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Checklist and Status of Plant Species Used as Spices in Kaduna State of Nigeria

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Abstract: A combination of social surveys and direct field observations were carried out to determine the plant species that are used in Kaduna Sate, Nigeria, as spices. A total of 25 plant species are used as spices in the study area. The most widely utilized parts, in terms of the diversity of the botanicals, are the fruits, seeds and flowers while the least utilized part is the rhizome. The methods of extraction in over 50% of spices were predatory and annihilative. Most of the species whose barks were extracted were not cultivated though some were perennials. The relative regrowth capabilities of debarked trees and shrubs in the study area were unknown indicating that these methods might results in increasing scarcity of these species. Though considerable proportion of the botanicals were extracted by non-predatory and gathering methods yet collection of fruits and seeds were observed to be by pulling or cutting of the branches thus making such collection to be destructive. At present most of the spices species are becoming rare. Thus the increasing conversion of valuable natural environment to monoculture plantation of exotic timber and agriculture, might likely lead to the continue erosion of botanical diversity in the study area. Consequently strategies for the conservation of these species were proposed.

Key words: Checklist, status, spices species, Kaduna State of Nigeria

INTRODUCTION

In recent times, there seems to be an upsurge of interests in the conservation of flora in Africa. In Nigeria, the most populous nation in Africa, a gross dearth of such conservation studies still abound. At present, there is lack of accurate database on the available botanicals in the country (Kayoed, 2006). Thus species being perceived as been abundant might be getting closer to endanger while those previously perceived as been endangered might be nearing extinction.

Perhaps the most widely utilized plant species in Nigeria are the spices. These species are the major sources of powder and/or seeds used in cooking and have strong taste and smell (Schippers, 2000). Apart from their nutritional and medicinal importance, the spices like the other non-timber products have significant potentials in terms of employment opportunity (Soladoye and Sonibare, 2003). The non-timber products are now being considered important, if not more, to the rural economy of a developing country like Nigeria (Osemeobo, 1992; Soladoye and Sonibare, 2003). Hence the extraction of these products is now on the increase in Nigeria (Fasola and Egunyomi, 2002).

In consequence of the above, the conservation of the plant species that are the source of spices is considered necessary for the use of present and future generations of Nigeria. This study aimed to achieve this objective.

MATERIALS AND METHODS

The Study Area

The study was conducted in Kaduna State, Nigeria (96°15'E to 98°60'E longitude, 9°02'N to 11°32'N latitude). The state (Fig. 1), which is located in the northern part of Nigeria, occupies

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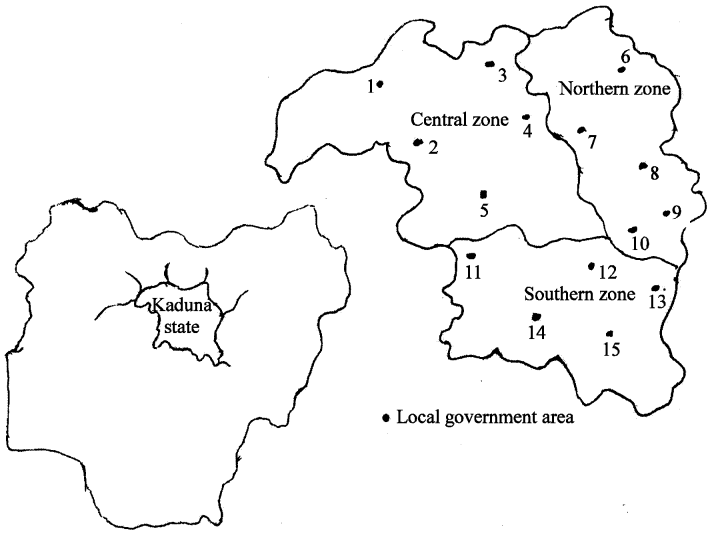

Fig. 1: Map of Kaduna state, Nigeria showing the study sites

48,473.2 km^2 and has a projected population of over 5 million, over 80% of them involved in agriculture (KDSG, 2005).

Kaduna State has two distinct seasons, a rainy season from April to October and a dry season from November to March and the vegetation extends from the Guinea savanna in the southern part of the state to the Sudan savanna in the northern part. The state, which is divided into 23 Local Government Areas (LGAs) is further classified into three geo-political zones, a northern zone which consists of 8 LGAs, a central zone consisting of 7 LGAs and southern zone which consists of 8 LGAs. The state has a pluralistic society with a total of 36 indigenous ethnic groups with Hausa being the general language common to all the groups.

Methods

Surveys and direct field observation were carried out as done in the previous works (Lipp, 1989; Kayoed *et al*., 1997). 5 LGAs were randomly selected from each of the three zones. In each of the selected local government area, 5 rural communities, which are still far from urban influence, were selected. In each community, 10 rural dwellers were randomly selected and interviewed with the aid of a semi-structured matrix. The interviews were conducted with fairly open framework that allowed for focused, conversational, two-way communication.

Plant species used as sources of spices by the respondents were documented and voucher specimens of such were obtained. The parts of the species used, the sources of collection as well as the methods of collection were defined and documented. The voucher specimens were later identified and deposited at the Herbarium of the Department of Plant Science, University of Ado-Ekiti, Ado-Ekiti, Ekiti State, Nigeria. Field information was confirmed (Balick and Cox, 1996) and compared with literature (Oliver, 1960; Gbile, 1986; Gill, 1992).

The relative abundance of the identified botanicals within 2 kilometer radius from each of the village center was determined according to Bongers *et al*. (1988) and Kayoed (1999) as: Less than 5 individuals as Rare, 5 to 10 as Occasional, 11 to 30 as Frequent, 31 to 100 as Abundant and over 100 individuals as Very Abundant. Information obtained was analyzed.

RESULTS AND DISCUSSION

A total of 25 plant species were used as spices in all the rural communities used in this (Table 1). These species ranged from herbs to trees and the various parts of these species used ranged from leaves, stem, seeds, fruits, flower, bulbs and rhizome to the barks of the stems and roots (Table 2). The methods of extraction of spices in over 50% of the species (Table 3) were predatory and annihilative particularly in the species where barks of stems and roots, roots, stems, rhizomes and bulbs were used as sources of spices. But where the parts used were the leaves, fruits, seeds and flowers, the methods of spices extraction were non-predatory and gathering (Table 3). The test on the relative abundance of each of the identified botanicals (Table 4) revealed that considerable proportions of the botanicals were rare (40%), occasional (12%) and frequent (8%) while only 32% and 8% of the identified botanicals were in abundance and very abundance categories respectively. The major chemical constituents of each of the identified botanicals as revealed by literature were shown in Table 5.

Table 1: List of botanical spices species identified by respondents in Kaduna State, Nigeria

	Names of botanicals		
Family	Scientific	English	Hausa
Annonaceae	*Enantia chlorantha* Oliv.	Moambe	Likita na dajii
	Monodora myristica (Gaertn.) Dunnal	African nutmeg	Gujiya danmiya
	Xylopia aethiopica (Dunnal) A. Rich.	Negro pepper	Kimba
Alliaceae	*Allium cepa* L.	Onion	Albasa
	Allium sativum L.	Garlic	Tafarnuwa
Aristolochiaceae	*Aristolochia bracteata* Retz.	Snakewort	Ga-daukuka
Caesalpiniaceae	*Tamaridus indica* L.	Tamarind	Tsamiya
Irvingiaceae	*Irvingia gabonensis* (Aubry.Leconite ex O' Rorke) Baill.	African mango	Goron biri
Laminaceae	*Ocimum basilicum* L.	Basil	Daddoya
	Hyptis spicegera Lam	Hyptis	Bunsurun fage
	Thymus vulgaris L.	Thyme	ThymeS
Lythraceae	*Lawsonia inermins* L.	Henna plant/ Mignontte tree	Lille/Lalle
Meliaceae	*Khaya senegalensis* (Desr.) A. Juss	Mahogany	Madachi
Mimosaceae	*Acacia nilotica* (L.) Willd. Ex Delile	Acacia	Bagarawa
	Parkia clappertoniana Keay	Locust Bean	Dadawa
Moringaceae	*Moringa oleifera* Lam.	Horse radish tree	Zogalagandi/ Bagaruwar maka
Myristicaceae	*Myristica fragrans* Houtt.	Nutmeg	Masoro
Myrtaceae	*Eugenia caryophyllus* (Spreng.) Bullock and Harrison	Clove	Kanumfari/ Kaole/Karanho
Piperaceae	*Piper nigrum* L.	Black pepper	Masoro
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Lemmon grass	Tsaure
Rutaceae	*Citrus aurantifolia* (Christm. and Panzer) Swingle	Lime	Lemu/Dankabuya
Solanaceae	*Capsicum frutescens* L.	Chillies	Barkono/Tasshi
	Solanum indicum L.	Garden egg	Dahuta
	Solanum nigrum L.	Nightshade	Goutan kadji
Zingiberaceae	*Zingiber officinale* Roscoe	Ginger	Cittar aho

Table 2: Parts used in the identified botanical spices species in Kaduna State, Nigeria

Parts used	Botanical species	Proportion (%) of the botanicals
Barks of Stem/Root, Stems, roots	*A. bracteata, A. nilotica, C. aurantifolia, C. citratus, E. chlorantha, K. senegalensis, M. oleifera, S. nigrum T. indica, X. aethiopica*	40
Leaves	*A. bracteata, C. citratus, H.spicegera, L. inermins, M. oleifera, O. basilicum, S. nigrum, T. indica, T. vulgaris*	36
Flower/Fruits/Seeds	*C. aurantifolia, C. frutescens, E. caryophyllus, I. gaboneensis M. fragrans, M. oleifera, M. myristica, P. nigrum, P. clappertoniana, S. indicum, S. nigrum, X. aethiopica*	48
Bulbs	*A. cepa, A. sativum*	8
Rhizome	*Z. officinale*	4

Table 3: Extractive techniques used on botanicals identified as spices species in Kaduna State, Nigeria

Extractive techniques	Botanical species	Proportion (%) of the botanicals
Predatory/Annihilation	*A. bracteata*, *A. cepa*, *A. sativum*, *A. nilotica*, *C. aurantifolia*, *C. citratus*, *E. chlorantha*, *K. senegalensis*, *M. oleifera*, *S. nigrum*, *T. indica*, *X. aethiopica*, *Z. officinale*	52
Non-Predatory/Gathering	*C. frutescens*, *E. caryophyllus*, *H. spicegera*, *L. inermins*, *M. fragrans*, *M. myristica*, *O. basilicum*, *T. vulgaris I. gaboneensis* *P. nigrum*, *P. clappertoniana*, *S. indicum*, *S. nigrum*	48

Table 4: Abundance status of identified botanical spices species in Kaduna State, Nigeria

Status	Botanical species	Proportion (%) of the botanicals
Very Abundant	*C. frutescens*, *C. citrates*	8
Abundant	*A. cepa*, *A. sativum*, *O. basilicum*, *P. nigrum*, *S. indicum*, *S. nigrum*, *X. aethiopica*, *Z. officinale*	32
Frequent	*C. aurantifolia*, *P. clappertoniana*	8
Occasional	*A. nilotica*, *H. spicegera*, *T. vulgaris*	12
Rare	*A. bracteata*, *E. chlorantha*, *E. caryophyllus*, *K. senegalensis*, *L. inermins*, *M. fragrans*, *M. myristica*, *M. oleifera*, *T. indica*, *I. gaboneensis*	40

Table 5: Chemical constituents of the identified botanical spices species in Kaduna State, Nigeria

Botanical species	Chemical constituents
A. bracteata	Alkanoids, manoflarine, aristolochine, aristolochi acid
A. cepa	Riboflavin, sulphur compounds-n-prophyldisulphide
A. sativum	Glycoside-allicin (A) Suphuric oils
A. nilotica	Tannis-gallotannins, catechins
C. aurantifolia	Essential oils
C. citratus	Essential oils-neral citral, citronellal, camphene, nerolidol, limonine geranoil, neryol, saponins, tannis
C. frutescens	Capsaicin, oil, ascorbic acid
E. chlorantha	Alkaloid-berberine, saponin, tannis
E. cryophyllus	Clove-oil-eugenol, caryophyllin, gallotonic acid
H. spicegara	Alkaloids, essential oil, terpenes
I. gabonensis	Alkaloids
K. senegalensis	Scopoletin scoparone, limonoid, bitter principle, tannis, saponins, Sterol
L. inermins	Dyestuff lawsone (hydroxynaphtoquinone) tannins, resin (mannite)
M. myristica	Alkaloid-annonaceine
M. oleifera	Moringine, moringinine, benil,moringie acid, athonin, spirochin, pterygospermin, gum, fixed oil, fatty acid, minerals, protein, Vitamins
M. fragrans	Essential oils-pinene, camphene, fixed oil-myristin, Phytosterol, ipuranol
O. basilicum	Essential oils, methylcinnamate, thymol, terpenes
P. clappertoniana	Alkaloid, cyanogenetic,glycoside, saponins, tannis
P. nigrum	Alkaloid-piperine, piperridine, essential oil, chavicine
S. nigrum	Alkaloid-solanine, solamarine, scopolin, scopoletin, aesculin, Isoscopolotine, demisine, solamargine, tomatine, solauricine
S. indicum	Alkaloid-solanine, saponins
T. indica	Mucilage gum, tartaric, citric and malic acids
T. vulgaris	Volatile oil (thymol, borneol, pinene, linalool, carvacrol, cymol) bitter principles, saponins, flavonoids, tannis, triterpenoids
X. aethiopica	Essential oil, resin, anonacein, reberoside, avocein, diterpenes, xylopic acid, kouran-16-ol, saponin
Z. officinale	Essential oil-gingerol

The most widely utilized parts in these spices species were the fruits, seeds and flowers while the least utilized part was the rhizome. Field observation revealed that the spices were widely utilized in the study area by every segments of the society irrespective of age, sex, economic and social status. Unfortunately in Nigeria, the conventional forest practice had neglected other products except timber for a long time (Soladoye and Sonibare, 2003). These other products were wrongly perceived as minor forest products or non-timber forest products. The importance of these minor products as previously stressed by Osemeobo (1988, 1992) and Soladoye (1995) can not be over-emphasized. The predatory

and annihilative methods of collection were utilized in the study area was previously observed by Homman (1994) to entail the destruction of source(s) in such a rate that the regeneration is slower than the rate of extraction. This study revealed that the bulbs, rhizomes, shrubs and herbs used for spices were gathered by pulling up the plant by roots even though some of their parts were often discard later.

The barks of roots and stems were also observed as important sources of spices in the study area (Table 2). Debarking of stems and roots had been identified as one of the highest destructive extractive technique commonly observed in Nigeria (Fasola and Egunyomi, 2002). Most of the species whose barks were used as spices were not cultivated though some were perennials. Studies by Cunningham (1988), John (1988) and Peters (1996) had revealed that debarking often kill the plants. Most of such perennials, as observed by Shinwari and Khan (2000) required prolonged period of growth with considerable number of years required to reach flowering and fruiting stage, thus minimizing their regenerating possibilities. The relative regrowth capabilities of debarked trees and shrubs in the study area were not studied. Thus, predatory and annihilation usually results in increasing scarcity of species. Though considerable proportion of the spices botanicals were extracted by non-predatory and gathering methods (48%, Table 3) yet collection of fruits and seeds were observed to be by pulling or cutting of the branches thus making such collection destructive. Quite often, collections were done indiscriminately without any consideration for size and age thus resulting in species depletion. Also the lower-altitude harvesting by a larger number of households in the study area due to the less vegetation cover per inhabitants may be detrimental to the survival of these species. Thus with increasing conversion of valuable natural environment to monoculture plantation of exotic timber and agriculture, there is the likelihood of the continued erosion of botanical diversity and the common traditional values of the minor products.

The spices species were essentially rich in natural products, most of which were relatively free of side effects. Also most of these species that are now rare in the study area are fast becoming stable source of income hence the need for their conservation. Perhaps, the most important strategy to achieve this might be the need for improvements in their methods of harvesting and processing. There is also the need for further research on the detail biology of the spices botanicals. At present a gross dearth of studies abound on the local management responses, such as domestication processes, to changes in the exogenous and endogenous factors determining botanical utilization and conservation. Thus some of the presently endangered species requires urgent domestication while in-situ and ex-situ conservation methods should be embarked upon. These, according to Shinwari and Khan (2000) involve protection of plant species in their natural habitats followed by ex-situ devices by growing important species and subsequently re-introducing them into their natural environment.

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