CHAPTER 3

Unveiling the Potential of *Dillenia indica* L.: A Comprehensive Review

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Abstract

Dillenia indica is an Indian fruit-bearing tree. People cultivate and plant it for food, medicinal, and ornamental purposes. It has economic value and is a preferred tree for avenue plantations. It is a highly important tree in tribal, rural, and urban areas. In this chapter, food, medicinal, ornamental, ecological, and economic significance is provided, along with photographs taken through a field survey.

Keywords: Edible fruits, livelihood, cultivation, trees

Introduction

Fruit-bearing trees have been a cornerstone of human civilization, providing sustenance, nourishment, and delight for centuries. Cultivated edible fruit-bearing trees have played a vital role in shaping the culinary, cultural, and economic landscape of communities worldwide (Huang, 2022). These trees not only produce delicious and nutritious fruits, but also contribute significantly to food security, environmental sustainability, and human well-being (Sithole et al., 2023). Tropical fruits (e.g., mango, banana, pineapple), temperate fruits (e.g., apple, pear, peach), citrus fruits (e.g., orange, lemon, lime), berries (e.g., strawberry, blueberry, raspberry), stone fruits (e.g., cherry, plum, apricot), and exotic fruits (e.g., durian, jackfruit, dragon fruit) are among the groups into which they fall. The cultivation of

fruit-bearing trees has a lot of benefits, like improved nutrition and health, increased food self-sufficiency, enhanced economic stability, environmental conservation, aesthetic appeal, and landscape beauty (Palar et al., 2019). They play a vital role in the following:

1. Food Security: Fruit-bearing trees provide a reliable source of essential nutrients, vitamins, and minerals.
2. Economic Empowerment: Fruit production and trade generate income and employment opportunities.
3. Environmental Benefits: Trees help maintain ecosystem balance, mitigate climate change, and support biodiversity.
4. Cultural Significance: Fruit-bearing trees hold spiritual, symbolic, and traditional value in many societies.



Figure 1: *Dillenia indica* growing near Mahanadi River areas on road side

Given the significance of fruit-bearing trees, authors have attempted to document the advantages of *Dillenia indica* (Figure 1) for both humans and the environment. It is commonly known as elephant apple. It is native to tropical Asia, belonging to the Dilleniaceae family. In India. It is distributed in Punjab, Uttar Pradesh, Bihar,

Madhya Pradesh, Maharashtra, Goa, Karnataka, Kerala, Tamilnadu, Andhra Pradesh, Odisha, West Bengal, assam, Arunachal Pradesh, Meghalaya and, Andaman and Nicobar (Sharma et al., 1993).



Figure 2: Fruit of *Dillenia indica*

Morphology and distribution

It is a large evergreen tree up to 15-25 meters tall. It has broad and rounded crown. Stem is woody, erect and branched. Bark is grey, smooth, and peeling off in thin layers. Leaves are simple, alternate, and spiral. Shape is ovate-lanceolate to elliptic-lanceolate. Apex is acute or acuminate. Leaves margin is wavy and toothed. Leaves upper surface is dark green and pale green in lower surface. Flowers are large, showy white with 5 petals. Fruits are green and yellow when ripen. Fruit looks like apple having 5-7 cm diameter. Sometimes, it is found in moist, deciduous forests

and along rivers and grows in well-drained soil, full sun to partial shade (Figures 2-3; Sharma et al., 1993; Present study).



Figure 3: Bark and leaves of *Dillenia indica*



Plate 1: Relish prepared by the authors

Food values

Fruits are edible as pickle, vegetable and relish. Usually during winter, fruits are taken to prepare the local dishes (Plate 1; Present study).

Folklore uses

It has ethnomedicinal uses. Fruits are sweet and slightly acidic. Fruits are used to treat diarrhoea and respiratory problems. Fruit pulp is good for healthy skin. Timber is used for making furniture and pulp production. Bark is used to extract yellow dye. It is considered as a sacred tree in Hinduism and Buddhism (Present study).

Pharmacological values

It is reported that plant parts have antioxidant, anti-inflammatory, antimicrobial, anticancer, antinociceptive effect, hepatotoxicity, hypolipidemic and histopathological and antidiabetic properties (Padhya et al., 2008; Kumar et al., 2011; Alam et al., 2012; Kamboj et al., 2019; Singh et al., 2022; Saikia et al., 2022; Souza et al., 2024).



Figure 4: Fruits in the daily vegetable market of Cuttack, India

Phytochemical Studies

Phytochemical analysis of *Dillenia indica* has identified various bioactive compounds, including pentacyclic triterpenoids, flavonoids, betulinic acid and

phenolic acids. These compounds are responsible for its medicinal properties (Kumar et al., 2010).

Economic values

Fruits are used to sell in the market. It has economic values but there is need of value addition at regional level (Figure 4; Present study).

Ecological values

Fruits are edible by many wildlife and birds. It is a preferred food of Asian Elephant. It is resistant to termite attack. The tree's extensive root system helps prevent soil erosion (Present study).

Cultivation

Seeds and stem cutting is good way to propagate this tree. It has moderate growth rate and need regular fertilizer and watering. Regular pruning is required (Present study).

Future Directions

1. Sustainable cultivation and harvesting practices.
2. Conservation efforts and habitat protection.
3. Research into pharmacological and medicinal applications.
4. Promotion of traditional recipes and cultural significance.

Recommendations

1. Encourage sustainable cultivation and harvesting.
2. Support conservation initiatives.
3. Conduct further research on medicinal properties.
4. Promote traditional recipes and cultural significance

Conclusion

Dillenia indica, commonly known as Elephant Apple or Chalta, is a highly valued species in tropical Asia, offering a multitude of benefits that underscore its significance in food, medicine, and ecology. Overall, *Dillenia indica* is a valuable

medicinal plant with a range of pharmacological activities, warranting further research and exploration for its potential therapeutic applications. *D. indica* is a vital species that deserves attention and conservation efforts to ensure its continued availability for future generations. Its multifaceted significance underscores the importance of preserving biodiversity and promoting sustainable use of natural resources.

References

Alam MB, Rahman MS, Hasan M, Khan MM, Nahar K and Sultana S. (2012). Antinociceptive and Antioxidant Activities of the *Dillenia indica* Bark. Int. J. Pharmacol. 8:243–251.

Kamboj P, Talukdar NC and Banarjee SK. (2019). Therapeutic Benefit of *Dillenia indica* in Diabetes and Its Associated Complications. Journal of Diabetes Research. 4632491; doi.org/10.1155/2019/4632491

Kumar D, Mallick S, Vedasiromoni JR and Pal BC. (2010). Anti-leukemic activity of *Dillenia indica* L. fruit extract and quantification of betulinic acid by HPLC. Phytomedicine: International Journal of Phytotherapy and Phytopharmacology. 17(6): 431–435.

Kumar S, Kumar V and Prakash O. (2011). Antidiabetic, hypolipidemic and histopathological analysis of *Dillenia indica* (L.) leaves extract on alloxan induced diabetic rats. Asian Pac. Journal of Trop. Med. 4:347–352.

Padhya IP, Choudhary NS, Padhy SK and Dash S. (2008). Effect of *Dillenia indica* leaves against carbon tetrachloride induced hepatotoxicity. Journal of Pharm Chem. 2:24–27.

Saikia D, Kesavan R, Stephen Inbaraj B, Dikkala PK, Nayak PK and Sridhar K. (2023). Bioactive Compounds and Health-Promoting Properties of Elephant Apple (*Dillenia indica* L.): A Comprehensive Review. Foods. 12(16):2993. doi: 10.3390/foods12162993.

Singh KD, Jena S, Patra B, Devi TB, Chawla S, Bharali R, Parida A, Mukherjee PK and Rajashekar Y. (2022). Safety evaluation of enriched fraction from leaves of *Dillenia indica* L. in BALB/c mice. Toxicology Reports. 9:1142-1149.

Souza DAA, Dias Viegas FP, Gontijo VS, Vieira Domingues JS, Giusti-Paiva A, Vilela FC, da Silva GA, Amaral JG, Lopes NP and Viegas CJr. (2024). Antinociceptive Effect of *Dillenia indica* (Linn.) Mediated by Opioid and Cannabinoid Systems: Pharmacological and Chemical Studies. Chemistry & Biodiversity. 21(3): e202301508. https://doi.org/10.1002/cbdv.202301508.

Huang H. (2022). Discovery and Domestication of New Fruit Trees in the 21st Century. Plants (Basel). 11(16):2107. doi: 10.3390/plants11162107.

Sithole Z, Siwela M, Ojo TO, Hlatshwayo SI, Kajombo RJ and Ngidi MSC. (2023). Contribution of Fruits and Vegetables to the Household Food Security Situation of Rural Households in Limpopo. Nutrients. 15(11):2539. doi: 10.3390/nu15112539.

Palar K, Lemus Hufstedler E, Hernandez K, Chang A, Ferguson L, Lozano R and Weiser SD (2019). Nutrition and Health Improvements After Participation in an Urban Home Garden Program. Journal of Nutr Educ Behav. 51(9):1037-1046.

Sharma BD, Balakrishnan NP, Rao RR and Hazra PK. (1993). Flora of India, Volume 1. Botanical Survey of India, Calcutta, West Bengal, India.