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Abstract- A combination of field surveys and direct observation was used to identify botanicals whose roots are extracted for anti-malaria purposes. A total of 33 botanicals were identified as having their roots being exploited for anti-malaria utilization in the study area. 14 of these species, representing 42% of the botanicals, were being cultivated while 58% were not cultivated. Most of the uncultivated species were indigenous tree species that has forest as their primary source. With the increasing deforestation, there is the need for conservation of these species. Strategies that would enhance the sustainable utilization of the species and make them available to the present and future generations were proposed.

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Roots Extractivism in Indigenous Malaria Control in Ekiti State, Nigeria

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Abstract- A combination of field surveys and direct observation was used to identify botanicals whose roots are extracted for anti-malaria purposes. A total of 33 botanicals were identified as having their roots being exploited for anti-malaria utilization in the study area. 14 of these species, representing 42% of the botanicals, were being cultivated while 58% were not cultivated. Most of the uncultivated species were indigenous tree species that has forest as their primary source. With the increasing deforestation, there is the need for conservation of these species. Strategies that would enhance the sustainable utilization of the species and make them available to the present and future generations were proposed.

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I. Introduction

Malaria is a life-threatening parasitic disease caused by *Plasmodium* parasites that are transmitted by female anopheles mosquitoes. Estimates revealed that over 60% of hospital attendance in Nigeria health care facilities was due to malaria. The disease is also known for lowering mental and manual productivities as well as contributing to the level of poverty in the country.

There abounds a wide indigenous knowledge about the disease and its cure most especially among the aboriginal communities in the rural areas of the country (Kayode 2002). Indeed a myriad of myths abound on the various diseases in the rural areas of Ekiti State, Nigeria. For example, it is believed that malaria may be caused by staying and/or working too long in the sun, by drinking contaminated water and by witchcraft. Also abounds is a wide knowledge of the medicinal values of botanicals in their neighborhoods. Over 70% of the population in the state resides in rural areas. Kayode (2004) asserted that most of these people depend on the environment for the maintenance of their health.

In the recent time, there has been a resurgence of interest on the use of botanicals for health management and maintenance in Nigeria (Kayode 2006). This is considered necessary particularly now that the forest that constituted the primary source of these botanicals is seriously been threatened. Nigeria, a country in the heart of the tropical rainforest belt, has lost most of its total forest cover. The rate of deforestation in the country has been estimated to be at an average of about 3.5 per cent per annual. Deforestation at this rate translates to loss of 350,000 to 400,000 ha of Nigeria's forest land per year (Ladipo 2010).

Consequent on the above, attempts are being made to document botanicals that have medicinal value with a view to determining their abundance, identifying the endangered species and evolving strategies that would conserve the identified the rare species thus enhancing their sustainability for the present and future generations.

II. Materials and Methods

The methods of Lipp (1989, Kayode 2002 and 2005) which consisted of a combination of social surveys and direct field observation was used in this study. Ekiti State was divided into three zones based on the existing political delineation. In each zones, 10 communities that were still relatively free from urban influence were selected.

In each community, 10 indigenes that had maintained continuous domicile for a period of 10 years and above were selected and interviewed with the aid of a semi-structured questionnaire matrix. The interviews were conducted with a fairly open framework that allowed for focused, conversational and two-way communication as suggested by Moniar (1989).

Botanicals whose roots were extracted and used as anti-malaria were identified and their voucher specimens were collected. The sources of such botanicals and their methods of utilization were also identified. The abundance of the species was also determined using the time taken to physically come in contact with the sample of the botanical within the aboriginal plant communities in the community. Where a sample was sighted within 20 minutes, it was considered as very abundant, it was abundant when sighted within 21-60 minutes but rare when it takes more than 60 minutes. The voucher specimens were later identified and deposited at the herbarium of the Department of Plant Science, Ekiti State University, Ado-Ekiti, Nigeria.

Key informants that were made up of officials of Health Department of the Local Governments Authorities, Ministry of Health, Hospital and other

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stakeholders, were interviewed. Also, in each community, group interviews were also carried out. Each group consists of a minimum of 5 respondents. This was done to attain group consensus on the suitability of the species identified at the individual level as advocated by Kayode and Omotoyinbo (2009).

III. Results and Discussion

A total of 33 botanicals were identified as having their roots being exploited for anti-malaria purpose. 14 of these species that belong to 11 families (Table 1) were being cultivated in the study area. The species were cultivated for other purposes; most of them were fruit trees that also served as viable source of income (Table 2). These include *Anacardium occidentale, Bligha sapida, Carica papaya, Citrus aurantifolia, Citrus sinensis, Elaeis guineensis* and *Mangifera indica* thus household farms and household areas constituted the primary and secondary sources of these species. Other species cultivated were meant to serve as shade provider and sometimes for control of wind as wind breakers. These include *Ficus thonningi, Ficus ptatyphylla* and *Senna siamea* thus they were primarily planted in household areas and secondarily in common areas such as schools, churches and markets premises. *Corchorus olitrius* and *Vernonia amydgalinia* were cultivated to provide vegetables primarily in household farms while *Zingiber officinalle* was meant primarily to serve as spice. All these cultivated species were found either as very abundant and/or as abundant. Previous study by Kayode (2005) had asserted that the use of botanicals for medical purposes in the study area had always been byproduct rather than been a main product.

The non-cultivated botanicals consist of 19 species that belonged to 14 families (Table 3). They were mostly indigenous tree species whose wildlings were preserved in the study area. These species were primarily sourced from the forest and secondarily from household farms of individuals with high land holdings. These species include *Alstonia boonei, Allablackia floridunda, Axonopus bonduc, Chrysophyllum albidum, Eniada Africana, Enantia chlorantha, Khaya invorensis, Lecaniodiscus cupanioides, Mallotus oppositifolius, Melanthera scadens, Milicia excelsa, Millattia thonningi, Morinda lucida, Olax subscorpioidea* and *Pterocarpus crinaceus.*

Field observations revealed that a number of reasons served as disincentives to their cultivation (Table 4). These ranged from the long gestation period required for them to grow into maturity, land tenure, inadequate silvicultural knowledge on the species, ignorance, lack of accurate data on the demography of the species, unfavourable legal environment and prevailing agricultural methods practiced in the study area.

Information from respondents revealed that each of these indigenous species takes over 20 years to grow into maturity hence it is considered unwise to invest already scare resources, such as time and labour, on tree cultivation. Elsewhere in Islamabad, Shinwari and Khan (2000) had made similar observation and asserted that most perennials required prolonged period of growth with considerable number of years required to reach flowering and fruiting stage, thus minimizing their regeneration possibilities. Already land fragmentation is now a common phenomenon; hence the utilization of the available land was skewed towards food production. Though field observation revealed that respondents possessed indigenous technical knowledge about these species but such appeared to be limited to their utilization rather than their silviculture. Most respondents did not consider tree production as necessary particularly when they were of the opinion that the issue of biodiversity loss has been exaggerated. Kayode (2006) had observed that respondents in the aboriginal communities of Ekiti State were ignorant of the consequences of biodiversity loss.

At present, there is an apparent lack of individuals and institutions with accurate data on the population of the species in the study area. Estimates were based merely on observation rather than been scientific. Similarly the use of tariff, a form of tax, on trees was considered as unfair and discriminatory thus putting forest production at a disadvantage. No such tax is imposed on crop production in the study area. This observation is similar to that of Kayode (2011). The prevailing agricultural method in practice is shifting cultivation where the cultivator uses a field (land) for one or two growing seasons after which he moves to another. The continuous rotation of land is laborious hence with increasing cost and/or scarcity of labour involved in land preparation, the involvement of fire in land preparation is on the increase, thus eliminating tree wildlings in the process. The problems are further compounded by the fact that most of the indigenous species were high light demanders; hence their seeds remained dormant in the soil for a long time. Thus they are poorly represented in the sapling stage (Kayode 2010).

Results obtained from this study revealed that ten of the uncultivated species were rare on the abundant scale (Table 5). These species are principally timber species in the study area. Extractions of the roots are annihilative and predatory. In fact, Fasola and Egunyomi (2002) described root extraction as one of the highest destructive extractive techniques commonly observed in Nigeria. Kayode and Omotoyinbo (2008) asserted that such extraction usually resulted in scarcity of species, thus, extraction *ad infinitum* could not be guaranteed (Homma 1992). There is therefore the need to examine how the species could be conserved. The indigenous technical knowledge of the respondents on

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these species could be classified into ecology and reproductive biology of the species. The knowledge could be utilized for the conservation of the species. Table 6 enumerates the implications of the indigenous knowledge on the conservation of the species.

In conclusion, the conservation of the rare species would enhance sustainability in the supply of the species. Thus there is the need to domesticate some of these species by planting them in household areas. Communities should be encouraged to own forests. Some of these species could be planted in common areas, such as school compounds, market areas, churches and mosque premises, road sides, wastelands among others. The enlightenment of the populace, previously advocated by Kayode (2006), on the dangers of biodiversity loss is equally relevant. The establishment of botanical gardens in each zones of the state is also necessary. Moore (1990) had described such establishment as a sustainable *in situ* method as such will maintain the original self-perpetuating populations. It is expected that the ready availability of these botanicals will help in the control of malaria in developing areas such as the area where this study was conducted.

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Table 1 : Cultivated botanicals whose roots are exploited for anti-malaria in Ekiti State, Nigeria

S/N	Botanical	Vernacular Name	Family	Sources* 1^0 2^0 3^0
1.	*Azadirachta indica*	Dongoyaro	Meliaceae	HHA CA -
2.	*Anacardium occidentale*	Kaju	Anacardiaceae	HHF HHA -
3.	*Bligha sapida*	Ushin	Sapindaceae	HHF HHA -
4.	*Carica papaya*	Ibepe	Caricaceae	HHF HHA -
5.	*Citrus aurantifolia*	Osan wewe	Rutaceae	HHF HHA -
6.	*Citrus sinensis*	Osan didun	Rutaceae	HHF HHA -
7.	*Corchorus olitorius*	Ewedu	Titiaceae	HHF HHA -
8.	*Elaeis guineesis*	Ope	Arecaeae	HHF HHA -
9.	*Ficus thonningii*	Odan	Moraceae	HHA CA -
10.	*Ficus ptatyphylla*	Agbagba	Moraceae	HHA CA -
11.	*Mangifera indica*	Mangoro	Anacardiaceae	HHF HHA -
12.	*Senna siamea*	Kasia	Caesalpiniaceae	HHA CA -
13.	*Vernonia amydgalinia*	Ewuro	Asteraceae	HHF HHA -
14.	*Zingiber officinale*	Ajo	Zingiberaceae	HHF PH -

* HHA: Household Area, HHF: Household Farm, CA: Common Area, PH: Purchased

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Table 2 : Products derived from cultivated botanicals whose roots are exploited for anti-malaria in Ekiti State, Nigeria

S/N	Botanicals	Major product(s) that enhance cultivation
1.	*Azadirachta indica*	Shade and Wind control
2.	*Anacardium occidentale*	Fruits and Cash income
3.	*Bligha sapida*	Fruits and Cash income
4.	*Carica papaya*	Fruits and Cash income
5.	*Citrus aurantifolia*	Fruits and Cash income
6.	*Citrus sinensis*	Fruits and Cash income
7.	*Corchorus olitorius*	Vegetable
8.	*Elaeis guineesis*	Fruits and Cash income
9.	*Ficus thonningii*	Shade and Wind control
10.	*Ficus ptatyphylla*	Fruits and Cash income
11.	*Mangifera indica*	Fruits and Cash income
12.	*Senna siamea*	Fruits and Cash income
13.	*Vernonia amydgalinia*	Vegetable
14.	*Zingiber officinale*	Spice

Table 3 : Non- cultivated botanicals whose roots are exploited for anti-malaria in Ekiti State, Nigeria

S/N	Botanical	Vernacular Name	Family	Sources		
				1^0	2^0	3^0
1.	*Alstonia boonei*	Ahun	Apocynaceae	FR	HHF	-
2.	*Allablackia floridunda*	Eku	Clusiaceae	FR	HHF	-
3.	*Axonopus bonduc*	Idi	Poaceae	FR	HHF	-
4.	*Bridelia ferruginea*	Ira	Euphorbiaceae	FR	HHF	-
5.	*Caesalpinia bonduc*	Ayoo	Caesalpiniaceae	FR	HHF	-
6.	*Chrysophyllum albidum*	Agbalumo	Sapotaceae	HHF	FR	-
7.	*Chromolaena odorata*	Akintola	Asteraceae	CA	HHH	HHF
8.	*Eniada africana*	Ogube	Annonaceae	FR	HHF	-
9.	*Enantia chlorantha*	Awopa	Annonaceae	FR	HHF	-
10.	*Khaya invorensis*	Oganwo	Annonaceae	FR	HHF	-
11.	*Lecaniodiscus cupanioides*	Akika	Sapindaceae	FR	HHF	-
12.	*Mallotus oppositifolius*	Orokoro	Moraceae	FR	HHF	-
13.	*Melanthera scadens*	Ako yurinyun	Asteraceae	CA	HHF	-
14.	*Milicia excelsa*	Iroko	Clusiaceae	FR	HHF	-
15.	*Millettia thonningi*	Ito	Papilionaceae	FR	HHF	-
16.	*Morinda lucida*	Ohiho	Rubiaceae	FR	HHF	-
17.	*Olax subscorpioidea*	Ifon	Olacaceae	FR	HHF	-
18.	*Piper guineensis*	Iyere	Piperaceae	HHF	-	-
19.	*Pteocarpus crinaceus*	Osun	Papilionaceae	FR	HHF	-

* HHA: Household Area, HHF: Household Farm, CA: Common Area, PH: Purchased, FR: Forest

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Table 4 : Identified disincentives to tree cultivation in Ekiti State, Nigeria

S/N	Disincentives	Proportion (%) of Respondents that Identified the Disincentive
1.	Long gestation period required for trees to grow into maturity	98
2.	Land tenure	96
3.	Inadequate silvicultural knowledge on indigenous trees	85
4.	Ignorance on the implication of biodiversity loss	95
5.	Lack of accurate data on tree demography	94
6.	Unfavourable legal environment	93
7.	Prevailing agricultural methods	92

Table 5 : Abundance of identified anti-malaria botanicals in Ekiti State, Nigeria

Abundance	Cultivated Species	Non-cultivated
Very Abundant	*A. indica, A. occidentale* *B. sapida, C. papaya,* *C. sinensis C. olitorius* *E. guineensis, M. indica* *S. siamea, V. amydgalinia*	*C. odorata, P. guineensis*
Abundant	*C. aurantifolia, F. thonningii* *F. ptatyphylla, Z. officinale*	*A. bonduc, B. ferruginea* *C. albidum, C. bonduc* *E. chlorantha, M. lucida* *P. crinaceus,*
Rare	-	*A. boonei, A. floridunda,* *E. africana, M. thonningi* *M. oppositifolius, M. scadens* *M. excelsa, O. subscorpionidea*

Table 6 : Implication of the indigenous knowledge on the conservation of the identified rare species

Feature	Indigenous Knowledge	Conservation Implication	Botanicals
Ecology	(a) Thrive well in both forest and savanna vegetations	Suitable for cultivation in all parts of the state	*K. invorensis,* *L. cupanioides,* *O. subscorpioidea* *M. excelsa* *M. scadens* *M. thonningi*
	(b) Thrives well in forest vegetation	Suitable for cultivation in southern part of the state	*A. boonei,* *A. floridunda,* *M. oppositifolius*
	(c) Thrives well in savanna northern part of the state	Suitable for cultivation in	*E. africana*
Reproductive Biology	(d) Flowers during the dry season	Seeds are available for cultivation during rainy season	*A. boonei, A. floridunda* *E.africana, K. invorensis,* *L. cupanioides,* *M.thonningi,M. scadens* *M. excelsa* *O. subscorpioidea*
	(e) Flower throughout the year	Seeds available throughout the year	*M. oppositifolius*

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