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***Kigelia africana* (Lam.) Benth.: A review of taxonomic description and Traditional knowledge**

Kanchan Vishwakarma*, Sunidhita, Prasanna Rawat and Chandra Pratap Sengar

Horticulture cell, Indian Institute of Management, Indore, Madhya Pradesh, India

*Email-Id: ms.kanchan14@rediffmail.com

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Abstract

Kigelia africana (Lam.) Benth., native to Africa, is a medicinal plant with several considerable potentials and attributes. An intensive study was done on the only *Kigelia africana* tree present inside the campus of the Indian Institute of Management, Indore, to explore its various taxonomic and medicinal characters. Several parts of the plant, such as the fruit, stem, bark, and leaf, are known to have traditional uses, which include the treatment of skin disorders, cancer, gynecological complaints, diabetes, epilepsy, ulcers, bacterial and fungal infections, etc. The current review is a compilation of the botanical studies performed on the plant parts along with the interactions made with the locals of the area and a screening of the available literature, aiming to review the taxonomic characters and traditional medicinal uses of this useful plant.

INTRODUCTION

Plants have been used in traditional medicine for several thousand years, and despite recent scientific advancement and globalisation, the system of traditional medicine is considered a primary health care modality in resource-constrained health care settings. The knowledge of

medicinal plants has been accumulated over many centuries based on different medicinal systems such as Ayurveda, Unani, and Siddha. India has about 45,000 plant species, among which several thousand are known to possess medicinal properties (Taur and Patil 2011). *Kigelia africana* is one such medicinally important plant whose properties are highlighted in this review. This highly variable, monospecific genus belongs to the family Bignoniaceae. It is endemic to Africa, growing over a wide region that extends from Senegal to Ethiopia to the northern parts of South Africa (Houghton 2002). *K. africana* is commonly referred to as the sausage or cucumber tree, due to its huge sausage- or cucumber-like fruit (Mann et al. 2003). In India, it is called 'Balmkheera' in Hindi. The generic name *Kigelia* is derived from the Mozambican name for sausage tree, "kigeli-keia", and the species name is "africana" because *Kigelia africana* is native to Africa (Dinesh et al. 2017). The various synonyms of *K. africana* are listed. The plant has been introduced to some countries in Southeast Asia, like India, Pakistan, China, and Iraq, where it is primarily cultivated as an ornamental tree (Guidigan 2018). In India, it is distributed all over the country but abundantly occurs in West Bengal (Saini et al. 2009). The tree is said to have been distributed in the sub-continent by the seeds obtained from a single fruit that was washed ashore in Bombay. In Central India, specifically Madhya Pradesh, *Kigelia* is known to be growing in moist and semi-moist zones covering Jabalpur, Guna, Indore, etc. (Species for plantations in Madhya Pradesh 1997). Talking about the plant's ecology, it especially grows well in wetter areas, spreading across riverine areas and the wet savannah (Saini et al. 2009). A review of the literature and indigenous knowledge of local people revealed that the various parts of the plant, such as the fruit, stem, bark, and leaf, are known to have traditional medicinal uses, which include the treatment of skin disorders, cancer, gynaecological diseases, diabetes, epilepsy, ulcers, bacterial and fungal infections, etc. *K. africana* is one of those tree species that have been heavily exploited for their medicinal, ornamental, religious, and cultural values (Grace et al. 2002). The present paper gives an account of *Kigelia africana*, focusing on its taxonomic characters and traditional medicinal uses.

STUDY AREA

The Indian Institute of Management Indore (often abbreviated as IIM-I) is an autonomous public business school located in Indore, Madhya Pradesh, India. The Coordinates are 22.624123°N 75.795579°E, with an area of 193 acres (0.8 km²). Situated atop a scenic hillock, the lush green campus is prominent for its rich biodiversity and is home to more than 300 different plant species, ranging from medicinal, decorative, flowering, vegetable, fruit,

wild, alien, and invasive types. While surveying the flora of the IIM Indore campus, the authors come across a unique plant, *Kigelia Africana*, which witnesses prodigious medicinal importance.

METHODOLOGY

The present work is an outcome of a study carried out by the authors on *Kigelia africana* trees present inside the campus of the Indian Institute of Management Indore. A flora survey of the whole campus was carried out in 2022. Plant specimens of *Kigelia africana* were collected, and the plant was botanically identified with the help of flora (Hooker 1885; Kirtikar and Basu 2012; Roy et al. 1992). Transverse and longitudinal sections of fruit and seeds were cut to study the details. To discover the traditional medicinal values of the plant, interactions with the locals of the campus, including gardeners and security guards, were made, supplemented by an intense analysis of the available literature.

Scientific Classification (Fredrick et al. 2014)

Kingdom: Plantae (Plants)

Class: Magnoliopsida (Dicotyledons)

Sub-kingdom: Tracheobionta (Vascular plants)

Subclass: Asteridae

Super-division: Spermatophyta (Flowering plants)

Order: Scrophulariales

Division: Magnoliophyta (Flowering plants)

Family: Bignoniaceae (Trumpet-creeper family)

Genus: *Kigelia* DC (Sausage tree)

Species: *Kigelia Africana* (Lam.) Benth (Sausage tree)

Synonyms (Jackson and Beckett 2012)

Bignonia africana, *K. abyssinica*, *K. acutifolia*, *K. aethiopum*, *K. africana*, *K. ellioti*, *K. elliptica*, *K. impressa* and *K. spragueana*

BOTANICAL DESCRIPTION

It is a tree that grows up to 20 metres tall or more. The bark is grey and smooth at first, peeling on older trees. It can be as thick as 6 mm on a 15-cm branch. The wood is pale brown or yellowish, undifferentiated, and not prone to cracking (Roodt 1992). The tree is evergreen where rainfall occurs throughout the year but deciduous where there is a long dry season (Gabriel and Olubunmi 2009). The leaves are large, about 7–12 cm in length and 4–6cm in width, imparipinnate, with leaflets ranging from 6–10, oblong–ovate, coriaceous, obtuse, and crowded near the ends of the branches in an opposite manner. The flowers are large, showy,

somewhat cup-shaped, scarlet, or deep maroon-coloured, with a foetid smell, arising on 0.8–1.5 cm long racemes at the ends of rope-like long flowering stems about 1.0–2.3 m long from the base of the branch. The flowers borne in clusters are usually clusters of three, out of which only one or two flowers open at a time. They bloom at night and fall before noon (Chand et al. 2017). The calyx is bell-shaped and 3-5 lobed, and the sepals are 4 in number and fused (length 3.6 cm and width 1.8 cm) (Chand et al. 2017). Corolla tubular-ventricose mouth: 2-lipped, 5-lobed, bilabiate (Hooker 1885) Petals are a deep, velvety red with yellow veining on the outside (Dhungana et al. 2016). Stamens 4, didynamous, and rudiments of the fifth are often present, inserted at the point where the corolla tube is suddenly swollen, and anthers are 2-celled. Ovary subsessile, ovules numerous, style long, stigma with 2 elliptic lobes (Kirtikar and Basu 2012). The fruits are large grey-green "sausages" about 30–60 cm long, which hang on stalks from the tree. Fresh fruit is poisonous and strongly purgative; for safety reasons, fruits are best prepared for consumption by drying, roasting, and fermentation. Each fruit weighs between 5 and 10 kg (Oyeku et al. 2011). The sausage tree is fast-growing and can mature in 4 to 5 years. It begins to flower at the age of 6 years. Mature fruits can be found on trees throughout the year (Jackson and Beckett 2012). Details are given in Plate 1.

TRADITIONAL USES

Traditional medicine plays a very significant role in indigenous health care systems for humans, especially in developing countries where access to allopathic medicines and practitioners is limited. Throughout Africa, communities have relied on traditional medicine for centuries because it is easy to access, culturally appropriate, and considered safe. The practice of traditional medicine includes explicit practices that exploit materials from plants, animals, and inorganic materials (*e.g.*, soils) and implied methods that include libations to spirits (Nabatanzi et al. 2020). The Bignoniaceae family is noted for the occurrence of iridoids, naphthoquinones, flavonoids, terpenes, tannins, steroids, saponins, and caffeic acid in fruits, stems, leaves, and roots (Asekun et al. 2007). The crude extracts of all family members of Biognoniaceae show antifungal activity, hepatoprotective, anti-plasmodial, antioxidant, anticancer, and antitumor activity, etc. (Choudhury et al. 2011). *Kigelia africana* has been used in the management of human ailments since time immemorial (Nabatanzi et al. 2020). Various parts of the plant, such as the fruit, stem, bark, and leaf, are known to have traditional uses, which include the treatment of skin disorders, cancer, gynecological complaints, diabetes, epilepsy, ulcers, bacterial and fungal infections, etc.

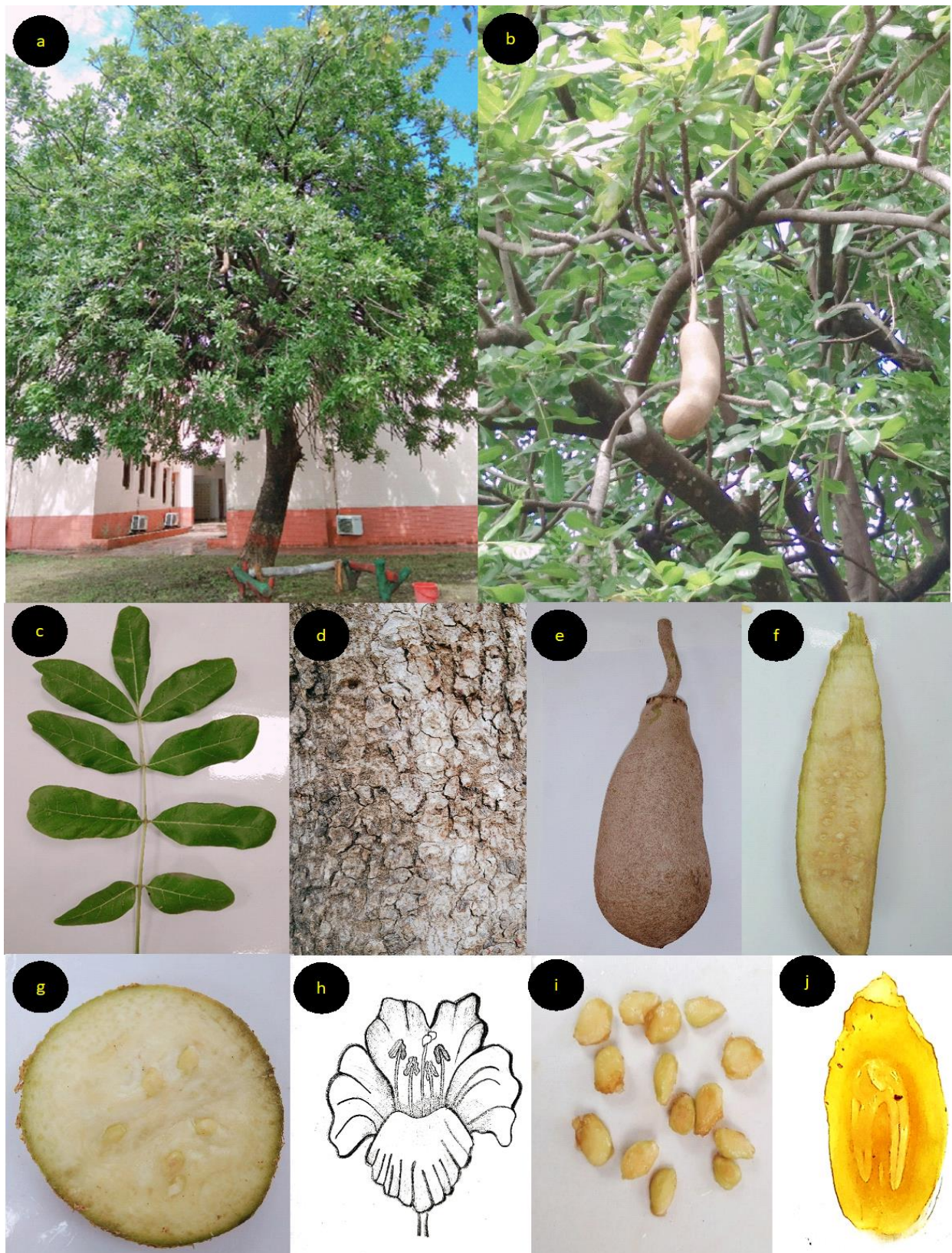


Plate 1: Morphology of *Kigelia Africana*, a) Whole tree, b) Fruit in wild, c) Leaves, d) Bark, e) Fruit, f) L.S. of fruit, g) T.S. of fruit, h) illustration of Flower, i) Seeds, j) T.S. of Seed

Table 1: Medicinal uses and mode of applications of *K. africana*

Plant part used	Ailment	Mode of application	Source(s)
Leaves	Worm infestation, Postpartum hemorrhage, Malaria, Diabetes and Aching	Leaves are boiled and utilized for the treatment of worm infestation, postpartum hemorrhage, malaria, diabetes, pneumonia, and aching.	Gill (1992)
	Stomach ulcers and Jaundice	Hot infusions of the leaves are used for stomach ulcers and jaundice.	Bello et al. (2016)
	Backache	A poultice made from leaves is used as a treatment for backache.	Jackson (1995), Jackson et al. (1996), Saini et al. (2009)
	Rheumatoid arthritis and Dermal infections.	The leaf extract is used traditionally for treating rheumatoid arthritis and dermal infections.	Lanalice et al. (2016)
Root and bark	Respiratory disorders	An infusion or powder of the root and bark is administered to treat respiratory disorders.	Pooley (1993)
Fruit	Hemorrhoids and Rheumatism	The unripe fruit is employed as an anthelmintic and for the treatment of hemorrhoids and rheumatism.	Irvine (1961)
	Solar keratosis (a pre-cursor to skin cancer) and Malignant melanoma	Crude creams of the fruit extract are used.	Jackson et al. (1996), Houghton et al. (1994)
	Constipation or Hemorrhoids	Remedies containing the fruits of <i>Kigelia africana</i> and Capsicum or <i>Anthocleista</i> are taken internally to relieve constipation or hemorrhoids.	Grace and Davis (2002)

	Gynecological problems	An aphrodisiac or an antidote prepared from the fruit is used to treat gynecological problems.	Oyelami et al. (2012)
Root	Pneumonia	Infusion from the roots and bark is taken to treat pneumonia.	Watt and Brandwijk (1962)
Bark	Wounds healing, Abscesses and Ulcers	<i>Kigelia pinnata</i> bark extract used in wound healing activity. The powdered mature fruits are applied as a dressing.	Sharma et al. (2010), Jackson, (1995); Jackson et al. (1996); Saini et al. (2009)
	Syphilis and Gonorrhoea	Stem bark extracts are used as a remedy for syphilis and gonorrhoea.	Houghton (2002)
Bark and fruit	Stomach problem in children	An infusion made from ground bark and fruit is taken.	Watt and Brandwijk (1962)
Fruits, Stems, Leaves, Twigs or Bark	Snake bite	Snake bite antidotes are made with an infusion of the fruits, stems, leaves, twigs, or bark, taken orally, or rubbed onto the bite.	Grace and Davis (2002)
	Flesh wounds and Open sores.	Powders and infusions of the bark, leaves, stems, twigs, or fruits are used to clean and dress flesh wounds and open sores.	Grace and Davis (2002)
Seed	Fungal infections, Eczema, and Waist pain	The seeds are either roasted then eaten, or they are crushed and used as ointments to treat fungal infections, eczema, and waist pain.	Bello et al. (2016)

The various traditional uses of the plant parts of *K. africana* in different ailments, including the mode of application, are compiled in [Table 1](#).

CONCLUSION

Trees are very important for human beings. They provide food, medicine, life stuffs along with have ecological and economic values. The present study highlights the importance of *Kigelia africana*. The study concludes that it has medicinal values and used as traditional therapeutic agent.

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