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Adansonia digitata L. (baobab): a review of traditional information and taxonomic description

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ABSTRACT

Adansonia digitata L. (Malvaceae) is commonly known as baobab tree native to Africa. Baobab is a multi-purpose tree which offers protection and provides food, clothing and medicine as well as raw material for many useful items. The fruit pulp, seeds, leaves, flowers, roots, and bark of baobab are edible and they have been studied by scientists for their useful properties. The fruit pulp have very high vitamin C, calcium, phosphorus, carbohydrates, fibers, potassium, proteins and lipids content, which can be used in seasoning as an appetizer and also make juices. Seeds contain appreciable quantities of phosphorus, magnesium, zinc, sodium, iron, manganese, whereas they have high levels of lysine, thiamine, calcium and iron. Baobab has numerous biological properties including antimicrobial, anti-malarial, diarrhoea, anaemia, asthma, antiviral, anti-oxidant and anti-inflammatory activities amongst others. Phytochemical investigation revealed the presence of flavonoids, phytosterols, amino acids, fatty acids, vitamins and minerals. The review summarizes the information on various aspects of traditional information, taxonomic description, medicinal properties and importantly nutritional value.

1. Introduction

African baobab is a very long-lived tree with multipurpose uses. It is said that some trees are over 1 000 years old. Earlier attempts to describe African Baobab on the basis of fruit difference are not accepted till now as they are not grown agronomically or domesticatedly[1,2]. *Adansonia digitata* (*A. digitata*) is commonly found in the thorn woodlands of African savannahs, which tend to be at low altitudes with 4-10 dry months per year. It tends to grow as solitary individuals, though it can be found in small groups depending on the soil type. It is not found in areas where sand is deep. It is sensitive to water logging and frost. All locations where the tree is found are arid or semi-arid[3]. *Adansonia digitata* (Malvaceae) (*A. digitata*) is a majestic tree revered in Africa for its medicinal and nutritional value. The plant parts are used to treat various ailments such as diarrhoea, malaria and microbial infections[4]. Several plant parts have interesting anti-oxidant and anti-inflammatory properties, and baobab has been used extensively since ancient times in traditional medicine[5]. The seeds, leaves, roots, flowers, fruit pulp and bark of baobab are edible. Baobab leaves are used in the preparation of soup. Seeds are used as a thickening agent in soups, but they can be fermented and used as a flavoring agent or roasted and eaten as snacks[6]. The flora from Tikamgarh District in Bundelkhand Region has immense pharmaceutical and commercial potential[7]. India has about more than 45 000 plants species and among them several thousand are claimed to possess medicinal properties[8]. Medicinal plants play an important role in providing knowledge to the researchers in the field of ethnobotany and ethnopharmacology[9].

Baobab trees are indigenous to Africa. The trees can tolerant to high temperatures and long spans of drought, and are grown for their sour fruit and leaves. The fruit consists of pulp and large seeds embedded in the dry acidic pulp and shell. The leaves are used to make soup, and the pulp is used to make beverage and for food preparation[10,11]. In recent years, due to industry seeks natural alternatives, demand for seed oils as ingredients for food, cosmetics

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and biofuel has been greatly increased. A study on biodiesel production and fuel properties was conducted by Modiba *et al*[12]. The seeds are pressed for oil, but the by-product baobab oilseed meal is typically underutilized. Most of previous studies on the baobab fruit have focused on the seed oil[13]. The total land area of Orchha wild life sanctuary in Madhya Pradesh is about 40-45 km^2, which is very rich in medicinal plant species[14].

2. *A. digitata*

The baobab tree (Figure 1), 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[2]. 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[15]. 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)[16].

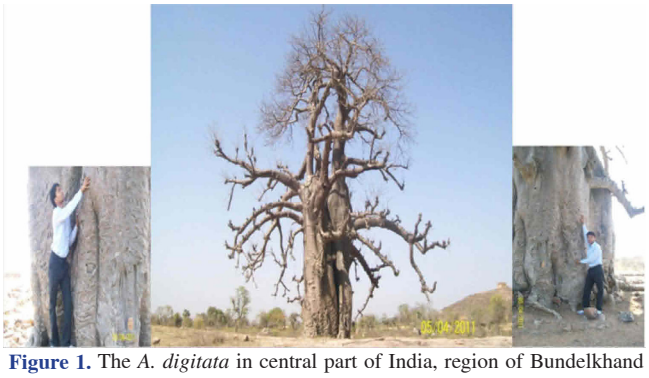

Figure 1. The *A. digitata* in central part of India, region of Bundelkhand (Orchha, Madhya Pradesh, India).

3. Taxonomic description and habitat

Kingdom: Plantae; Phylum: Tracheophyta; Class: Magnoliopsida; Order: Malvales; Family: Malvaceae; Genus: *Adansonia*; Species: *digitata*; Botanical name: *A. digitata*; English name: Baobab[17]. Synonyms: *Adansonia bahobab* L. (synonym), *Adansonia baobab* Gaert. (synonym), *A. digitata* var. congolensis A. Chev. (synonym), *Adansonia somalensis* Chiov. (synonym), *Adansonia sphaerocarpa* A. Chevall. (synonym), *Adansonia sulcata* A. Chevalier (synonym), *Baobabus digitata* Kuntze (synonym)[18].

A. digitata is a massive deciduous tree, up to 20-30 m tall with a diameter up to 2-10 m at adult age. The trunk is often of vast girth. The bark is smooth, reddish brown to grey, soft and possesses longitudinal fibers. *A. digitata* is highly branched. *A. digitata* produces an extensive lateral root system until 50 m from the trunk. The roots tips are often in the form of tubers. But the main roots of old trees are relatively shallow and rarely extend beyond 2 m depth. Therefore they are very sensitive to strong winds and can be uprooted by storm[19]. Leaves of young trees are usually simple. Adult trees begin each season by producing simple leaves followed by 2-3-leaflets leaves; mature leaves (20 cm diameter with about 5 to 9 leaflets) appear later. The inflorescence of baobabs consists of a single flower, situated in the axils of leaves near the tips of reproductive branches. The flowers are white, large, pendulous, solitary or paired in the leaf axils, showy[20]. Flowering begins about the end of dry season or just before the first rains; often when the first leaves appear. The flowers open in late afternoon and fall the next day at dawn. The flowers emit a sulfur fragrance that attracts particularly the bats which play the role of pollinators[18].

The history of known references to African baobab is well documented[2]. The binomial name of *A. digitata* was given by Linnaeus, the generic name honouring Michel Adanson who had been to Senegal in the eighteenth century to describe baobab[21]. Taxonomic details of *A. digitata* are shown in Table 1 and explanation is given below.

The African baobab is named a very large number of local names. A selection of important ones is shown in Table 2.

Table 1
Nomenclature of *Adansonia* species (after Baum, 1995)[2].

Genus	Species	Synonyms	Area	References
Adansonia	*A. digitata* L.	*Adansonia baobab* L. (1763), *Adansonia baobab* Gaertn. (1791), *Adansonia sphaerocarpa* A. Chev. (1901), *Adansonia sulcata* A. Chev. (1906), *Adansonia digitata* var. *congolensis* A. Chev. (1906)	Widespread in Africa	[42]
Brevitubae Hochreutiner	*Adansonia grandidieri* Baill.		Restricted to Madagascar	[43]
	Adansonia suarezansis H. Perrier		Restricted to Madagascar	[44]
	Adansonia gibbosa (A. Cunn.) Guymer ex D. Baum	*Adansonia gregori* Mueller (1857), *Adansonia rupestris* W. Saville-Kent (1897), *Adansonia stanburyana* Hochreutiner (1908)	Restricted to NW Australia	
Longitubae Hochreutiner	*Adansonia rubrostipa* Jum. & H. Perrier	*Adansonia fony* Baill. ex H. Perrier (1952)	Restricted to Madagascar	[45]
	Adansonia madagascarensis Baill.	*Adansonia bernieri* Baill. ex Poisson(1912)	Restricted to Madagascar	[46]
	Adansonia za Baill.	*Adansonia bozy* Jum. & H. Perrier, *Adansonia alba* Jum & H. Perrier	Restricted to Madagascar	[47]
	Adansonia perrieri Capuron		Restricted to Madagascar	[1]

Source: Sidibe and Williams (2002)[16].