

UTILISATION OF MEDICINAL PLANTS AND ITS IMPLICATIONS FOR CONSERVATION IN OMO BIOSPHERE RESERVE, NIGERIA

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Abstract

Biosphere Reserves are *in situ* conservation areas created to demonstrate the potential for conservation of biodiversity despite the growing human activities to support development. Currently, local options for forest management and for choice of conservable species have not been fully integrated into the management of biosphere reserves. Our paper aims at identifying the role indigenous knowledge could play in the sustainable management and conservation of biosphere reserves, using Omo Biosphere Reserve, Nigeria as a case study. We thus carried out ethnobotanical studies in the reserve following standard methods. We evaluated the local importance of eight medicinal plants and documented how they are used in the reserve. The species studied were *Carpolobia lutea*, *Dioscoreophyllum cumminsii*, *Irvingia gabonensis*, *Myrianthus arboreus*, *Sphenocentrum jollyanum*, *Spondias mombin*, *Tetrapleura tetraptera* and *Xylopiya aethiopica*. Our results show that rather than exotics, there are successful indigenous medicinal species in the biosphere reserve including *Irvingia gabonensis*, *Sterculia rhinopetala* and *Tetrapleura tetraptera* that could be used to support on-going conservation programmes. These have high potential for maintaining the cultural and ecological resilience of degraded sites in the reserve. We recommend that the integration of local knowledge and practices into national and regional conservation programmes are critical in achieving the purpose for which biosphere reserves were established.

Keywords: *Indigenous knowledge, Medicinal Plants, Conservation, Omo Biosphere Reserve.*

INTRODUCTION

Tropical forests are known to be dwindling rapidly due to land use change and over-exploitation. Presently, only about 9.8% of the total Nigerian land area exists in fragmented and discontinuous units inside the forest reserves (Isichei, 1995). Research has proved that the only integrated approach to forest use and conservation is sustainable exploitation of non-timber forest products (Peters, 1994) of which medicinal plants are an integral

part. Unprocessed medicinal plants have been known to play a vital role in the health of indigenous people who depend mainly on traditional medicine (Okafor and Ham, 1999, Botha *et al.*, 2004). About 80% of the world's population depends mainly on traditional medicine for the treatment of ailments. The situation is worse in developing countries due to the combined effect of high cost and non-availability of Western medicine (Cunningham, 2001) as well as preference

by a large fraction of the society. In African countries like Ghana and South Africa, traditional medicine is considered complementary to Western medicine (Brown, 1992, Botha *et al.*, 2004.) In Nigeria, the situation is not very different and in almost all rural areas, there is the likelihood of total dependence on herbal medicine (Okafor and Ham, 1999, Adekunle, *et al.*, 2002).

The bulk of medicinal plants are usually harvested from the wild, which, together with increased pressure on habitats means that many species are now threatened (Obioh and Isichei, 2006). In many African countries, the current loss of biodiversity has caused a drastic decline in the supply of traditional medicines while the demand has increased as a result of high population (Okafor and Ham, 1999). This is the situation in Omo Biosphere Reserve, Nigeria, where the establishment of the Omo Sawmill and forest plantations in the transition zone has led to significant increase in the population of the locality. The importance of medicinal plants in providing sustainable rural livelihoods and in conserving valuable habitats and plant species cannot be over emphasised (Brown, 1992). Out of the 300 plants species of medicinal importance in western Nigeria, more than 200 are found and utilised in Omo Biosphere Reserve (Isichei, 1995). Despite the significance of medicinal plants in the locality, none of the studies that have been carried out in the reserve has ever focused primarily on the medicinal plants species. This is partly because, the primary interest of forest

managers in Nigeria have almost always been in timber species.

Omo Biosphere Reserve, which is the only biosphere reserve in Nigeria has been highly fragmented and degraded due to extensive logging, establishment of plantations, infrastructure development, cultivation and poor management. Therefore, there is a need to protect the remaining forest patches in the reserve and to preserve the indigenous knowledge of the use of the species. This requires an in-depth evaluation of the interactions between the local people and plants important to their survival in the reserve. In this paper, we present the results of ecological ethnobotany conducted in the reserve. The specific objectives were to: conduct an ethnobotanical inventory of utilized woody species in the reserve, identify indigenous species that could be incorporated into on-going plantation and other conservation programmes and assess the ethnoecological knowledge relating to the biology, ecology and utilization of eight medicinal plants commonly utilised in the reserve.

The study focused on eight medicinal species namely; *Carpolobia lutea* G. Don (Polygalaceae), *Dioscoreophyllum cumminsii* (Stapf) Diels (Menispermaceae), *Irvingia gabonensis* (Aubry-Lecombe ex O'Rorke) Baill. (Ixonanthaceae), *Myrianthus arboreus* P. Beauv. (Moraceae), *Sphenocentrum jollyanum* Pierre (Menispermaceae), *Spondias mombin* L. (Anacardiaceae), *Tetrapleura tetraptera* Taub. (Leguminosae-Mimosoideae) and *Xylopiya aethiopica* (Dunal) A. Rich. (Annonaceae). The species

were chosen because they are non-timber forest plants utilised in overlapping contexts especially as medicine, food and/or commerce in the study area. In addition, many of these species are becoming very rare and seem threatened locally (Okafor, 1993; Ola-Adams and Onyeachusim, 1993).

MATERIALS AND METHODS

The study Area

The study was carried out in Omo Forest Reserve (6°35' & 7°05' N, 4°05' & 4°40' E), which is situated in Ogun state, South-western Nigeria. In 1946, a 460 ha Strict Nature Reserve (SNR) was established by the Forestry Research Institute of Nigeria (FRIN). In 1977, United Nations Educational, Scientific and Cultural Organisation (UNESCO) upgraded the SNR to a biosphere reserve. FRIN manages the SNR and the adjoining buffer zone while the Ogun state Government controls the transition zone. There are very strict restrictions on access and use of the SNR. In the East-North-East of the reserve, there is a 4.05-hectare Walsh System experimental plot (WSP) demarcated in 1949 by FRIN. The WSP is located near Oloji farm settlement in the transition zone. It was however, abandoned by FRIN after the experiment and is therefore under lax control. With the stringent control on the SNR, extractions are now going on unchecked in the WSP and the adjacent forest patches. The study site included the Oloji enclave, the WSP and its surroundings. The human population at Oloji is predominantly male, with only a few households having women and children. Majority of the people are

farmers while a few are hunters, timber loggers or traders.

The climate of the reserve is equatorial, with mean hourly minimum and maximum temperatures in the range of 21 °C and 30.5 °C while the mean daily temperature is 26.4 °C. The Reserve receives a mean annual rainfall of more than 2000 mm whose distribution is bimodal with peaks in May/June and September/October. The period November to February is the dry season. High relative humidity of about 95% at dawn and 80-85% in the afternoon has been recorded for the reserve (Ahuama, 2004). The vegetation is mixed moist, semi-evergreen lowland rain forest in the Congolian sub-unit of the Guinea-Congolian phytochorion.

Field Inventory

Ecological Ethnobotany was carried out in the WSP at Oloji using standard ethnobotanical methods of Martin (1995). Data collection was carried out using the Participatory Rural Appraisal (PRA) technique. The survey team included the researchers, a tree identifier, a forester and 20 local guides selected from Oloji community. The local guides and all the other people interviewed were purposively chosen from the adult population in Oloji with a minimum age of 30 years. Our selection involved all sections of the society (male and females), the community healers, birth attendants, hunters, farmers and herb sellers and non-professionals such as the *baale* (community head) and his senior wife. Fieldwork for the ethnobotanical study was conducted concurrently with fieldwork for basic ecological studies. These were conducted

during the one-week per month visits between September 1999 and February 2000.

Permanent sample plots of 25 m by 25 m each and a central sub-plot of 2 m by 25 m within each main plot (used for ground flora inventory) were laid out randomly in the site. All macrophytes ≥ 2 m and < 2 m in height encountered within each main plot and sub-plot respectively were identified and enumerated. In each main plot, the girth at breast height and total height of all individual plants ≥ 2 m were measured and evaluated. Individuals encountered were grouped into the arbitrary height classes of Hawthorne (1995). Density, basal area and relative dominance of each species were evaluated. The local ecological knowledge, local names and all possible uses of each species by each field guide were elicited through interactive questioning. From these, the categories of use were established and use-values estimated. Vouchers of all scientifically unidentified species were collected, dried, and mounted following the standard methods and taken to the Forestry Herbarium, Ibadan, Nigeria for identification and deposition. Plant nomenclature followed Keay (1989) for trees/shrubs and Hutchinson and Dalziel (1954-72) for the ground flora.

Ethnobiology and Ethnoecology of Selected Medicinal Plants

The second phase of the study investigated the local knowledge of the biology, ecology and utilisation of selected medicinal plants. Each local guide was interviewed separately. Fresh voucher specimens of the target species were taken to the community

and the selected residents (one person/household) were interviewed on the biology, ecology and utilization of each specimen presented to them. Interviews were mainly open ended. Interviewees were asked if they recognized the plants, had names for them as well as the plants' medicinal uses (including preparations and dosage) and the specific uses of the plants by the interviewees themselves. Additional questions were targeted at population density, distribution, locations, habitat types, growth habits, reproductive phenology, propagation methods and demand.

RESULTS

Field Inventory

A total of 1263 individual plants were tagged in a 0.2-hectare plot. The enumeration of these provided 65 woody species distributed among 49 genera and 24 families. Three plants remained unidentified in the plot. In terms of abundance and usefulness, the most important families were Euphorbiaceae, Rubiaceae, Apocynaceae, Ebenaceae, Meliaceae and Sterculiaceae. The five most abundant species were *Sterculia rhinopetala* k. Schum., *Diospyros dendo* Welw. Ex Hiern, *Octolobus augustatus* Hutch., *Drypetes gilgiana* (Pax) Pax & K. Hoffm. and *Rinorea oblongifolia* (C. H. Wright) Marq. Ex Chipp while the most widely used woody species were *Alstonia boonei* De Wild, *Zanthoxylum xanthoxyloides* (Lam) Zepernick & Timler, *Hunteria umbellata* (K. Schum) Hallierf., *Carpolobia lutea* and *Sterculia rhinopetala*. *Celtis zenkeri* Engl., *Eribroma oblonga* (Mast.) Pierre ex A. Chev. and *Sterculia rhinopetala* were the

few utilized species that occurred in all the height classes .

More than 93% of the tagged plants in the plot had utilities. Of the utilised stock, about 29% were in the Sterculiaceae family while *Sterculia rhinopetala* alone accounted for 16%. The local guides identified and named 96% as well as described the uses of 88% of the species enumerated in the plot. Eight species namely, *Deinbollia pinnata* Schum & Thonn., *Oxyanthus formosus* Hook.f. ex Planch, *Psychotria* spp. Linn., *Salacia pallescens* Linn., *Suregada occidentalis* Hoyle, *Trichilia* spp Linn. and two unidentified species were not utilized. Out of the 60 species of ethnobotanically useful wild plants identified in the plot, 41 had multiple uses, 30 were used medicinally, 24 were used as timber and for other construction purposes, 32 were used for fuel wood while 27 species were used for other purposes like dyes, chewing sticks and for setting traps. Two species, *Alstonia boonei* and *Zanthoxylum xanthoxyloides* were culturally so important that the baale solicited for government's assistance in the conservation of the two species.

Of the 60 species whose utilities were described, only four, namely, *Bombax buonopozense* P. Beauv., *Carpolobia lutea*, *Glyphaea brevis* (Spreng) Monachino and *Monodora* spp. Dunal have edible parts. The petals of *Bombax buonopozense* are slimy and used to thicken local soup. *Carpolobia lutea* has sweet and edible

fruits. The young fruits of *Glyphaea brevis* are very slimy and tasty and were used as local soup thickener while the matured seeds of *Monodora* spp. were used locally as spice.

Ethnobiology and Ethnoecology of the Selected Medicinal Plants

The study recorded local knowledge of the biology and ecology far less than that of the utilisation of the target species. However, some reasonable information was provided on abundance, distribution, location, habitat preferences, reproductive periods and propagation methods of the species. Of the eight species of interest, only *Carpolobia lutea* and *Sphenocentrum jollyanum* were found in the plot. The local guides located the other species that were not encountered in the plot. These include: *Dioscoreophyllum cumminsii* found along footpaths, *Irvingia gabonensis* near river Omo, *Spondias mombin* in fallows, agro-forestry farms and around the enclaves while *Xylopia aethiopica* was encountered in farms. Very old and senile individuals of *Tetrapleura tetraptera* were located in the matured forest patches. Most respondents had adequate knowledge of the reproductive periods and propagation methods of the target species except those of *Dioscoreophyllum cumminsii* and *Sphenocentrum jollyanum* (Table 1). Majority of the people interviewed including the baale believed that the target species like many other utilized wild plants have been depleted in the wild due to habitat loss and over-exploitation.

Table 1. Summary of information collected on the local knowledge of the biology of species studied.

Botanical Name	Local Name/s	Growth Habit	Reproductive Periods	Propagation Methods	Demand. harvested in parenthesis.	Parts demanded/
<i>Carpolobia lutea</i>	Osunsun	Shrub	Rainy & dry seasons	Stem cutting	Low	(roots/stems/root-stem bark/leaves/twigs)
<i>Dioscoreophyllum cumminsii</i>	Omuraja	Liana	Rainy season	Seed*	Very low	(Leaves/fruits)
<i>Irvingia gabonensis</i>	Oro	Tree	Rainy & dry seasons	Seed	Very high for commerce	(roots/wood/stem bark/leaves/fruits/seeds/sap)
<i>Myrianthus arboreus</i>	Ibisere	Tree	Rainy & dry season	Seed	High	(root-stem bark/leaves)
<i>Sphenocentrum jollyanum</i>	Akerejupon	Woody herb	Rainy. & dry seasons	Seed*	Very low	(roots/stem/root-stem bark/leaves/fruit/seeds)
<i>Spondias mombin</i>	Iyeye	Tree	Any time. Rainy & dry seasons	Stem cutting	High	(root-stem bark/leaves/fruits)
<i>Tetrapleura tetraptera</i>	Aidan, Aridan	Tree	Dry season	Stem cutting & seed	High for commerce	(root-stem bark/wood/fruits/seeds)
<i>Xylopia aethiopica</i>	Eerun, Erunje	Tree	Rainy season	Seed	Very high for commerce	(fruits/seeds/wood)

*Information supplied by only the *Babalawos* (community healers).

The target species were all multipurpose medicinal plants. The species were found to be used in the treatment of malaria, yellow fever, cough, worms, rheumatism, dysentery, male impotence, dizziness, stomach ache, body pain, convulsion, skin diseases, miscarriage, gonorrhoea, diabetes and pain during labour. *Carpolobia lutea*, *Myrianthus arboreus*, *Sphenocentrum jollyanum*, *Spondias mombin* and *Tetrapleura tetraptera* treated the greatest number of ailments. All the target species have edible parts and were put to various other uses. They were sources of spices, firewood, chewing sticks, brooms, baits for game animals, local gum and were used in soap making, roofing, wrapping kola,

staking yam, and other cultural practices such as divination. The wood of *Carpolobia lutea*, *Irvingia gabonensis*, *Tetrapleura tetraptera* and *Xylopia aethiopica* was used for constructing domestic appliances either due to their hardness or high resistance to insect attack.

DISCUSSION

Field Inventory

The study recorded high woody plant diversity of about 65 species in 49 genera and 24 families in the 0.2-hectare plot. This compares well with reports from other studies on tropical semi deciduous forests. Okali and Ola-Adams (1987)

reported 50 tree species in 25 families in a 0.75-hectare plot in same site in Omo while Killeen *et al.* (1998) observed about 71 species in a 0.1-hectare plot in Bolivia. The differences observed in these reports might be attributed to differences in either size of plots or woody plants studied. *Sterculia rhinopetala* was the only abundant and multipurpose species that occurred in all height classes. This implies that the species has adapted to a wide spectrum of irradiance and is successful both biologically and ecologically in the reserve.

Local and indigenous people depend on wild natural resources to sustain their livelihood (Cunningham and Hamilton, 2002). They often claim that most plants in their locality have uses (Balick and Cox, 1996). Our results were consistent with the above facts probably because the people have subsistence-based economies which was instrumental to their settlement in the biosphere reserve. Plot enumeration showed that 93.75% of the tagged plants representing 88.24% of the species in the plot were used for various purposes. This is in agreement with many other reports found in literature. Boom (1989) surveyed a 1-hectare plot in the Bolivian Amazon forest and found that the Chacabo people of the area use approximately 95% of the individual trees amounting to 82% of the tree species for one purpose or the other. Other workers here have also reported similar observations in Nigeria (Biosphere Reserves for Conservation and Sustainable Development in Anglophone Africa (BRAAF), 1998). Indeed, wild plants provide a 'green social security' to

millions of people in the form of low-cost building materials, fuel, food supplements, herbal medicines, basketry containers for storage, processing or preparation of food crops, or as a source of income (Cunningham, 2001).

Ethnobiology and Ethnoecology of the Selected Medicinal Plants

Most respondents had adequate knowledge of the reproductive periods of the target species probably due to the fact that the species have edible fruits and people have an idea of when the fruits are usually available. The dearth of many of the target species in the plot may be attributed to the fact that they are pioneers and non-pioneer light demanders that thrive in disturbed or secondary forests. Brown (1990) confirmed that most utilized plant species in the tropics thrive in secondary forests, which were referred to as 'species refugia'. It may equally be due to the fact that their fruits are edible, thus animals and humans that feed on them act as agents of dispersal to other sites. The target species were used in the treatment of many ailments. This is in part because all the target species were medicinal and in part due to the fact that five, out of the eight target species comprising of *Myrianthus arboreus*, *Sphenocentrum jollyanum*, *Spondias mombin*, *Tetrapleura tetraptera* and *Xylopia aethiopica* were common medicinal plants identified and utilized in various recipes by almost every adult in the study area. It may equally be because the community healers and birth attendants interviewed were highly knowledgeable in both the ecology and biology of the species and described many

utilities for each of these species. Since the study site represents typical areas where Western medicines are unavailable or expensive, the treatment of ailments by herbal medicine is important and predominant (Brown, 1992; Okafor and Ham, 1999). As such, conservation programmes that integrate medicinal plant species would be most welcome by the people.

CONCLUSION

In recent years, a lot of literature has called for the incorporation of indigenous ecological knowledge in the conservation and sustainable management of tropical forests. This reiterates earlier efforts to include local communities and their institutions in participatory forest management. This is primarily because, effective conservation programmes require information on both biodiversity and resource use (Gain and Anderson, 2005). Ecological ethnobotany therefore, provides the information needed to maintain the cultural and ecological resilience of ecosystems. Indigenous forest people have first-hand experience and knowledge of the environment they exploit, including knowledge about the direct assessment of the local forest species, stocks and how they change over time, which is an expertise traditional foresters rarely have. Our study has affirmed that local people remain a critical source of valuable information on the biology, ecology and utilisation of the plant species in their locality, which could have great implications for sustainable management of biosphere reserves and conservation of their species. We have also demonstrated that many of the

abundant species in the reserve were neither the most culturally important nor the most widely used species in the reserve. Recent researches have suggested both enrichment planting and ecological restoration of the biosphere reserves. This paper has identified *Sterculia rhinopetala* as one indigenous species that could be used to enrich and restore degraded sites in Omo biosphere reserve, Nigeria. The species is recommended due to its abundance, ecological success and usefulness in the area.

Since medicinal plants are considered an integral part of rural livelihoods, it is important their sustainable supply be incorporated into conservation programmes to enhance the success of such activities. It is therefore, important that gardens or plots of medicinal plants be established in the transition zones of biosphere reserves where controlled exploitation would be permitted. There is also a strong need for training and human capacity development especially among plant harvesters which would improve their capacity to nurture and control exploitation in the plots. Conservation is strongly linked to satisfying a wide variety of people's interests, encouraging and integrating such interests into local activities are therefore important in the attainment of the goals of biosphere reserves. Dhillion *et al.* (2004) suggested that management of biosphere reserves should be open, evolving and adaptive. In Omo Biosphere reserve, indigenous species like *Alstonia boonei*, *Irvingia gabonensis*, *Sterculia rhinopetala*, *Tetrapleura tetraptera* and *Zanthoxylum*

xanthoxyloides have been identified as useful species for inclusion into plantation and/or agro-forestry programmes in the reserve. Consequently, detailed autecological and biological studies of such species involving the local people are urgent tasks that must be embarked upon, to ensure improved understanding of the pathways for conservation.

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