Parkia biglobosa-a Tree of Food and Medicinal Values: Domesticate Them or Disappear

Aisha Idris Ali
Department of Food Science and Technology, Aliko Dangote University of Science and Technology Wudil

Corresponding author: aishaidrisali@gmail.com Tel: 08027545409

Abstract

Parkia biglobosa (African locust bean) is a culturally and nutritionally important tree species in West African agroforestry systems. Its fermented seeds (*soumbala*, *dawadawa*, *iru*) constitute a cornerstone protein condiment, while its pulp, bark, leaves, and pods provide food and traditional medicine. Despite its significance, *P. biglobosa* faces threats from land-use change, overexploitation, fire, grazing, and climate stress. Natural regeneration is poor, and domestication efforts remain limited, raising concern over its long-term survival. This review synthesizes current evidence on ethnobotany, nutritional composition, phytochemistry, pharmacology, ecology, and socio-economic importance. It also evaluates threats and outlines domestication pathways to secure both conservation and sustainable utilization. We argue that domestication, through farmer-led selection, propagation, pollinator-smart orchard management, and gender-equitable value-chain upgrading, offers the most viable strategy for future resilience. Without deliberate intervention, *P. biglobosa* risks gradual decline in populations and erosion of cultural heritage. With coordinated action, it can remain a pillar for food security, health, and livelihoods in West Africa.

Keywords: *Parkia biglobosa*, African locust bean, nutrition, ethnopharmacology, domestication, agroforestry, food security, conservation.

Introduction

Parkia biglobosa (Jacq.) R. Br. ex G. Don, also called the African locust bean tree, is widely distributed across the Sudano–Sahelian region (Teklehaimanot, 2004). It is co-managed with Vitellaria paradoxa in agroforestry parklands, where its products provide essential food, income, and ecosystem services (Bayala et al., 2003). Seeds are fermented into protein-rich condiments (soumbala, iru, dawadawa) (Termote et al., 2022). The pulp serves as a sweetener and energy source (Termote et al., 2022). Leaves, bark, and pods are integral to traditional medicine (Komolafe et al., 2014). However, pressures from agriculture, deforestation, and climate change threaten its survival (Plečková et al., 2024). This review synthesizes knowledge on the nutritional and medicinal values of *P. biglobosa*, evaluates challenges, and discusses domestication as a pathway for conservation and sustainable use.

Ethnobotany and Food Uses of *P. biglobosa*

P. biglobosa seeds are fermented into high-protein condiments (soumbala, iru, *dawadawa*) (Termote et al., 2022). Pulp is consumed fresh or processed into beverages (Termote et al., 2022). Foliage and pods are used as livestock feed (Teklehaimanot, 2004). Flowers are important nectar source for honey production (Jensen et al., 2017). Women play central roles in processing and marketing (Price et al., 2015).

Nutritional Composition

Table 1. Nutritional profile of *P. biglobosa* products (per 100 g dry weight)

Product	Protein	Lipids	Carbohydrates	Key Micronutrients	Notes
Raw seeds	30–35%	20–25%	30–40%	Iron, calcium, zinc	Presence of antinutrients (Samtiya et al., 2020)
Fermented seeds	35–40%	20–30%	20–25%	Bioactive peptides, improved digestibility	Fermentation reduces antinutrients (Price et al., 2015)
Pulp	5–10%	1–3%	70–80%	Vitamin C, carotenoids	Energy-rich, sweet flavor (Termote et al., 2022)

Phytochemistry and Pharmacology

Reported phytochemicals include tannins, saponins, flavonoids, alkaloids, triterpenoids, and polysaccharides (Komolafe et al., 2014). Pharmacological studies suggest antimicrobial, anti-inflammatory, antihypertensive, antidiabetic, and neuroprotective properties (Komolafe et al., 2014). However, most evidence derives from *in vitro* or rodent models, often at high doses, with limited clinical validation.

Table 2. Pharmacological properties of P. biglobosa extracts

Extract/Compound	Reported Activity	Model	Evidence Strength	Reference
Seed protein hydrolysates	Antihypertensive (ACE inhibition)	*In vitro*, rodent	Moderate	Komolafe et al., 2014
Bark extract	Antimicrobial, anti-inflammatory	*In vitro*, animal	Preliminary	Komolafe et al., 2014
Leaf extract	Antidiabetic (glucose lowering)	Rodent	Preliminary	Komolafe et al., 2014
Pulp extract	Antioxidant	*In vitro*	Moderate	Termote et al., 2022

Ecology and Threats

P. biglobosa is an outcrossing species reliant on bats and bees for pollination (Tinguely et al., 2012; Jensen et al., 2017). Natural regeneration is poor due to grazing, fire, and seed predation (Ræbild et al., 2012). Land conversion for agriculture and charcoal production further exacerbates population decline (Houndonougbo et al., 2020). Climate change is projected to shift its suitable ranges southward (Plečková et al., 2024). Pollinator declines due to habitat loss and pesticide exposure also threaten productivity (Jensen et al., 2017).

Table 3. Threats vs. Consequences for *P. biglobosa*

Threat	**Consequence**	**Reference**
Land-use change	Loss of habitat and mature trees	Houndonougbo et al., 2020
Overexploitation (bark, seeds)	Reduced regeneration capacity	Komolafe et al., 2014
Fire & grazing	High seedling mortality	Ræbild et al., 2012
Climate change	Range shifts, reduced productivity	Plečková et al., 2024
Pollinator decline	Lower pod and seed set	Jensen et al., 2017

Domestication Pathways

Domestication strategies include seed pre-treatment (scarification, hot water, acid) (Vinceti et al., 2013), vegetative propagation (grafting, cuttings), and breeding for traits such as seed size, ease of dehulling, fermentation quality, and drought tolerance (Teklehaimanot, 2004). Pollinator-smart orchards supporting bats and bees enhance productivity (Jensen et al., 2017). Seed systems with decentralized nurseries and quality control are essential (Houndonougbo et al., 2020).

Socio-Economic Importance and Gender

Women dominate processing and marketing but face challenges of land tenure, finance, and equipment (Price et al., 2015). Domestication and value-chain upgrading (e.g., mechanized dehullers, improved fermentation, shelf-stable condiments) should prioritize gender equity for maximum livelihood impact (Termote et al., 2022).

Policy and Governance

Policy interventions should secure tenure for women and smallholders (Houndonougbo et al., 2020), incentivize pollinator conservation (Jensen et al., 2017), and integrate P. biglobosa into climate adaptation and restoration programs (Plečková et al., 2024). Establishing food safety and quality standards for fermented products is also crucial (Price et al., 2015).

Conclusion

Parkia biglobosa embodies the dual role of food and medicine in West Africa. Without proactive domestication, populations will continue to decline under ecological and socio-economic pressures. With coordinated farmer-led domestication, pollinator conservation, and equitable value-chain development, *P. biglobosa* can remain central to nutrition, health, and livelihoods. Domestication is not optional it is essential for survival.

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