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TROPICAL ALMOND: THE VALUABLE TREE

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ABSTRACT

Terminalia catappa is a big spreading tree in strong winds. It nurtures in normally drained, well aerated, sandy soils, belongs to family Combretaceae. It is naturally found in subtropical and tropical zones of Indian and Pacific Oceans and also parts of the world including Brazil, the Caribbean, and East Africa. The tree bears fruit that is ellipsoid in shape, with apex which are bluntly pointed. It is able to show antimicrobial, anti-inflammatory, antidiabetic, antioxidant, hepatoprotective, and anticancer activities. All parts of the plant can be used in traditional medicine. Terminalia catappa can even produce dye which provenly has some medicinal properties.

Keywords: *Terminalia catappa, antimicrobial, antidiabetic, dye, medicinal properties.*

INTRODUCTION

Terminalia catappa is a big, spreading tree, in strong winds. It nurtures in normally drained, well aerated, sandy soils. It can be easily propagated from seeds, and is fast growing plant which needs minimum maintenance in suitable environments [1]. It is from the family Combretaceae [2]. Terminalia catappa L. is not so utilised crop which is from a group of nuts with hard seeds enclosing a single edible kernel [3]. They are expected to live about 60 years and grow best in sands and loamy soils [1].

Distribution

It is naturally found in subtropical and tropical zones of Indian and Pacific Oceans and also parts of the world including Brazil, the Caribbean, and East Africa. It is accepted in Florida and Puerto Rico [1].

Taxonomical classification [4]
Kingdom: Plantae
Division: Magnoliphyta
Class: Magnoliopsida
Order: Myrtales
Family: Combretaceae
Genus: *Terminalia*
Species: *T. catappa*

Vernacular names

Plant can be called with different names like; Sea Almond [5], Ketapang [6], Tropical Almond Christian [7], Pacific Almond, Singapore Almond [8], Indian Almond [9], Bastard Almond [10], Telisai, Jelawai Ketapang [11] in their respective regions.

Botanical description

It is a large tree with size 25–40 m (82–130 ft) tall, at maturity the trunk achieves a diameter of 50–150 cm (20–60 in) [1]. The leaves are large, 15–25 centimetres long and 10–14 centimetres broad, ovoid, glossy dark green and leathery [15], they are arranged in close spirals. The flowers are small (4–6 mm white or cream in colour with an unpleasant smell [1]. The bark is grey to brown, generally one to five fruits develop on the basal part of the flower spike. 3yr old tree is able to produce nutritious, the seed kernels can be eaten immediately after extraction [12]. The tree bears fruit that is ellipsoid in shape, with apex which are bluntly pointed [13].

Phytochemical importance

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The plant is able to show antimicrobial, anti-inflammatory, antidiabetic, antioxidant, hepatoprotective, and anticancer activities [2]. It has the ability to lower cholesterol specifically by reducing low-density lipoprotein (LDL) cholesterol [14].

The bark is rich in tannins, seeds contain oil. The fruit tastes bitter and is acrid, astringent and aphrodisiac. The leaves are maturant and emollient; the juice of leaves is used in the preparation of ointment for diseases. The root bark is given in dysentery and diarrhoea [2].

The leaves have vast medicinal uses, young leaves or scraped bark is taken as a potion for treating mouth infections in Tonga and Samoa and is used in the Cook Islands to treat fractures. The bark is used as an astringent in dysentery and thrush [1], before falling, leaves turn pinkish-red or yellow brown, due to the presence of the pigments violaxanthin, lutein, and zeaxanthin [15]. They show protection against acute liver injury. In Taiwan fallen leaves are used as herb to treat liver diseases and has a potential in treating of sickle cell disorders and aphrodisiac in nature [16].

The fruit flesh, nut might be a potential source for the generation of herbal drug as it has many nutritional values [12], also the fruit is useful in bronchitis and bowels [2]. They rich in phytochemicals and nutrients and contribute to the therapeutic properties, so are the potential source for herbal drug [12].

Terminalia catappa is responsible to host endophytic fungi which produces enzymes like amylase, cellulase, lipase, and laccase, they all are pharmaceutically important enzymes [17]. All parts of the plant can be used in traditional medicine [16].

MATERIALS AND METHODOLOGY

TABLE 1

List of phytochemicals found in different parts of the plant

Sr. no.	*Plant part*	*Phytochemical found*	*References*
1.	Leaves	Flavonoids, Saponins, Phytosterols	[15]
		Alkaloid, Flavonoids, Resins, Steroids, Sugars, Tannins, Saponins, Alkaloids and Tannins	[16]
		Tannins	*[18],[22]*
		Ellagic acid	[19]
		Saponins, Glycosides, Steroid, Glycosides, Anthraquinones, Tannins, Flavonoids, Alkaloid, Volatile oils, Phenols and Balsam (Gum).	[20]
		Glycosides	[21]
2	*Bark*	*Flavonoids, Saponins, Phytosterols*	*[15]*
		Tannins	*[18]*
3	*Fruits*	*Alkaloid, Flavonoid, Protein, Phyto Steroid*	*[12]*
		Tannins	*[18]*
		Tannic Acid	*[19]*
5	*Seed*	*Oils and Fats*	*[7]*
		Lipid and Tannins	*[12]*
		Flavonoids, Alkaloids, Tannins, Steroids, Resins and Saponins	*[21]*

TABLE 2: List of phytochemicals and their benefits

Sr no.	**Plant part**	**Phytochemical**	**Useful in the treatment**	**Reference**
1.	Bark	Tannin	Dysentery, Diarrhoea	[2]
		Flavonoids	Liver Diseases, Dysentery and Diarrhoea	[15]
2.	Fruit	Ascorbic acid	Bronchitis and Bowels	[2]
		Unsaturated fatty acids	Sexual inadequacies (Premature ejaculation)	[14]
		TanninsGallic acidEllagic acid	Diabetes	[23]
3.	Seed	Oil	Diarrhoea	[2]
4.	Leaves	Tannin	Scabies, Leprosy, Liver Diseases	[1],[2]
		Flavonoids	Liver Diseases, Dysentery and Diarrhoea.	[15]
		Alkaloids and Tannins	Liver Injury	[16]
		Amylase, Cellulase, Lipase, and Laccase	Gastroenteritis, Dysentery, Hypertension, Diarrhoea, Diabetes, Headache, Colic, Intestinal Parasites, Oral	[17]

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			and Skin Conditions, Oral and Genital Candidiasis	
		Ellagic acid	Leprosy, Scabies,Colic And Headache	[19]

TABLE 3: Qualitative analysis

Sr. no.	Plant part	Properties	References
1	Leaves	Anticarcinogenic activity Antioxidant activity Anticlastogenic activity Anti-Bacterial activity	[15]
		Antioxidant activity Anticlastogenic activity Antimicrobial activity Anticancer activity Anti-viral activity Hepato-Protective activity	[16]
		Antibacterial activity Hepatoprotective activity Hypoglycaemic activity Antioxidant activity Antiparasitic and Antifungal activity Chemo preventive effect. Anti-inflammatory activity ACE inhibitory activity	[19]
		Anticancer activity Antioxidant activity Hepatoprotective activity Antidiabetic activity	[23]
2	Fruit	Antidiabetic activity	[2]
		Antioxidant activity Anti-viral activity Anti-Asthmatic activity Anti-Inflammatory activity Anticarcinogenic activity Antibacterial activity Hepatoprotective Properties	[12]
		Aphrodisiac Activity	[14]
		Anti Asthmatic activity Anticataract activity Antidiabetic activity Anti-Hyperglycaemic activity	[23]
3	Root	Antimicrobial activity	[2]
4	Leaves	Antimicrobial activity	[2], [20]

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		Anticarcinogenic activity Anti- viral activity Hepatoprotective activity Anti-Diabetic activity	[14]
		Antitumor activity Antioxidant activity	[24]
		Anti-diabetic activity Anticancerous activity Antioxidant activity Anti-HIV reverse transcriptase activity Hepatoprotective activity Anti-inflammatory activity Anti-hepatitis activity	[25]
5	Seed	Anti-indigestion activity Anti-dysenteric activity	[1]
		Antioxidant activity	[3]
		Antioxidant activity	[12]
		Antioxidant activity	[14]

Local uses

Terminalia catappa is used traditionally for the treatment of wounds, boils and other ailments.

Due to the presence of tannins plants may be useful in various industries. For example, in food, pharmaceutical and leather industries as well as in agriculture. Terminalia catappa has been found to be effective against some pathogenic microorganisms [20].

Perennial tree is grown mainly to provide shade during hot weather [14]. The dried leaves can be used for fish pathogen treatment, Phyto-waste materials are considered to be a more important because they are cost-effective, renewable nature, safe, available, and easily accessible sources. These waste residues are usually disposed of by burning or deposition in landfills [26].

It is found that tree is responsible for ethnomedical uses, phytochemical presence and pharmacological. It is widely planted throughout the tropics, for shade, ornamental purposes, and edible nuts [19]. Tree also provides medicine dye and wood [13].

Thomas and team in his paper listed so many uses of terminalia, like they can be used in: Mulch/organic matter, Soil stabilization, Crop shade, Alley cropping, home gardens, Improved fallows, Windbreaks, Animal fodder, Woodlot, Food for Native animal/bird, Wildlife habitat, Bee forage, Coastal protection and ornamental purposes. Seeds have many nutritive values, which make them necessary in diets, also good sources of edible oils and fats [4].

TREE AS DYE YIELDING PLANT

Natural dyes are from naturally occurring sources such as plants, insects, animals and minerals. Organic pigments are large and complex organic molecules responsible for the different colours of plants and foods. They give color to the vegetable and are also responsible for critical plant functions. The different variations of colours in plants are due to combinations of pigments [27]. Natural colors are safe and even possess some medicinal qualities. Where synthetic colors, produced from coal and petroleum, could be harmful [28]. Water soluble extracts from Terminalia leaf and seed pericarp can be used as natural dyes in presence of mordants [29]. Leaves fall twice in a year; can be collected and used for dyeing variety of colours on cotton and silk fabrics. After extraction of dye, residual matter can be use as fertilizer. Also, the liquid matter can be used in fish breeding. So, the process of dyeing is totally eco-friendly [15]. Ketapang is one of the sources of natural dyes [30]. Natural dye rich of tannin can be easily extracted from Ketapang leaf through maceration process. This leaf contains tannin substance that can be used as natural dye for textile materials. This natural dye is one of

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potential alternatives to the synthetic dyes because it is environmentally friendly and also Ketapang leaf is plentiful [22]. The fruit is high in tannic acid and this could stain cars, pavement and sidewalks [19]. In many remote areas of Assam dyes from vegetables are still in use, *Terminalia catappa* is one of the listed plants [31], leaves extract powder is qualified to be utilised as textile dye powder [30]. Tropical almonds have potential to be used as natural dye, the bark and leaves (as well as fruit shells and roots) are rich in tannins and may be used for staining/coloring fabrics including tapa, tanning leather, and ink-making [1].

CONCLUSION

Terminalia catappa contains various phytochemicals (Table 1 and 2), and possess many qualitative properties (Table 3). In this review paper the use of plant and its various parts have been listed in the treatment of many diseases. Presence of steroids, alkaloids, tannin, saponins etc were detected by many scientists in their research papers. In addition to this plant has been reported with numerous local uses like it can be used in natural dye, ornamental purposes, organic matter, oil stabilization, crop shade, alley cropping, home gardens, animal fodder, etc. All parts of the plant can be used in traditional medicine. No doubt it's a wonder tree.

REFERENCES

1. Thomson, L. A., & Evans, B. (2006). Terminalia catappa (tropical almond). *Species Profiles for Pacific Island Agroforestry*, *2*(2), 1-20.
2. Nair, R., & Chanda, S. (2008). Antimicrobial activity of Terminalia catappa, Manilkara zapota and Piper betel leaf extract. *Indian journal of pharmaceutical sciences*, *70*(3), 390.
3. Adu, O. B., Omojufehinsi, M., Esanboro, M. O., Abe, D. A., Shofolahan, A. O., Uzodinma, E., ... & Martins, O. (2013). Effect of processing on the quality, composition and antioxidant properties of Terminalia catappa (Indian almond) seed oil. *African Journal of Food, Agriculture, Nutrition and Development*, *13*(3).
4. Jagessar, R. C., & Alleyne, R. (2011). Antimicrobial potency of the aqueous extract of leaves of Terminalia catappa. *Academic Research International*, *1*(3), 362.
5. Falótico, T., Spagnoletti, N., Haslam, M., Luncz, L. V., Malaivijitnond, S., & Gumert, M. (2017). Analysis of sea almond (Terminalia catappa) cracking sites used by wild Burmese long-tailed macaques (Macaca fascicularis aurea). *American journal of primatology*, *79*(5), e22629.
6. Santi, S. S., Irawati, F., & Prastica, N. (2020). Extraction of Tannin from Ketapang Leaves (Terminalia catappa Linn). *Nusantara Science and Technology Proceedings*, 196-199.
7. Agatemor, C. (2006). Studies of selected physicochemical properties of fluted pumpkin (Telfairia occidentalis Hook F.) seed oil and tropical almond (Terminalia catappia L.) seed oil. *Pakistan Journal of Nutrition*, *5*(4), 306-307.
8. UK, C. (2014). Terminalia catappa (L.), Singapore almond. [host/crop]. *Terminalia catappa (L.), Singapore almond. [host/crop].*, (AQB CPC record).
9. Agunbiade, S. O., & Olanlokun, J. O. (2006). Evaluation of some nutritional characteristics of Indian almond (Prunus amygdalus) nut. *Pakistan journal of nutrition*.
10. Marjenah, M. (2021). The Role of Structure Canopy of Terminalia Catappa Linn. on Light Penetration and Decreasing Ambient Temperature as Climate Change Mitigation. *Wood Research Journal*, *12*(1), 35-40.
11. Jahurul, M. H. A., Adeline, K. B., Norazlina, M. R., Islam, S., Shihabul, A., & Zaidul, I. S. M. (2022). Characterization and nutritional content of Terminalia catappa kernel and its oil from Sabah, Malaysia. *Applied Food Research*, *2*(1), 100088.
12. Krishnaveni, M., & Dhanalakshmi, R. (2015). Phytonutrient analysis in Terminalia catappa fruit, flesh, nut, shell. *International Journal of Current Pharmaceutical Review Research*, *6*(1), 28-35.
13. Akpakpan, A. E., & Akpabio, U. D. (2012). Evaluation of proximate composition, mineral element and anti-nutrient in almond (Terminalia catappa) seeds. *Research Journal of Applied Sciences*, *7*(9-12), 489-493.
14. Barku, V. Y., Nyarko, H. D., & Dordunu, P. (2012). Studies on the physicochemical characteristics, microbial load and storage stability of oil from Indian almond nut (Terminalia catappa L.).
15. Vadwala, Y., & Kola, N. (2017). Dyeing on nylon fabric with natural dye extracted from waste leaves of Terminalia catappa locally known as tropical almond tree. *International Journal of Home Science*, *3*(2), 175-181.
16. Muhammad, A., & Mudi, Y. (2011). Phytochemical screening and antimicrobial activities of Terminalia catappa, leaf extracts. *Biokemistri*, *23*(1).
17. Toghueo, R. M. K., Zabalgogeazcoa, I., de Aldana, B. V., & Boyom, F. F. (2017). Enzymatic activity of endophytic fungi from the medicinal plants Terminalia catappa, Terminalia mantaly and Cananga odorata. *South African Journal of Botany*, *109*, 146-153.

ISSN: 2321-1520 **E-ISSN:** 2583-3537

18. Krisnawati, M., Cahyani, I. W. N., Paramita, O., & Kusumastuti, A. (2022). Textile natural dye powder of Terminalia catappa leaves. In *IOP Conference Series: Earth and Environmental Science* (Vol. 969, No. 1, p. 012038). IOP Publishing.
19. Mohale, D. S., Dewani, A. P., Chandewar, A. V., Khadse, C. D., Tripathi, A. S., & Agrawal, S. S. (2009). Brief review on medicinal potential of Terminalia catappa. *Journal of Herbal Medicine and Toxicology*, *3*(1), 7-11.
20. Babayi, H., Kolo, I., Okogun, J. I., & Ijah, U. J. J. (2004). The antimicrobial activities of methanolic extracts of Eucalyptus camalctulensis and Terminalia catappa against some pathogenic microorganisms.
21. Purnama, H., Eriani, W., & Hidayati, N. (2019, June). Natural dye extraction from tropical almond (Terminalia catappa Linn) leaves and its characterization. In *AIP Conference Proceedings* (Vol. 2114, No. 1, p. 050026). AIP Publishing LLC.
22. Faisal, R. M., & Chafidz, A. (2019, June). Extraction of natural dye from ketapang leaf (Terminalia catappa) for coloring textile materials. In *IOP Conference Series: Materials Science and Engineering* (Vol. 543, No. 1, p. 012074). IOP Publishing
23. Nagappa, A. N., Thakurdesai, P. A., Rao, N. V., & Singh, J. (2003). Antidiabetic activity of Terminalia catappa Linn fruits. *Journal of ethnopharmacology*, *88*(1), 45-50.
24. Anand, A., Divya, N., & Kotti, P. (2015). An updated review of Terminalia catappa. *Pharmacognosy reviews*, *9*(18), 93.
25. Ahmed, S. M., Swamy, V., Gopkumar, P., & Dhanapal, R. (2005). Anti-diabetic activity of Terminalia catappa Linn. leaf extracts in alloxan-induced diabetic rats. *Iranian Journal of pharmacology and therapeutics*, *4*(1), 36-0.
26. Sathishkumar, P., Arulkumar, M., Ashokkumar, V., Yusoff, A. R. M., Murugesan, K., Palvannan, T., ... & Hadibarata, T. (2015). Modified phyto-waste Terminalia catappa fruit shells: a reusable adsorbent for the removal of micropollutant diclofenac. *RSC Advances*, *5*(39), 30950-30962.
27. Gupta, M., Thakur, S., Sharma, A., & Gupta, S. (2013). Qualitative and quantitative analysis of phytochemicals and pharmacological value of some dye yielding medicinal plants. *Orient J Chem*, *29*(2), 475-81.
28. Mittal, J. (2020). Permissible synthetic food dyes in India. *Resonance*, *25*(4), 567-577.
29. Chitnis, K. S. (2013). Extraction, Characterization and Application as Natural Dyes of extracts from Terminalia catappa leaf and seed pericarp. *Res J Chem Environ*, *17*, 94-99.
30. Krisnawati, M., Cahyani, I. W. N., Paramita, O., & Kusumastuti, A. (2022). Textile natural dye powder of Terminalia catappa leaves. In *IOP Conference Series: Earth and Environmental Science* (Vol. 969, No. 1, p. 012038). IOP Publishing.
31. Kar, A., & Borthakur, S. K. (2008). Dye yielding plants of Assam for dyeing handloom textile products.