

# Chemical Composition and Radical Scavenging (Anti-Oxidant) Efficacy of the Leaf of *Terminalia Catappa* Linn

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*Terminalia catappa* is a large tropical tree in the leadwood tree family, Combretaceae, that grows mainly in the tropical regions of Asia, Africa, and Australia. Common names in English include country almond, Indian almond, Malabar almond, sea almond, tropical almond, beach almond.

The tree has been spread widely by humans, so the native range is uncertain. It has long been naturalised in a broad belt extending from Africa to northern Australia and New Guinea through Southeast Asia and Micronesia into the Indian subcontinent. More recently, the plant has been introduced to parts of the Americas. Until the mid-20th century, the tree had been used extensively in Brazilian urban landscaping, since being a rare case tropical deciduous, their fallen leaves would give a "European" flair to the street. This practice is currently abolished, and the "amendoeiras" are being replaced by native, evergreen trees. *T. catappa* is widely grown in tropical regions of the world as an ornamental tree, grown for the deep shade its large leaves provide. The fruit is edible, tasting slightly acidic.

The wood is red and solid, and has high water resistance; it has been used in Polynesia for making canoes. In Tamil, almond is known as nattuvadumai.

The leaves contain several flavonoids (such as kaempferol or quercetin), several tannins (such as punicalin, punicalagin or tercatin), saponines and phytosterols. Due to this chemical richness, the leaves (and the bark) are used in different herbal medicines for various purposes. For instance in Taiwan, fallen leaves are used as an herb to treat liver diseases. In Suriname, an herbal tea made from the leaves has been prescribed against dysentery and diarrhea. The leaves may contain agents for prevention of cancers (although they have no demonstrated anticarcinogenic properties) and antioxidants, as well as anticlastogenic characteristics. Extracts of *T. catappa* have shown activity against *Plasmodium falciparum* chloroquine (CQ)-resistant (FcB1) and CQ-sensitive (HB3) strains.

Keeping the leaves in an aquarium may lower the pH and heavy-metal content of the water. It has been used in this way by fish breeders for many years, and is active against some parasites and bacterial pathogens. It is also believed to help prevent fungus forming on the eggs of the fish.

*Terminalia catappa* Linn bark is used to treat dysentery by various populations in Southeast Asian countries, and its leaves have also been used in traditional medicine to treat hepatitis in India and the Philippines. Here, the antifungal actions of crude hydro-alcoholic extract (TcHE) and fractions from *T. catappa* leaves were assessed via the agar diffusion and microdilution tests on *Candida* reference strains

and clinical isolates from patients with acquired immunodeficiency syndrome (AIDS). Additionally, the potential cytotoxic effects of TcHE were assessed on cultured human peripheral blood mononuclear cells (PBMC). *T. catappa* fractions and sub-fractions were analyzed by gas chromatography coupled to mass spectrometry with electron impact (GC/MS/EI), high-performance liquid chromatography coupled to mass spectrometry "electrospray" ionization in positive mode (HPLC/MS/MS/ESI+) and hydrogen nuclear magnetic resonance (1HNMR). TcHE and its fractions were able to inhibit the growth of all tested *Candida* strains with the n-butanol (FBuOH) fraction presenting the best antifungal activity. Testing of different FBuOH sub-fractions (SF) showed that SF10 was the most active against *Candida* spp. Fractioning of SF10 demonstrated that 5 out of its 15 sub-fractions were active against *Candida* spp., with SF10.5 presenting the highest activity. Chemical analysis of SF10 detected hydrolysable tannins (punicalin, punicalagin), gallic acid and flavonoid C-glycosides. Overall, the results showed that *T. catappa* L. leaf extract, fractions and sub-fractions were antifungal against *Candida* spp. and may be useful to treat diseases caused by this fungus.

Medicinal plants have been identified and used throughout human history to treat aliment and diseases. Plants have ability to synthesize a wide variety of chemical compound. Many of which are efficacious and contain substances that are potential drugs that require further examinations. Chemical compounds in plants mediate their effects on the human body by binding to receptor molecules present in the body; *Terminalia catappa* Linn (Indian almond) is a Combretaceae plant (tropical almond family) Fresh leaf of *Terminalia catappa* was collected from Bolori ward Maiduguri Borno state and it was identified by Professor S. S. Sunusi Department of Biological Science Faculty of Science, University of Maiduguri. One thousand grammes (1000g) of the powdered leaf of *Terminalia catappa* was extracted with methanol using cold infusion (maceration) method. Eighty three point eight two grammes (83.82g) of the dark green in colour gummy in texture of methanol crude extract was obtained, which was further partitioned with n-hexane, ethyl acetate, n-butanol and water to give n-hexane portion (1.638% W/W), dark green in colour, oily in texture, ethyl acetate portion (0.075% W/W), black in colour, gummy in texture, n-butanol portion (0.777% W/W), brown in colour, oily in texture and finally aqueous portion (2.997% W/W), dark brown in colour, powdered in texture. Preliminary phytochemical screening of the methanol crude extract and partitioned portions revealed the presence of some secondary metabolites such as cardiac glycoside, flavonoids, saponins, terpenoids, tannins and alkaloid. The antioxidant activity was carried out on the methanol extract and partitioned portions. The methanol extract showed the percentage inhibitions of 98.25 at 10ug/ml 97.40 at 20µg/ml 96.94 at 30µg/ml

ml 96.63 at 40µg/ml and 97.10 at 50µg/ml and all the partitioned portions exhibited anti-oxidant activities. The concentration levels of macro-elements (Ca, Mg, Na, K) and micro-elements (Cd, Cu, Ni, Zn, Fe, Mn) were analyzed using Atomic Absorption Spectrophotometer and the anions (Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, and SO<sub>4</sub><sup>2-</sup>) were estimated using smart spectrophotometer. The leaf of *Terminalia catappa* indicated the presence of calcium (19.68µg/ml), cadmium (0.12µg/ml), copper (6.84µg/ml), iron (10.67µg/ml), potassium (18.90µg/ml), magnesium (10.27µg/ml), manganese (1.27µg/ml), sodium (15.30µg/ml) nikkel (1.00µg/ml), zinc (4.17µg/ml), chloride (0.72µg/ml), nitrate (46.00µg/ml), phosphate (70.00µg/ml) and sulphate (227.33µg/ml). However, only phosphate and sulphate exceeded the permissible limit of world health organization (WHO) standard. Purification of compound was

done by using column and thin layer chromatography method. After pooling and recombination with different solvent system of the n-butanol extract, three compounds TCA, TCB and TCC were obtained with melting points TCA (286.00-287.00), TCB (278.00-279.00) and TCC (260.00-262.33). All the melting points were shape and uncorrected. The Gas Chromatography-Mass Spectrometry of the compound TCA revealed the presence of fatty acid derivatives such as octadecanoic acid 4-hydroxybutyl ester, tetradecanoic acid 2-hydroxyl, pentanoic acid, 2,2 4-trimethyl-3-carboxy isopropyl, isobutyl ester, octadecanoic acid (2-phenyl 1-3-dioxolan -4-yl) methyl ester cis..The methanol extract showed promising antioxidant activities at various concentrations when compared with the partitioned portions.