

Conservation Status of *Vitellaria paradoxa*, *Parkia biglobosa* and *Daniellia oliveri* in Ilorin Environ Kwara State Nigeria

A.A. AbdulRahaman, F.A. Oladele and A.O. Babalola
Department of Plant Biology, University of Ilorin, Ilorin, Nigeria

Corresponding Author:

A.A. AbdulRahaman,
Department of Plant Biology,
University of Ilorin, Ilorin, Nigeria

ABSTRACT

In a survey which was conducted about a decade ago on tree species used as sources of fuelwood in Ilorin environ, *Vitellaria paradoxa* C. F Gaerten and *Parkia biglobosa* (Jacq.) Benth. stood out as the most preferred species for domestic cooking and baking of bread. In the present study, the conservation status of these 2 species was determined along with that of *Daniellia oliveri* (Rolfe) Hutch. And Dalz., which is not a popular choice for use as firewood. The frequency of *V. paradoxa* dropped from 62% in 1989-40% in 2011. That of *Parkia biglobosa* dropped from 88-60%, while the frequency of *D. oliveri* rose from 62-70%. *V. paradoxa*, therefore, appears to be vulnerable or threatened while *P. biglobosa* is near threatened. The frequency of *D. oliveri* rose from 62-70% hence the status is of least concern. The data obtained on the tree height, trunk diameter and crown diameter agreed with these conclusions on anthropogenic impact on these species. There were relatively few tall trees, with very wide trunks and crowns in *V. paradoxa* and *P. biglobosa*, while *D. oliveri* had fairly many more tall trees with wide trunks and crowns.

Key words: Conservation status, *Vitellaria paradoxa*, *Parkia biglobosa*, *Daniellia oliveri*, Ilorin

INTRODUCTION

Many African people depends on the forest resources for their food, energy and other socio-economic needs (Kristen and Lykke, 2003; Vodouche, Coulibay, Greene and Sinsin, 2009). Among these uses, fuelwood consumption has the potential of causing deforestation. The situation could be worsened if the affected plants are economic trees such as *Vitellaria paradoxa*, a source of sheabutter and *Parkia biglobosa*, a source of food spice or condiment called African locust bean. Oladele and Yisa (1989), Oladele (2002), AbdulRahaman, Fajemiroye and Oladele (2006) found that these 2 species are usually preferred in Ilorin environ as sources of firewood for cooking of food and baking of bread. This is a clear case of conflicting interests, having the potential to cause both economic and environmental problems. Few trees as a result of deforestation can lead to economic losses, global warming and climate change.

Natural resources occur naturally within environments that are relatively undisturbed by mankind. A natural resource often consists of various amounts of biodiversity and geodiversity existent in the ecosystems. Many of these resources (forest inclusive) are essential for our survival while others are for satisfying our wants. Meanwhile, human being has affected plants in many ways in the past centuries. The increasing pace of man's technology and

development, for instance translates into drastic impacts on the environment. There are many threats to the natural resources, which include habitat loss, degradation, invasive aliens, over-exploitation of resources and species extinction.

To appreciate the rate at which resources have been depleted, the World Conservation Union (WCU) formerly known as International Union for the Conservation of Nature (IUCN) Red List of Threatened Species has put forward conservation status listing and ranking system. The system divides threatened species into three categories: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). This system serves as a guide in categorizing species in relation to the level of their being threatened. Majority of tree species (especially *V. paradoxa* and *P. biglobosa*) in the forests can be categorized into one of these rankings. To prevent this problem, there must be some conservative measures to be put in place. This will become imperative because conservation of natural resources (i.e. the wise use of the earth's resources by humanity) is one of the ways by which planet earth can be saved from further deterioration.

Against this backdrop, the present study was conducted as a follow-up study to elucidate the current conservation status of these 2 species, with a view to highlight the possible need to apply measures to conserve them.

MATERIALS AND METHODS

Study materials: Three savanna species namely *Vitellaria paradoxa*, *Parkia biglobosa* and *Daniellia oliveri* were studied in 5 different locations namely near ARMTI (Agricultural and Rural Management Training Institute), Ajase-Ipo Road; near KWASU (Kwara State University), Malete; near Kwara State Polytechnics; Afon village and near Tanke all in Ilorin environ of Kwara State, Nigeria.

Frequency of tree species: The frequency of each tree species was determined based on 250 plots of 10×10 m, using the formula:

$$\frac{x}{y} \times 100$$

Where:

x = The occurrence of each tree species in the plots

y = Total occurrences of all tree species (Bennett and Humphries, 1974)

Frequencies of tree height, trunk diameter and crown diameter: The tree height, trunk diameter and crown diameter were determined using altimeter and metre rule respectively. The range of values were divided into 2 or 3 size classes and their frequencies were determined using the formula $x/y \times 100$ (Bennett and Humphries 1974).

RESULTS AND DISCUSSION

Survey of 5 different locations in Ilorin environ of Kwara state, Nigeria in 2011 revealed the rate at which two of the three plant species namely *Parkia biglobosa* (African locust bean tree), *Vitellaria paradoxa* (sheanut tree) and *Daniellia oliveri* (African copaiba balsam tree or West African gum copal) studied in this work are facing extinction threats. *V. paradoxa* and *P. biglobosa* are more prone to exploitation and threats than *D. oliveri*. These are indigenous tree species that are economically and socially important for local people in sub-Saharan Africa. Farmers deliberately maintain these trees on farms mainly for their fruits and nuts. The kernels of *V. paradoxa* yield shea butter, which is rich in fatty acids, is also used locally for food and internationally in chocolate, pharmaceutical and cosmetic products. *P. biglobosa* seeds are processed into a nutritious spice or condiment, *soumbala* or *dawadawa*, which is added to soups and stews throughout the savanna regions of sub-Saharan Africa. The tree is also important in improving soil fertility and in traditional medicine (Oladele and Yisa, 1989; Sabiiti and Cobbina, 1992; Lovett and Haq, 2000a and b; Oladele, 2002; Teklehaimanot, 2004; AbdulRahaman *et al.*, 2006).

Table 1: Frequencies of three savanna tree species and their conservation status

Year of study	Species		
	<i>Vitellaria paradoxa</i>	<i>Parkia biglobosa</i>	<i>Daniellia oliveri</i>
1989	62a	88a	62b
2011	40b	60b	70a
Conservation Status	Vulnerable or threatened	Near threatened	Least concern

Means with same letter(s) are not significantly different at $p < 0.05$, Key: Frequency (%) 10 or less : Critically endangered (CR), Frequency (%) 11-50: Vulnerable (VU) or threatened (T), Frequency (%) 51- 60: Near threatened (NT), Frequency (%) 61-100: Least concern (LC)

Table 2: Frequencies of tree height, trunk diameter and crown diameter in three savanna tree species

Size-classes	Species		
	<i>Vitellaria paradoxa</i>	<i>Parkia biglobosa</i>	<i>Daniellia oliveri</i>
Tree height (m)			
a. 5.0-10.0	24	26	24
b. 10.1-15.0	31	32	23
c. 15.1-20.0	45	42	53
Diameter at breast height (cm)			
a. 20.0-40.0	25	39	15
b. 40.1-60.0	49	41	50
c. 60.1- 80.0	26	20	35
Crown diameter (m)			
a. 5.0-10.0	60	53	35
b. 10.1-15.0	40	47	65

The frequency of *V. paradoxa* was found to drop from 62% in 1989-40% in 2011, while the frequency of *P. biglobosa* dropped from 88- 60% (Table 1). This suggests that human or anthropogenic activities with respect to fuelwood sourcing and possibly the recent upsurge in charcoal production may be having adverse impact on the species. Based on the World Conservation Union (WCU) criteria, *V. paradoxa* may be regarded as being vulnerable or threatened, while *P. biglobosa* is near threatened (Table 1).

The data on the frequencies of tree heights, trunk diameter and crown diameter showed that there are relatively few tall trees with very wide trunks and crowns in these two species (Table 2). There is thus a need to apply some conservation measures e.g. establishment of tree plantation, introduction of the species in agroforestry practice and their protection from indiscriminate exploitation. Despite their important uses, the populations of both species (i.e. *V. paradoxa* and *P. biglobosa*) are in decline and they remain semi- or undomesticated. Oladele (2002) noted the fact that *V. paradoxa* and *P. biglobosa* are economic trees, which are usually spared during land clearing for agricultural purposes, it however, appears that the cultural practice of using firewood for cooking and baking of bread does not spare them. Exploitation rate of these tree species has no boundary, it cut across both protected and unprotected forests.

Recent studies had shown that *V. paradoxa* and *P. biglobosa* are genetically diverse, thus there is the potential for domestication through selection and breeding (Sabiiti and Cobbina, 1992; Lovett and Haq, 2000a, 2000b and Teklehaimanot, 2004). They may also benefit from consistently protective measures, as discussed by Pare, Tigabu, Savadogo, Oden and Quadba (2010) with respect to Sudanian dry forest trees in Burkina Faso.

Worthy of note is the observations that *D. oliveri* is not among the most valued plant species for exploitation as firewood. Thus the frequency of *D. oliveri*, however, rose from 62% in 1989 to 70% in 2011, indicating its conservation status is of least concern (Table 1). The data on the frequencies of tree heights, trunk diameter and crown diameter supported its widespread use as timber species especially in riparian forest locations. It is not a popular choice for firewood possibly because of the noticeably high smoke production and poor charcoal formation.

Among factors for monitoring conservation status of tree species are parameters which include tree height, trunk diameter especially at breast height, crown diameter and frequency of species (Table 1-6). From the survey conducted in 5 different locations in Ilorin environ of Kwara State, Nigeria, there were relatively few trees, with very wide trunks

and crowns in *V. paradoxa*, followed by *P. biglobosa*; some species of *D. oliveri* have wide trunk and large crown. These size-classes are indices reflecting the conservation status of the above tree species and it can be interpreted that *V. paradoxa*, *P. biglobosa* and *D. oliveri* are vulnerable or threatened, near threatened and less concern respectively. In conclusion, we advocate for establishment of plantations of these 2 species, integration of these species into the farming system, protection measures such as regulations of indiscriminate tree cutting, establishment of National Parks and Forest Reserves and establishment of biodiversity centres in some centres of origins.

REFERENCES

- Abdulrahman, A. A., Fajemiroye, O. J. and Oladele, F. A. (2006). Ethnobotanical study of economic trees: uses of trees as timbers and fuelwoods in Ilorin-Emirate of Kwara State, Nigeria. *Ethnobotanical leaflets*, 10: 113-120.
- Bennett, D. P. and Humphries, D. A. (1974). Introduction to Field Biology. 2nd ed. Edward Arnold, London. pp. 43-70.
- Kristensen, M. and Lykke, A. M. (2003). Informant-based valuation of use and conservation preferences of savanna trees in Burkina Faso. *Economic Botany*, 57(2): 203-217.
- Lovett, P. N. and Haq, N. (2000a). Evidence for anthropic selection of the Sheanut tree (*Vitellaria paradoxa*). *Agroforestry Systems*, 48(3): 273-288, DOI: 10.1023/A:1006379217851
- Lovett, P. N. and Haq, N. (2000b). Diversity of the Sheanut tree (*Vitellaria paradoxa* C.F. Gaertn.) in Ghana. *Genetic Resources and Crop Evolution*, 47(3): 293-304
- Oladele, F. A. (2002). The Only One We Have. 62nd Inaugural Lecture, University of Ilorin, Ilorin. pp. 16-18.
- Oladele, F. A. and Yisa, A. B. (1989). Frequencies of dominant tree species used as sources of fuelwood in Ilorin LGA. *Bioscience Research Communications*, 1: 19-24.
- Paré, S., Tigabu, M. Savadogo P., Oden, P. C. and Ouadba, J. M. (2010). Does designation of protected areas ensure conservation of tree diversity in the Sudanian dry forest of Burkina Faso? *African Journal of Ecology*, 48(2): 347-360.
- Sabiiti, E. N. and Cobbina, J. (1992). Initial agronomic evaluation of *Parkia biglobosa* in the humid zone of Nigeria. *Agroforestry Systems*, 17(3): 271-279.
- Teklehaimanot, Z. (2004). Exploiting the potential of indigenous agroforestry trees: *Parkia biglobosa* and *Vitellaria paradoxa* in sub-Saharan Africa. *Agroforestry Systems*, 61-62(1-3): 207-220.
- Vodouhê, F. G., Coulibaly, O., Greene, C. and Sinsin, B. (2009). Estimating the local value of non-timber Forest Products to Pendjari Biosphere Reserve Dwellers in Benin. *Economic Botany*, 63(4), 397-412.