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, anti-inflammatorry, 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

*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 *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. phytochemical 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

*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

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”.

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**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.

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**Fig 1:** Adansonia flowers  
**Fig 2:** Adansonia Fruit  
**Fig 3:** Fruits with seeds  
**Fig 5:** Tree  
**Fig 6:** Root bark

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**Taxonomic Classification** [8]

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Adansonia digitata</th>
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<tbody>
<tr>
<td>Family</td>
<td>Bombacaceae</td>
</tr>
<tr>
<td>Kingdom</td>
<td>Plantae</td>
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<tr>
<td>Subkingdom</td>
<td>Viridiplanteae</td>
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<tr>
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<tbody>
<tr>
<td>Genus</td>
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<tr>
<td>Species</td>
<td>Adansonia digitata- baobab</td>
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**Vernacular Names** [8, 9]

<table>
<thead>
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<th>Synonym</th>
<th>Baobab</th>
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<tr>
<td>English</td>
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<tr>
<td>Tamil</td>
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<tr>
<td>Beng</td>
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<td>Guj</td>
<td>Gorak amabli</td>
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<tr>
<td>Hindi</td>
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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 epcatechin isolated it have strong anti-oxidant property can also promote survival in diabetic mice. From roots 3,7 di hydroxyl –flavon-4-one-5-o-b-d- galactopyranosyl and a flavanone 3’3’, 4’-di hydroxy flavan-4-one-7-o-6-l-rhamnopyranoside and quercetin-7-o-b-d-xlyopyranoside. From seed oil campesterol, cholesterol, isofucoesterol, b-sitosterol, 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 | With figs made to syrup
Fruit pulp | Diminishing the heat & quenching the thirst | Mixed with butter milk
Seed pulp | Diarrhoea & dysentery | Powder of raw seeds
Seed | Hiccoughs in infants & children | Aqueous methanolic extract of A. digitata
Gum | Promote granulation | On wounding bark, fruit shell gum collected
Stem bark | Substitute for cinchona bark | On wounding bark, fruit shell gum collected
Bark fibre | Making ropes, musical instruments | Stem bark
White matrix of baobab fruit | Source of cream of tartar | Stem bark
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-trypansome, anti-diabetic, anti-cancer, diuretic activities.

1) Anti-Sickling Activity

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

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

Antibacterial activity of *Adansonia digitata* stem bark extract 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

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

*Adansonia digitata* seed possess 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

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

7) Hepato Protective Activity

Fruit pulp of *Adansonia digitata* showed hepatoprotective activity. Wistark 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 cc14. 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

This study based on high polyphone concentration inhibition of NO production. The methanol extract of *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

*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 38.6ºC – 37.3 ºC.

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 quercitain, 7- xylopyranoside and β-sitosterol.

Conclusion
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.

References
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