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An updated review of *Adansonia digitata*: A commercially important African tree

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Abstract

Adansonia digitata L. (Malvaceae) 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. It is reported that it is an excellent anti-oxidant due to the vitamin C content which is seven to ten times higher than the vitamin C content of oranges. Baobab has numerous biological properties including antimicrobial, anti-viral, anti-oxidant and anti-inflammatory activities amongst others. Phytochemical investigation revealed the presence of flavonoids, phytosterols, amino acids, fatty acids, vitamins and minerals. The seeds are a source of significant quantities of lysine, thiamine, calcium and iron. Baobab is an important commodity which is integral to the livelihood of rural communities. In addition, the global demand for baobab raw material (*e.g.* seed oil, fruit pulp) by the food and beverage, nutraceutical and cosmetic industries has increased dramatically in recent years thereby increasing the commercial value and importance of this coveted African tree. In the past few years, there has been an increased demand for non-timber forest products (NTFPs), specifically baobab seed oil for inclusion in cosmetic formulations due to its high fatty acid composition. This review summarises the botanical aspects, ethnobotany, phytochemistry, biological properties and most importantly the nutritional value and commercial importance of baobab products.

Keywords: *Adansonia digitata*; Baobab; Biological activity; Commercialisation; Ethnobotany; Nutrition; Phytochemistry

1. Introduction

Baobab (*Adansonia digitata* L.) is a large iconic tree (Fig. 1B) indigenous to Africa where it is found in many countries. It is an emblematic, culturally important and physically majestic sub-tropical tree. The baobab has been referred to as "arbre a palabre", meaning the place in the village where the elders meet to resolve problems. In the past decade, it has attracted the interest of several pharmaceutical companies and researchers due to its various traditional uses (medicinal, nutritional and cosmetic). Recently, the European Commission authorised the import of baobab fruit pulp as a novel food (Buchmann et al., 2010) and it was approved in 2009 by the Food and Drug Administration as a food ingredient in the United States of America (Addy, 2009). Due to the high demand for commercial baobab products in EU and United States, this tree with its edible fruits needs to be conserved and treasured (Sanchez et al., 2010).

Baobab products (*e.g.* fruits, seeds, leaves, bark) contribute to the livelihood of many populations in Africa as it is a source of food, fibre and medicine (Wickens, 1982; Codjia et al., 2001; Sidibe and Williams, 2002; Chadare et al., 2009; De Caluwé et al., 2009). More than three hundred traditional uses have collectively been documented in Benin, Mali, Zimbabwe, Cameroon, the Central African Republic, Kenya, Malawi, South Africa and Senegal (Buchmann et al., 2010). Various plant parts (*e.g.* leaves, bark, fruit pulp), have traditionally been used for immuno-stimulant, anti-inflammatory, analgesic, insect repellent and pesticidal properties, in the treatment of diarrhoea and dysentery in many African countries, and have been evaluated as a substitute for imported western drugs (El-Rawy et al., 1997; Ramadan et al., 1994). Some of the traditional

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Fig. 1. (A) A woman gatherer displaying *Adansonia digitata* fruits; (B) The *Adansonia digitata* tree; (C) *Adansonia digitata* fruit and seeds. Photographs courtesy of PhytoTrade Africa.

medicinal uses of baobab are presented in Table 1. Baobab products (*e.g.* seed oil, fruit pulp) are increasingly being commercialised and exported around the world leading to increased pressure on this resource (Sidibe and Williams, 2002). In this review, available data on the nutritional value, phytochemistry, biological activities of different plant parts (*e.g.* fruit pulp, seed oil), plant biology, ethnobotany as well as commercial aspects of baobab are presented.

2. Botanical aspects

2.1. Origin of the name of the plant

The origin of the vernacular name "baobab" is uncertain. However, most scientists believe it is derived from the Arabic name *buhibab* meaning fruit with many seeds (Diop et al., 2005). The genus name *Adansonia* is used in honour of Michel Adanson (1727–1806) who brought seeds to Paris in 1754 and who was the first person to provide a comprehensive description accompanied by a drawing of the plant (Esterhuyse et al., 2001) after a trip to West Africa (Senegal). The species name *digitata* (hand-like) was selected in reference to the shape of the leaves. Several names are used to describe the baobab depending on its geographical location and include "magic tree", "chemist tree", "symbol of the earth", "upside-down tree" and "monkey bread of Africa" amongst numerous others (Wickens, 1982; Diop et al., 2005; Vermaak et al., 2011).

2.2. Botanical description, habitat and distribution in Africa

The baobab is found in many African countries. Eight baobab species have been identified globally and six species found on the island of Madagascar are endemic to that region (Wickens and Lowe, 2008). It is postulated that the centre of evolutionary origin of the genus *Adansonia* is Madagascar (Drake, 2006). The African species *A. digitata* is indigenous to, and widely distributed throughout the savannas and savanna woodlands of sub-Saharan Africa (Wickens and Lowe, 2008). The only species which is not endemic to the African continent is *A. gibbosa* (A.Cunn.) Guymer ex D.A.Baum native to Australia (Drake, 2006; Wickens and Lowe, 2008). In southern Africa, *A. digitata* is commonly found in Malawi, Zimbabwe, Mozambique and South Africa especially in the warm parts of the Limpopo Province, while in West Africa, it is found in Mali, Benin, Senegal, the Ivory Coast, Cameroon and Burkina Faso. In East Africa, the plant is found in countries such as Kenya, Uganda and Tanzania (Watt and Breyer-Brandwijk, 1962; Adesanya et al., 1988; UNCTAD, 2005; Lamien-Meda et al., 2008).

The baobab is a massive deciduous tree easily distinguishable by its huge trunk. It is regarded as the largest succulent