

## COMPREHENSIVE REVIEW ON A NUTRITIONAL PLANT: ADANSONIA DIGITATA L. (BAOBAB)

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### ABSTRACT

*Adansonia digitata* L. is native to Africa, also found in India belongs to Malvaceae family. It is one of the tallest trees in the world - commonly known as baobab. Baobab lives more than 4000 years. Baobab is regarded as the “Queen of all carbon storage trees” and is commonly referred to as the ‘Upside Down Tree’ or the ‘Tree of Life’. It is mentioned in Ayurvedic texts by the name of *Gorakshi*. *Adansonia digitata* L. (Malvaceae) is a one of the universal remedial plant having great medicinal and nutritional value. It is a multi-purpose tree which offers protection and provides food, clothing and medicine as well as raw material for many useful items. Every part of the plant is edible. The fruit pulp, seeds, leaves, flowers, roots, and bark of baobab are edible and they have been studied by scientists for their useful properties. *A. digitata* is a large, round canopied tree with a swollen trunk, about 10-25m in height. 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 has so many medicinal and non medicinal uses. Pharmacologically proved action in Anti Sickling Activity, Diuretic Activity, Antibacterial Activity, Anti Diabetic Activity, Hepato – Protective Activity, Anti –Inflammatory Activity, and Anti – Viral activity. The present article summarizes the review of pharmacognostical, phytochemical, pharmacological activity which shows the importance of plant in medicinal aspect.

**Keywords:** *Adansonia digitata*, Baobab, *Gorakshi*, Anti Sickling Activity, Hepato- Protective Activity.

### INTRODUCTION

*Adansonia digitata* L. belongs to family Malvaceae, commonly known as Baobab, Monkey bread tree<sup>1</sup>. Baobab (*A. digitata* L., Malvaceae) is a multi-purpose tree species native to Africa, cultivated in India. It is a tree with trunk of an enormous size; fruit bottle or cucumber shaped; shell hard, woody, light and covered with dull green felt-like yellowish down or brown hairs. The interior of the fruit consists of a soft, corky substance, tough and fibrous in structure and a sub – acid pulp, of a brownish red colour. It consists of mucilage which is firmly adherent to and surrounds the seed. The seeds are enclosed in a horny shell; they are kidney shaped, rough externally, of a rusty red colour, acid flavor and sour taste. The bark yields a white semi-fluid gum, which is colourless, tasteless and insoluble in water. It contains calcium oxalate and resin<sup>2</sup>. It has lots of important phytochemical constituents; pulp contains phlobaphenes, mucilage and gum, glucose, tartrate and acetate of potash and other salts. The pericarp contains phlobaphene, albuminoids, gum, colouring matter, carbonate of potash and soda. The leaves contain wax, glucose, albuminoids, carbonate and chloride of sodium and potassium and a glucoside adansonin antagonistic to strophanthus<sup>2</sup>. *Adansonia digitata* L. (Malvaceae) is a majestic tree revered for its medicinal and nutritional value. The plant parts are used to treat various ailments such as diarrhoea, malaria and microbial infections<sup>3</sup>. Several plant parts have interesting anti-oxidant and anti-inflammatory

properties, and baobab has been used extensively since ancient times in traditional medicine<sup>4</sup>. Its trunk sometimes becomes hollow and forms a water reservoir; 4500 litres of water was recorded in a tree. Powdered leaves when orally administered to guinea pigs prevented the crisis in asthma induced by histamine aerosols. Fruit pulp is diaphoretic; gives relief in bronchial asthma and allergic dermatitis. The kernels are eaten as nuts and yield an oil used for cooking. The bark yields as soft fiber. It is occasionally used for ropes and sacking. The wood yields paperpulp suitable for wrapping as well as writing paper. Wood also used for trays, canoes, rafts, floats and fishing – nets<sup>5</sup>.

#### TAXONOMIC DESCRIPTION<sup>6</sup>:

Kingdom: Plantae; Phylum: Tracheophyta; Class: Magnoliopsida; Order: Malvales; Family: Malvaceae; Genus: *Adansonia*; Species: *digitata*.

#### Synonyms<sup>7</sup>:

- *Adansonia bahobab* L.
- *Adansonia baobab* Gaertn.
- *Adansonia integrifolia* Raf.
- *Adansonia scutula* Steud. Syno
- *Adansonia situla* (Lour.) Spreng.
- *Adansonia somalensis* Chiov.
- *Adansonia sphaerocarpa* A.Chev.
- *Adansonia sulcata* A.Chev.
- *Baobabus digitata* (L.) Kuntze
- *Ophelus sitularius* Lour.

**Table 1:** Vernacular Names<sup>8,9</sup>:

English	<i>Baobab</i>
Tamil	<i>Papparapuli anaipuliyamaram</i>
Beng	<i>Gorakamali</i>

Guj	<i>Gorak ambli</i>
Hindi	<i>Gorak amlī Rookha Hathi- khatiyān</i>
Kan	<i>Anehunese bhramlica</i>
Mar	<i>Gorakh</i>
Tel	<i>Brahmaamlīka seemaichinthakaaya</i>
Sans	<i>Kuchandana</i>
Mal	<i>Manjeti</i>
Unanai	<i>Gorakh imli</i>
Arab	<i>Habhabu</i>
Burm	<i>Bila-magisi</i>
Ayurvedic	<i>Gorakshi Panchparni, Sheet-phala</i>

### HISTORY:<sup>10</sup>

*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.

### CLASSICAL REVIEW:

The drug *Gorakshi* is first mentioned in Raj *Nighantu* in *Parpatadi varga* which is a 15<sup>th</sup> cent. A.D. Lexicon written by *Narhari Pandit*. In this text synonyms, properties and uses of *Gorakshi* has been described, but correlation with *Adansonia digitata* was not mentioned<sup>11</sup>. *Gorakshi* is *A. digitata* first men-

tioned in *Bhavprakash nighantu*, which is a 16<sup>th</sup> cent. A. D. lexicon written by Acharya *Bhavmishra*. Here, the synonyms in Sanskrit like *Gorakshchinchā*, *Sheetaphala*, *Ravanamallikka* and hindi name *Gorakimli* is mentioned with description of plant as it is native to Africa. The morphological characters and physical properties explained here are well correlated to *A. digitata* as it has wide trunk of 9 m, fruits are like white guard 22-30cm long and 10 cm in diameter with a harder outer covering, fruit pulp is sour in taste and seeds are shiny kidney shaped, which is widely used by Africans to treat different type of fevers<sup>12</sup>. After this *A. digitata* is described as *Gorakshchinchā* in *Shalmalyadi varga* of *Nighantu Adarsh* which is a 20<sup>th</sup> cent A.D. lexicon. Here, the detailed description of synonyms, vernacular names, natural habitat, useful part, chemical constituents, physical properties, morphological description, uses, dosage of the plant is described<sup>13</sup>. The *Bhavprakash nighantu* & *Nighantu Adarsh* are authentic lexicons of Ayurvedic texts which clearly explained *Gorakshi* is *A. digitata*. *A. digitata* is a scientific name which is not used by the local people generally. They usually termed with different vernacular names. Then on the basis

of morphological characters, Physical properties, chemical constituents and medicinal uses the correlation is well described.

**PROPERTIES<sup>12</sup>:**

**Rasa (Taste)** – *Amla* (sour), *Madhura* (sweet).

**Vipaka** – *Madhura*, *Amla* (Undergoes sweet & sour taste after digestion).

**Veerya (Potency)** – *Sheeta*.

**Karma (Actions)** – *Pita shamaka* (reduces vitiated kapha and vata dosha)

**PART USED<sup>12</sup>:** *Phlalamajja* (Fruitpulp), *Twacha*(Bark).

**DOSAGE<sup>12</sup>:** fruit pulp ½ -1 *tola* (5 – 10 gm).

**HABITAT:** <sup>14-16</sup>.

Baobab found in areas of south Africa, Botswana, Namibia, Mozambique and other tropical African countries where suitable habitat occurs. Tree grown in various parts of India chiefly in Bombay, Andhra Pradesh, Bihar, Utter Pradesh, Gujarat, Coromandel Coast and Ceylon.

***Adansonia digitata*<sup>17</sup>:**

The baobab tree and its related species belong to the family of Malvaceae and the genus *Adansonia*. The tribe, which is pantropical, includes *Bombax* and *Ceiba* producing fruit fibres used as kapok. The family includes about 30 genera, 6 tribes and about 250 species. A number of these species are used locally for leaves, wood, fruits, seeds or gum. The African baobab (*A. digitata*) occurs naturally in most countries of Sahara as a scattered tree in the savannah, and is also present in human habitation. In the past, some ethnic groups in Mali such as the Dogon, Kagolo and Bambara used to take seedlings from the wild to plant them around their villages. The tree

has been introduced in many countries used as an ornamental plant. It is also known as the dead-rat tree (from the appearance of the fruits), monkey-bread tree (the dry fruit as food for monkeys), upside-down tree (the bare branches looked like roots) and cream of tartar tree (the acidic taste of the fruits).

- **Leaves** are 2-3-foliolate at the start of the season and they are early deciduous, of which more mature ones are 5-7(-9)-foliolate. Leaves are alternate at the ends of branches or occur on short spurs on the trunk. Leaves of young trees are often simple. Leaflets are sessile to shortly petiolulate with great variation in size. Overall mature leaf size may reach a diameter of 20 cm and the medial leaflet can be 5-15 ×2-7 cm, leaflet elliptic to ovate-elliptic with acuminate apex and decurrent base. Margins are entire and leaves are stellate pubescent beneath when young becoming glabrescent or glabrous. Stipules are early caducous, subulate or narrowly triangular, 2-5mm long, glabrous except for ciliate margins. Young leaves are widely used, cooked as spinach, and frequently dried, often powdered and used for sauces over porridges, thick gruels of grains, or boiled rice.
- **Fruits pulp of *A. digitata*:** Baobab pulp is a valuable source of vitamin C content, almost ten times that of oranges. It contains sugars but no starch and is rich in pectin. It can be dissolved in water or milk. The liquid is then used as a drink and sauce for food, a fermenting agent in local brewing, or as a substitute for cream of tartar in baking.

- **Seeds of *A. digitata*:** The seeds of *A. digitata* are uniformed and embedded in the pulp; the color is dark brown to reddish black with smooth testa. Seed kernels are widely used. They are eaten fresh, dry or ground and used in cooking. Kernels have an energy value of 1803 kJ/100 g, approximately 50% higher than leaves. The seed is a good source of phosphorus, calcium and magnesium. Seed oils are important sources of nutritional oils, industrial and pharmaceutical importance.

#### **CONSTITUENTS**<sup>18,19</sup>:

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, vitamin 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- $\beta$  sitosterol, on wounding, the bark yield a large quantity of semi fluid white gum, have acidic reaction.

#### **TRADITIONAL USES:**

- The pulp of fruit is astringent and demulcent, given in dyspepsia, diarrhoea, dysentery, cough and other pulmonary affections<sup>20</sup>.
- The bark is demulcent and aperients given for dyspepsia, diarrhoea, dysentery, cough and other pulmonary affections<sup>20</sup>.
- As a refrigerant (acid drink), like tamarind, the pulp is used in fevers.
- The leaves are used in painful swellings<sup>20</sup>.

- The dry powder of leaves called, Lallo, is used to check excessive perspiration<sup>20</sup>.
- The fruit is sweet, bitter, cooling, antipyretic; useful in biliousness, vomiting, dysentery, excessive perspiration<sup>21</sup>.
- The dried leaves in powder form have been found serviceable in diarrhea, fevers, and other maladies<sup>21</sup>.
- The pulp is beneficial in pyrexia of any form of fever, by diminishing the heat and quenching thirst<sup>21</sup>.
- The various parts of the plant (leaves, bark and seeds) are used as a panacea, that is, to treat almost any disease and specific documented uses include the treatment of malaria, tuberculosis, fever, microbial infections, diarrhoea, anaemia, dysentery, toothache, etc. The leaves and fruit pulp are used as febrifuge as well as an immune stimulant<sup>22,23</sup>.
- In India, it is reported that baobab pulp is used externally with buttermilk for the relief of diarrhea and dysentery, while the young leaves are crushed and used to treat painful swellings<sup>24</sup>.
- In some countries in West Africa, the leaves, fruit pulp and seeds are the main ingredients in sauces, porridges and beverages<sup>25,26</sup>.
- Recently, baobab has been referred to as a “super fruit” based on its nutritional profile (e.g. vitamin, fatty acid, mineral)<sup>27</sup>.
- Cooling, refrigerant (allays burning sensation). Leaves— diaphoretic (used as a prophylactic against fevers). Fruit— antidysenteric, antiseptic, antihistaminic<sup>28</sup>.  
Cp khare

- In Africa, dried leaves provide much of the dietary calcium<sup>28</sup>.
- Aqueous extract of the bark is used for treating sickle cell anaemia<sup>28</sup>.
- An infusion of the leaves and flowers is given in respiratory disorders. (Powdered leaves prevented crisis in asthma induced by histamine in guinea pigs)<sup>28</sup>.
- Dried fruit pulp also gives relief in bronchial asthma, allergic dermatitis and urticaria<sup>28</sup>.

### 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<sup>29</sup>: 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 bisulphite sickled washed hbss blood samples. No inhibitory anti sickling activity was observed for any of the extracts when they were preincubated with HbSS blood samples for 6 hours before deoxygenation by sodium metabisulphite.
2. Diuretic Activity<sup>30</sup>: 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<sup>+</sup>, 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<sup>31</sup>: 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 antibacterial activity.
4. Anti- Diabetic Activity<sup>32</sup>: 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. Hepato Protective Activity<sup>33</sup>: 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.
6. Anti- Inflammatory Activity<sup>34</sup>: This study based on high polyphenol 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.

7. Anti- Viral Activity<sup>35</sup>: *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 activity. 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.

## DISCUSSION

*A. digitata* is first mentioned in *Bhavprakash nighantu* by the name of Gorakshi, plant which is native to Africa. The morphological characters and physical properties explained here are well correlated to *A. digitata* as it has wide trunk of 9 m, fruits are like white guard 22-30cm long and 10 cm in diameter with a harder outer covering, fruit pulp is sour in taste and seeds are shiny kidney shaped, which is widely used by Africans to treat different

type of fevers. The fruit pulp is a rich source of vitamin C; dried pulp contains calcium and vitamin B1. In Africa, dried leaves provide much of the dietary calcium. Aqueous extract of the bark is used for treating sickle cell anaemia. An infusion of the leaves and flowers is given in respiratory disorders. (Powdered leaves prevented crisis in asthma induced by histamine inguinea pigs). Dried fruit pulp also gives relief in bronchial asthma, allergic dermatitis and urticaria. *A. digitata* is a nutritional plant used as a dietary supplement and to cure many diseases.

## CONCLUSION

*Adansonia digitata* L. (Malvaceae) is a one of the universal remedial plant having great medicinal and nutritional value. The useful part is fruit-pulp which is a rich source of Vitamin C and bark of the plant. In this article, the summarize explanation on correlation of *Gorakshi* mentioned in Lexicons with *A. digitata* is mentioned. This article is a comprehensive review on *A. digitata* in which Taxonomic description, Classical review, Different Synonyms & Vernacular names , History, Properties, Useful Part, Dosage, Habitat, Morphological Characteristics, Phytochemical constituents, Traditional uses & different Pharmacological uses well mentioned, which clearly shows the importance of plant as it is a multi-purpose tree species, mostly used for medicine, food, fodder & clothing as well as raw material for many useful items.

## FIGURES:



**Fig 1:** Shows *Adansonia digitata* Tree.



**Fig 2:** Shows Fruit Of *Adansonia digitata*.



**Fig 3:** Shows Flower of *Adansonia digitata*.

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