement and single towards the finish of every branchlet. *Dillenia* has biggest and most limited bloom in the *Dilleniaceae* family. *Dillenia* species has two structures, one with spreading stylar branches and two arrangements of stamens with heteranthery (indirect blossom) and this structure is unmistakable, in light of the fact that circuitous blossoms are in any case uncommon in angiosperms (Weber, 1993; Endress, 1994) and the other structure with more connivent stylar branches and without two particular arrangements of stamens, in spite of the fact that stamen size decreases all the more steadily towards the outskirts of the bloom (gun blossom).

Elephant apple is significant wellspring of solid eating routine and help in physiological procedure. Through, it has

been utilized by ancestral and people networks of different backwoods locale of India, data on the wellbeing, wholesome, pharmacognostical, phytopharmacological advantages of this plant is constrained because of the absence of information, specialized examination and examinations, Accordingly, present work is planned to decide the physical, optical and biochemical qualities of elephant apple to measure its commitment to the eating regimen and it's conceivably to use in pharmaceutical and food industry.

### Vegetal explanation

It belongs to evergreen large shrubs. It is 6-15 m tall, which contain growing branches and thick bark.

**Leaves:** leaves are 15-36cm long with a remarkable ridged surface with strong veins. Leaves are having an oval shape regularly mark and second veins 30-40 paired ending in the sawlike or jagged edge.

**Flowers:** Flowers are 15-20 cm in diameter which contains white color petals.

**Petals:** Petals are oval in shape.

**Fruits:** Fruits are huge greenish yellow in shading which contains seeds which are palatable. The natural products are 5-12cm in distance across. Organic products are huge greenish yellow, have numerous seeds and are palatable. The natural product is 5-12cm in width. The natural product is for all time secured calyx, adhesive, 5-12cm over.

### Physical features

*Dillenia indica* establishes in the wet and evergreen woodlands of the sub Himalayan tract, from Kumaon and Garhwal eastwards to Assam and Bengal and southwards to focal and southern India. It is additionally found in Malaysia, Myanmar, Thailand, Bangladesh, Nepal and Sri Lanka. It is found in tropical and subtropical evergreen or downpour woods elevation up to 2500ft. *Dillenia indica* is rich in vitamin C as in *Citrus maxima* (or *Citrus grandis*), (kumar S *et al.* 2017)

### Refinement

*Dillenia indica* found in zones where yearly daytime temperatures are inside 30-40°C, however can endure 7-47°C. It favors a mean yearly precipitation in the range 3,000-4,000mm however endures 2000-5000mm. Develops best in a rich, marginally corrosive soil. At some point the seeds get sprouted into organic products, which are abandoned on the bank of a stream.

### Tradition and Medicinal uses

*D.Indica* (Outenga) is one of the generally utilized herbs of the distinctive northeastern clans close by Assam. It is among the evergreen timberland plants trapped in nature. The jam like substance inside the organic product has

generally been utilized to treat dandruff and falling hair. It was additionally generally discovered that the juices of leaves, bark and leaves were blended in different pieces of Northeast India and controlled orally for the malignancy treatment and the runs. The leaves and bark can be utilized as an astringent and diuretic.

The examination of different writing demonstrated that the leaves, bark, organic products or the diverse piece of *D. Indica* (Outenga) has significant therapeutic qualities. It has various capacities, for example, antimicrobials, Antioxidant, Analgesic, Anti-inflammatory, Dysentery, Antidiabetic etc. Along these lines the *D. Indica* has a wide scope of action which makes the organic product or the entire plant a present for individual.

### Phytochemical Constituent

*Dillenia indica* Linn is the phytochemical constituent. The unrefined concentrate contains glycoside, hormones, flavonoids, saponins and sugar decrease. The phytochemical constituent examination shows that the leaves are furnished with a rich wellspring of triterpenoids and flavonoids (Md. Abdul M *et al.*). It additionally answered to contain different substance constituents like 3, 5, 7-trihydroxy-3',4'-dimethoxy flavone (dillenetin), betulinic corrosive,  $\beta$ -sitosterol and stigmasterol (Md. Abdul M *et al.*, Bose U *et al.*).

Tannins, malic corrosive, arabinogalactan, and glucose are the chief substance of meaty sepals. They likewise contain arabinogalactan, betulin, flavonoids and betulinic corrosive. Bark and wood contain flavonoids, betulin, betulinic corrosive, betulinol, lupeol,  $\beta$ -sitosterol, myricetinhydroxy-lactone, dihydroisorhamnetin, dillentin, and glucosides. The stem bark contains  $\beta$ -sitosterol, myricetin, another hydroxylactone, dihydroisorhamnetin, dillentin and glucosides.

### Sensation of the fruit (elephant apple) and its nutritional value

The viscous pulp surrounding the sepals is sweet but acidic inside. The taste of petals is like unripe apples. Table 1

**Table 1:** Nutritional value of elephant apple per 100gm of edible part.

SI No	content	Percent	SI No	Content	Percent
1	Protein	0.8	5	Ash	16mg
2	Fat	0.20-2.50	6	Phosphorus	26mg
3	Fiber	2.10-2.50	7	Ascorbic acid	04mg
4	Ash	3.54	8	Total calories	59Kcal

### *Dillenia Indica* in Ancient Relics

There are different medicinal properties of *Dillenia Indica* according to the pre-historic study. Table 2

**Table 2:** Ethno-medicinal uses of *Dillenia indica* L. (Khanum *et al.*, 2007).

Tribes/ ethnic group	Part used	Ethnomedicinal uses
Bodos	Fruit	Fruit is eaten to cure stomach related disorders
Manipuri	Fruit	Fruit is used for curing hair fall and dandruff.
Wlikir	Fruit	Fruits are consumed raw to combat weakness.
Rajbongshis	Mucilage	Applied on wounds and burns
Tai Ahom	Fruit	A decoction of fruit is used as anti-dandruff and applied on head to check frequent hair fail. Fruit is also eaten to combat weakness
Tai singfou	Fruit	Decoction of fruit is used to remove dandruff.

## Utilization

The elephant apple plants are found to have generally excellent helpful qualities in various infections. The various parts like bark leaves and organic products are utilized customarily and pharmacologically to fix sicknesses and ailments. Generally, the entire plant of *Dillenia Indica* is utilized in the event of fever, as a sexual enhancer and furthermore advances virility. Decoction of it very well may be utilized as an all-inclusive remedy (Khanum *et al.*, 2007). The foundations of *Dillenia Indica* likewise go about as an element of a medication for consuming sensation in the chest, root bark extricate fixes food contamination, glue of root bark alongside leaf glue applied remotely in hyper-extends, youthful bark and leaf as an astringent, decoction of *Dillenia petagyna* is given in the event of body torment twice day by day till fix (Khanum *et al.*, 2007).

The stem and bark of *Dillenia Indica* is filling in as a part of medication for injuries brought about by mercury harming interminable prodigious bruises and carbuncle as a prophylactic in the cholera season. (Janick and Paull, 2008). Leaves of *Dillenia Indica* are utilized as an astringent. The leaf planning in various structures is likewise utilized for treatment like glue is applied on bone crack; decoction is utilized in skin illnesses and body torment. (Janick and Paull, 2008; Anisuzzaman *et al.*, 2007).

The sepals are highly acidic and hence are not possible to consume as fresh. But a number of products can be made from these sepals. In West Bengal, it is a very popular fruit to prepare chutneys, sour preparation and pickles. Also used for making packaging cages.

## Pharmacological activity of *Dillenia indica*

### Antioxidant activity

Cell reinforcement property has been analyzed on the results of *Dillenia Indica*. Methanol, oil ether and water concentrates of the shade dried results of *Dillenia indica* were gained and the IC<sub>50</sub> estimations of their DPPH, hydroxyl, oxygen and nitric oxide looking through activities were assessed close by their reductive limit; supplement C and hard and fast phenolic content. Supplement C is used as the standard reference for the cell support looking through activities. The IC<sub>50</sub> regards for DPPH, hydroxyl, oxygen, nitric oxide and reductive limit of the methanolic concentrate of *Dillenia indica* were 31.25, 51.82, 51.44, 39.73 and 40.18 µg/ml separately. Higher proportion of phenolic content in the methanolic concentrate of *Dillenia indica* added to its supervisor in vitro cell fortification property. In another assessment, the reducing solicitation of malignancy counteraction operator activity among the *D. indica* natural item removes saw as methanol evacuate > ethyl acidic corrosive induction separate > water independent. This solicitation is moreover similar to the phenolic substance of the concentrates that exhibited the level of cell fortification activity of the concentrate is according to the proportion of phenolics present in that remove. It is seen that the methanol concentrate of *D. indica* natural item contains critical proportion of phenolics and it is the level of phenolics present in this concentrate liable for its stepped malignancy anticipation operator activity as tried through various in vitro models. (Uppalapati L, Rao JT).

### Antidiabetic activity

(Sunil kumar *et al.*) Transported Diabetes is one of the world's driving wellbeing conditions. Treatments created by

Western medication ideas are regularly constrained in viability, convey the danger of unfavorable impacts and are frequently excessively exorbitant, especially for creating nations. So rewarding diabetes with natural mixes and conventional meds consistently appears to have a prevalent favorable position. An exertion has been made in this audit article to get some answers concerning the utilization of *Dillenia Indica* (outenga or elephant apple) as an antidiabetic herb. It has indicated critical clinical and pharmacological action and broadly found an examination to know the hypoglycemic impact of the bioactive part of *D* in various areas of Assam. In trial diabetic Wistar rodents, *indica* methanol separate. In Wistar rodents they prompted type-I diabetes by single intraperitoneal Streptozocin infusion (60 mg/kg body weight), and type-II diabetes was actuated by single intraperitoneal Streptozocin infusion (60 mg/kg body weight) joined by intraperitoneal Nicotinamide infusion (120 mg/kg body weight) after 15 min. The rodents were treated by overseeing reviewed oral portions of separated ethyl acetic acid derivation part of methanolic concentrate of *D. indica* for 21 days. They watched a generous decrease in blood glucose levels for both the test rodents.

The likely method of activity of the plant concentrate might be by potentiating the insulin impact by raising the pancreatic discharge of insulin from the Langerhans islet cell or discharging it from the bound structure or cell recovery.

## Conclusion

*Dillenia Indica* (Elephant Apple) as an Antidiabetic Herb. It is rich in Medicinal properties can use in various disease control. It has been demonstrating critical clinical and pharmacological action and has been broadly found in various Assam areas.

Home grown medication intensity is critical and has unimportant symptoms contrasted with engineered antidiabetic drugs. There is expanding request by patients to utilize the regular items with Antidiabetic drugs. There is expanding request by patients to utilize regular items with Antidiabetic action. As of late there has been restored enthusiasm for plant cures. Plant holds positive guarantees in the administration of diabetes mellitus. Disconnection and ID of dynamic constituents from these plants, planning of normalized rest and measurements routine can assume a huge job in improving hypoglycaemic activity.

The expansive composing study and late reports on researching its development revealed that *Dillenia indica* is significantly seen as a potential and pending candidate in the common medicine. Different concentrates of this plant and its parts have been represented to contain phytoconstituents like flavonoids, steroids, triterpenoids, phenolics, saponins, subject for unparalleled pharmacological activities performed on animal models. From the reports obviously it has anticancer development in vitro on different cell lines with inhibitory property and significant cytotoxicity. Betulinic destructive expect a critical activity in applying anticancer activity. The plant has extraordinary helpful potential and enormous extension, controlled pharmacological assessment is relied upon to favor these results. The review by and large depicts the hugeness of *Dillenia indica* as a remedial plant by its distinctive phytochemical blends and pharmacological activities. Diabetes positions as one of the world's driving medical

problems. Treatments created by Western medication ideas are regularly constrained in viability, convey the danger of unfriendly impacts and are frequently excessively expensive, especially for creating nations. The treatment of diabetes with plant-determined mixes and customary meds consequently still has a predominant advantage. In this writing audit there was an endeavor to discover how to utilize *Dillenia Indica* (elephant apple) as an antidiabetic herb. It has been indicating noteworthy clinical and pharmacological action and has been generally found in various Assam district.

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