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Sundarambal M
Department of
Pharmacognosy, College of
pharmacy, Madras Medical
College, Chennai. India.

Muthusamy P
Department of
Pharmacognosy, College of
pharmacy, Madras Medical
College, Chennai. India.

Radha R
Department of
Pharmacognosy, College of
pharmacy, Madras Medical
College, Chennai. India.

Jerad Suresh A
Department of
Chemistry, College of pharmacy,
Madras Medical College,
Chennai. India.

Correspondence:
Sundarambal M
Department of
Pharmacognosy, College of
pharmacy, Madras Medical
College, Chennai. India.

A review on *Adansonia digitata* Linn.

Sundarambal M, Muthusamy P, Radha R, Jerad Suresh A

Abstract

Adansonia digitata native to Africa, also found in India belongs to Bombacaceae family one of the tallest trees in the world. *Adansonia* is regarded as the “Queen of all carbon storage trees”. Every part of the plant should be edible. Baobab is older than 4000 years. The trunk of the tree swell greatly during rainy season will absorb 1000 liters of water. From various parts of the plant various nutritional, phytochemical constituents were isolated like vitamin-C, steroids, flavonoids, epicatechin, campesterol, Tocopherol, adansonin, amino acid etc. It have so many medicinal and non medicinal uses it is used in the treatment of bronchial asthma, dermatitis, sickle cell anemia, diuretic, anti-diabetic, diarrhoea, dysentery, laxative, hiccough in children, anti-oxidant, antiinflammatory, antidote for poison, anti-trypanosome uses. The present article summarizes the review of pharmacognostical, phytochemical, pharmacological activity.

Keywords: *Adansonia digitata*, anti-diabetic, antidote, anti-inflammatory, phytoconstituents.

Introduction [1, 2]

Adansonia digitata belongs to Bombacaceae family, the bombax or kapok family. African baobab also known as dead rat tree, Ethiopian sour gourd, Judas’s bag, lemonade tree, monkey bread tree, monkey tamarind, Senegal calabash, and upside down tree, there are 8 species of *ad Adansonia* genus. *Adansonia digitata* a curious shaped, medium sized, deciduous tree. Native to tropical Africa, baobab trees are bizarre in appearance with grotesquely swollen trunks the tree is usually massive, with a barrel like trunks. That may reach a diameter of 9 meter; few trees are tall as 25 meter. Baobab generally produce leaves during the rainy season and shed their foliage during the dry season to reduce moisture loss, the tree produces large white flowers these hang down on long stalks. Fruit of the baobab large gourd like with velvety skin also hang down by long stalks. Leaves and fruits are eaten, commonly used as medicine. phyto chemical investigation revealed the presence of flavonoids, phytosterols, amino acids, fatty acids, vitamins and minerals. It is used in scurvy related diseases, laxative purpose. anti-diabetic, anti-diarrhoeal, anti- trypanosomal activities

Up to 21 meter in height and spreading branches, bark – smooth grayish, often with purplish tinge (or) brown, leaves digitate, leaflets 3 in young plants 5(or) 7 in older plants. 5 cm×12.5 cm obviate oblong (or) lanceolate; flowers solitary, one of the longest lived trees of the world. It can tolerate well high temperature upto 40-42 °C. The tender roots, tubers, twigs, fruits, seeds, leaves and flowers are all edible and they are common ingredients in traditional dishes in rural areas in Africa.

History [3, 4]

Adansonia native to Africa, also native to Madagascar and Australia. There are 8 species of baobab trees (of the genus *adansonia*), 6 native to Madagascar, one in Australia, and one in Africa. French naturalist Michel Adanson had calculated smr baobab were older than 4000 years. It has equal number of right handed flower (with petals that coil toward the right while still in the bud) and left handed flowers (with petals that coil toward the left while still in the bud). However, right handed flowers tend to have more male organs (stamens, which may number unto 1600 in a flower) than left handed flowers. Some baobab has continued to grow while lying flat on the ground. The authentic reports are dead rat trees bursting into flame from spontaneous combustion.

Habitat [5-7]

Baobab found in areas of south Africa, Botswana, Namibia, Mozambique and other tropical African countries where suitable habitat occurs. Tree grown various parts of India chiefly in Bombay, Anthra, Bihar, utter Pradesh, Gujarat, Coromandel Coast and Ceylon. *Adansonia* is regarded as the “Queen of all carbon storage trees”.

Fruit: said to have high vitamin-c content 10 times that of an orange.

Leaves: high in mineral content and pro-vitamin A.

Flowers: white and emit a musky odour to attract bats at night the bats drink the nectar and pass pollen from flower to flower. The petals wilt within 24 hours and fall to the ground.



Fig 1: Adansonia flowers



Fig 2: Adansonia Fruit



Fig 3: Fruits with seeds



Fig 5: Tree



Fig 6: Root bark

Taxonomic Classification [8]

Botanical name : *Adansonia digitata*
Family : Bombacaceae
Kingdom : Plantae
Subkingdom : Viridiplantae
Infra kingdom : Streptophyta
Division : Tacheophyta
Sub-division : Spermatophyte
Infradivision : Angiosperm
Class : Magnoliopsida
Super order : Rosanae

Order : Malvaless
Genus : *Adansonia*
Species : *Adansonia digitata*- baobab

Vernacular Names [8, 9]

Synonym : Baobab
English : Baobab
Tamil : Papparapuli, anaipuliyamaram
Beng : Gorakamali
Guj : Gorak ambli
Hindi : Gorak amlı

| | |
|-----------|--|
| Kan | : Anehunese, bhramlica |
| Mar | : Gorakh |
| Tel | : Brahmaamlika, seemaichinthakaaya |
| Sans | : Kuchandana |
| Mal | : Manjeti |
| Ayurvedic | : Sheet-phala, Ravanaam-likaa. Gorakshi, Panchparni. |
| Unanai | : Gorakh imli |

Constituents ^[10, 11]

Leaves- protein, lipids, carbohydrates, ash, vitamin-c, traces of calcium, phosphorus, leaves contain mucilage which on hydrolysis gives galacturonic acid and glucuronic acids with small quantities of galactose, rhamnose, glucose and arabinose. Fruit-protein, lipids, ash, calcium, vit B₁, and fruit contain furfural.

Seed-protein, lipids, ash, calcium, vitamin B₁, rich in proteins, fatty acids (palmitic acid, oleic. Stearic, linoleic acid).

Young shoot, stem bark-β sitosterol, on wounding, the bark yield a large quantity of semi fluid white gum, have acidic reaction.

History ^[12]

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Names ^[13]

“Baobab” possibly from North African Arabic bibab (buhibab) many seeded fruit. Baobab also known as dead rat tree, Ethiopian sour gourd, Judas bag, lemonade tree, monkey bread tree upside down tree.

Name upside down tree points out the appearance of the tree in it’s leafless state, when the trunk has the form of a gigantic swollen tap root, and the branches look like roots directed to sky rather than in to the ground.

Name dead rat tree based on the baobab’s long fuzzy fruits hanging on long stalks, giving the appearance of dead rats hanging by their tails.

The genus name *adansonia* commemorates French naturalist philosopher and explorer Michel Adanson (1727-1806).

Digitata in the scientific name *A. digitata* is Latin for digitate a reference to the finger like arrangement of the leaflets on the leaves.

The baobab has been said to be the most drought resistant of trees, during rains the trees swell greatly absorbing water large trees can store thousands liters of water in their trunk for later use. Which is the third tallest tree in the world at breast height has a diameter of 8.8m (28.9 ft) greater than any other known tree in the world

Regeneration

Bats primarily pollinate the large white flowers with their ruffled petals at night, although many insects and other creatures such as birds will visit the sweetly scented flowers. The flowers being white are more visible at night and being sweetly scented also helpful to attract the pollinators Natural regeneration occurs in exceptionally wet years. For artificial regeneration one- to 2 year old seed lings, grown in a well watered nursery, may be transplanted during august-September

Phytochemistry

Several compounds isolated from fruit pulp, seed oil, root isolates terpenoids, flavonoids, steroids, vitamins, amino acids, carbohydrates and lipids. 10 Aromatic compounds including isopropyl myristate and nonanal were identified in fruit pulp. From pericarp using column chromatography epicatechin isolated it have strong anti- oxidant property can also promote survival in diabetic mice. From roots 3,7 di hydroxyl –flavan-4-one-5-o-β-d- galacto pyranosyl (1→4)-β-d- glucopyranoside and a flavanone 3,3’, 4’- tri hydroxy flavan-4-one-7-o-α-l-rhamnopyranoside and quercetin-7-o-β-d-xylopyranoside.

From seed oil campesterol, cholesterol, isofucoesterol, β-sito sterol, stigma sterol and tocopherol are isolated.

Traditional Usage

| Plant Part | Use | Preparation |
|------------------------------|---|---|
| Bark | Sickle cell anemia | Aqueous extract of bark |
| Dried fruit pulp | Bronchial asthma, dermatitis | |
| Fruit pulp | Diminishing the heat & quenching the thirst | With figs made to syrup |
| Seed pulp | Diarrhoea & dysentery | Mixed with butter milk |
| Seed | Hiccoughs in infants & children | Powder of raw seeds |
| Gum | Promote granulation | On wounding bark, fruit shell gum collected |
| Stem bark | Substitute for cinchona bark | |
| Bark fibre | Making ropes, musical instruments | |
| White matrix of baobab fruit | Source of cream of tartar | |
| Leaves | Laxative | Mucilage |

In Malawi where a poison arrow is withdrawn from a killed animal, the juice of baobab is poured into the wound in the belief that it neutralizes the toxin before the meat is eaten.

Pharmacological Uses

It have various usage used as astringent, demulcent, diaphoretic, diarrhoea- dysentery, and haemoptysis, rheumatic pain, inflammatory ulcers, intermittent fever, anti-trypanosome, anti- diabetic, anti- cancer, diuretic activities.

1) Anti- Sickling Activity ^[14]

Aqueous methanolic extract of *Adansonia digitata* bark and its ether fractions at various concentrations showed reversal anti sickling properties when incubated with 2% sodium Meta bi

sulphite sickled washed hbss blood samples. No inhibitory anti sickling activity was observed for any extracts when they were preincubated with hbss blood samples without washing with sodium metabisulphite.

2) Diuretic Activity ^[15]

Methanolic and aqueous extracts of *Adansonia digitata* leaves were tested for diuretic activity in rats. The parameters studied on individual rat were body weight before and after test period, total urine volume, urine concentrations of Na⁺, K and Cl ions. The methanolic and aqueous extract of leaves (100 mg/kg body weight) showed increase in urine volume and cation and anionic excretion. Furosemide was used as reference diuretic.

3) Antibacterial Activity ^[16]

Anti-bacterial activity of *Adansonia digitata* stem bark extracted was studied against clinical bacterial isolates of escherichia coli, klebsiella, pneumonia, proteus mirabilis and mirabilis and staphylococcus species using disc diffusion and micro broth dilution techniques. In photochemical screening confirmed the presence of alkaloids, flavonoids, reducing sugars, steroids. Presence of flavonoids may reason for their anti-bacterial activity.

4) Anti- Diabetic Activity ^[17]

Hypoglycemic activity of *Adansonia digitata* stem bark, fruit pulp extract was studied against streptozotocin induced diabetic rats. Methanol used as solvent. Fruit pulp 300 mg/ kg ability to lower serum glucose comparable to chlorpropamide.

5) Anti-Rheumatoid Arthritic Activity ^[18]

Adansonia digitata seed posses anti rheumatoid arthritic activity were assessed by method of complete freund's adjuvant induced arthritis. Administration 200mg/kg and 400 mg/kg on days 7th, 14th, 21st days reduced the inflammation. Also arthritic activity was confirmed by radiographic studies.

6) Anti -Trypanosomal Activity ^[19]

Extracts of baobab roots eliminates the motility in trypanosoma congolense within 60 min and drastically reduce motility in trypanosome brucei

7) Hepato Protective Activity ^[20]

Fruit pulp of *Adansonia digitata* showed hepato protective activity. Wistar male albino rats used. Animals are divided into 5 groups. The administration of aqueous extract of the *Adansonia digitata* fruit pulp resulting normalized serum levels of ALT AST and ALP if given before ccl4. The liver protective ability of ad *Ansonia digitata* extract was 76, 77, and 87 percent for ALT, AST and ALP, respectively, if the extract was given after the commencement of CCl₄ toxicity.

8) Anti- Inflammatory Activity ^[21]

This study based on high polyphone concentration inhibition of NO production. The methanol extract of ad *Adansonia digitata* leaf showed anti-inflammatory activity, extract significantly inhibition of NF-KB activation, there by suppressing expression of the proinflammatory iNOS gene resulting decreased NO production. This is the first report of anti-inflammatory effect of MEAD.

9) Anti -Microbial Activity

The extracts from fruits, leaves, seeds are anti- microbial against bacillus subtilis, Escherichia coli, mycobacterium leprae, and anti-fungal against penicillium crusto-sum, Candida albicans. The stem and root bark of baobab contain bioactive constituents which are responsible for this activity

10) Anti -Oxidant Activity

Adansonia digitata has a particularly high anti-oxidant capability mainly because of it is high natural vitamin C content which is equivalent to 6 orange per 100 gm. The anti-oxidant capacity of baobab fruit pulp was investigated using auto chemiluminescence (plc) assay. Baobab fruit pulp was found to have interesting anti-oxidant in particular the integral anti-oxidant capacity (iac) value of baobab fruit pulp (11.1 m mole/ g fresh weight) was higher than that of orange pulp (0.3 m mole/ gm of fresh weight

11) Anti- Viral Activity ^[22]

Adansonia digitata root bark showed anti-viral activity. This study has evaluated the potentials of the methanolic root bark extract of *Adansonia digitata* as an anti- viral agent against ND virus using multiplication of the ND virus in embryonated egg as an indicator for anti-viral property. the result of the viral propagation showed that 250 and 200 mg/ml concentrations of the extract completely inhibited the growth of ND virus in embryonated chicken eggs, indicating that the methanolic root bark extract of *Adansonia digitata* At these doses are effective against the virus when exposed in-ovo..

12) Analgesic and Anti- Pyretic Activity

Hot water extract of *Adansonia digitata* fruit show analgesic activity in vivo (mice). Showed analgesic activity 2 hrs after administration.

Anti-pyretic activity was evaluated in *Adansonia digitata* extract in 20 rats, hyperthermia was induced by subcutaneous injection of 12% yeast suspension, after 4 hours extract administration rectal temperature slightly decreased from 38.6° – 37.3 °C.

13) Use as Drug Permeation Enhancer

The mechanism through which *Adansonia digitata* exerts its effect, the kinetics of drug delivery and the use of *Adansonia digitata* mucilage in the formulation of matrix tablets were investigated *in vitro* using aminophylline as positive control. The drug release retardation efficiency of *Adansonia digitata* mucilage at equal polymer concentrations was higher than those of plasma concentration but less than that of hydroxyl propyl methyl cellulose in stimulated intestinal fluid and stimulated gastro intestinal fluid, furthermore, it was found that the mechanism of release of aminophylline from *Adansonia digitata* mucilage in hydroxyl n-Propyl Methyl Cellulose was by diffusion.

14) Antidote to Poison

Bark, fruit pulp and seeds appear to contain an antidote to poisoning by strophanthus species. They contain the alkaloid adansonin which has a strophanthus like action. The juice of these species has been used widely as an arrow poison especially in east Africa.

Chemical Constituents

Carbohydrates, lipids, proteins and vitamins, fruit and leaves also contain vitamin-c, arabinose, galactose, glucose, rhamnose, galacturonic, Glucuronic acids. Seed oil contains myristic, oleic. Palmitic, stearic acids, stem bark contain quercetin, 7 o- xylopyranoside and β -sitosterol.

Conclusion^[23]

Adansonia digitata is one of the largest and long lived trees in the world. It is evident that the baobab is a nutritional, medicinal resource. It is a tree that can provide food, water, shelter and relief from sickness. Every part of the plant reported to be useful. The global demand for baobab has increased dramatically as more sectors such as cosmetic industry and used in pharmaceutical industry due to its fatty acid content known to have beneficial effects when applied into the skin. Baobab fruit pulp has been approved by statutory bodies for use in certain nutritional products. It is certain that commercialization of baobab products (seed oil. Fruit pulp) has increased especially after the FDA, EU have recognized the fruit pulp as a food supplement. Numerous studies on the biological activities of baobab have been conducted with promising results. Including anti-inflammatory, analgesic, anti-pyretic, anti- oxidant, anti-viral activity, anti-diarrhea, anti- dysenteric activity, due to increased interest in baobab products and slow growth of the plant, research should be directed on how to develop a new cultivation with a short maturation period. It is hoped that the review will be a strong stimulus for research and development efforts towards better understanding and utilization of the plant *Adansonia digitata*.

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