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Review

Current outlook and future promise of ethnobotany in Nigeria: A review and personal observation

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This paper reviews the current state and future prospects of ethnobotany in Nigeria. A brief historical background is presented. Books and journals indexed by Scopus and Science Direct were reviewed. Direct search was also made on the official websites of journals specializing in ethnobotany and allied disciplines. The field of ethnobotany manifests in all facets of human activities and relates to cultural and sociological relevance of plants. Ethnobotanical data generated from historical, religious, literary, linguistic, and pharmacological viewpoints serve as useful information regarding indigenous food production, traditional agricultural systems, and source for the development of new medicines. Since the vast majority of ethnobotanical studies conducted in Nigeria center on indigenous medicines, collaborative efforts geared toward efficient health service delivery is essential. This must include accreditation or documentation of traditional healers and herbal medicine vendors as well as policies in drug regulation, quality assurance, and control. Ethical guidelines and equitable sharing of benefits gained from sale of active compounds from source locations should be instituted and implemented. Conservation of indigenous plant resources requires the integration of ethnobotanical knowledge into national development programmes. Curriculum development and inclusion of ethnobotany (as a distinct subject) in Nigerian schools will direct future investigations in this promising field.

Key words: Ethnobotany, indigenous medicine, traditional botanical knowledge, Nigeria.

INTRODUCTION

The birth of ethnobotany

In 1895, a seasoned American floristic and taxonomic botanist, John William Harshberger, conceived the term "Ethnobotany". In a lecture on "food, dress, household utensils and agricultural tools of plant origin" presented in 1896 at the University of Pennsylvania; he made a formal incorporation of this term into the botanical diction and regarded it simply as "the use of plants by the aboriginal peoples". Prior to this time, Stephen Powers in 1873 (Cotton, 1996) had termed the concept "Aboriginal Botany" to describe the study of all forms of vegetation which aborigines used for commodities such as medicine, food, textiles and ornaments. Since the introduction of the term, the definition of ethnobotany has changed from the later submission of Robbins et al. (1916) down to Martin

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(1995). At present, a working definition by Cotton (1996) which considers ethnobotany to encompass all studies which concern mutual relationships between plants and traditional people is regarded as widely acceptable. These studies include the ways in which a society relates to its environment; the relationships may be social, economic, symbolic, religious, commercial, and artistic (Aumeeruddy-Thomas and Shengii, 2003). Wickens (2000) informed that all usages are founded on ethnobotany.

The dual ideologies in ethnobotany are people and plants. The people are variously referred to as aboriginal, local, indigenous, native or traditional people by several workers in the field. Ethnobotanists and cultural anthropologists have also reviewed the concepts from "man" to "human" to "people" and from "aborigine" to "primitive" to "traditional" (Bennett, 2006). For a detailed historical background of ethnobotany in the Old and New World, the reader is referred to Cotton's "*Ethnobotany Principles and Applications"* (Cotton, 1996).

The scope of ethnobotany

The field of ethnobotany is inherently multi-institutional and several disciplines have contributed to the growth and progress of the subject. Ethnobotany is a subset of ethnobiology (Stepp, 2005) and ethnobotanical studies form the vast majority of research in ethnobiology due to the greater importance of plants than animals in some human societies and their place in food web and nutrient cycle. Before now, ethnobotany combined the interests of botany and ethnology, and is approached from two perspectives, viz. the practical or utilitarian, and the theoretical or philosophical (Bennett, 2006). At the professional level, botanists appreciate the economic benefits of plants; anthropologists are concerned with traditional perceptions and management of plant resources whereas ecologists study the interrelationships between traditional societies and germplasm. Therefore, botany, anthropology, linguistics, education, archaeology, economics and resource management are often included in the study of ethnobotany. These disciplines are inter-connected to explore the field of ethnobotany in the modernization of traditional agricultural systems, industrialization, food security, documentation and preservation of botanical knowledge, conservation of plant resources, and social integration.

There are four major fields of ethnobotany, viz. basic (documentation of traditional botanical knowledge) (Liengme, 1983; Bhat et al., 1990; Cheikhyoussef and Embashu, 2013); quantitative (evaluation of use-values, relative use-values, proportion of agreement, and preference ranking) (Phillips and Gentry, 1993a, b; Assogbadjo et al., 2011; Avocevou-Ayisso et al., 2011); experimental (assessment of benefits, hypothesis testing and prediction) (Soleri and Smith, 1995; Albuquerque, 2006; Alencar et al., 2009); and applied (practical application of ethnobotanical information in areas such as pharmaceutical prospecting and conservation biology) (Gustafson et al., 1992; Cox, 1994). However, six fields of study (botany, anthropology, ecology, ethno-pharmacology, linguistics and economics) are recognized (Martin, 1995; Cotton, 1996).

The importance of ethnobotany

The significance of ethnobotany cannot be over-stated. Theoretically, the discipline informs the link between people and plants, the cultural significance of plants, as well as ecological relations of plants in human societies. The practical implications of these are the understanding of indigenous food production (Omohinmin, 2012), documentation of traditional botanical knowledge (O'Brien, 2010), and the scientific evaluation of plants used in traditional medicine (Gustafson et al., 1992; Cox and Balick, 1994; Schlage et al., 2000). Ethnobotany also provides explanation for biodiversity, cultural diversity, and indigenous bio-resources management practices. The subject make known the cultural position of the tribes who used plants for food, shelter, clothing, construction, tools, and ceremonies (Bussmann, 2006). Studies in ethnobotany bring to the fore the distribution of plants and the transfer of botanical knowledge from generation to generation together with the modes of transfer (Harshberger, 1896). Today, ethnobotanical studies are providing clues to new lines of production as well as the improvement of stale methods of plant product manufacture.

Ethnobotany as an academic discipline

The activities of the "primitive" people of the Old World played major roles in the history of ethnobotany since they concerned themselves with local ecology and non-industrialised utilization of plant resources. The publication of "Purposes of Ethnobotany" by Harshberger (1896) signalled the genesis of ethnobotany as an academic discipline (Thomas, 2003). However, the history of ethnobotany started with European explorers, travellers, and missionaries who observed and documented the uses of plants by the aboriginal peoples (Cotton, 1996). These explorations and meticulous observations led to the discovery of *Nicotiana tabbacum* by Christopher Columbus and *Banisteriopsis caapi* by Richard Spruce between 1492 and 1870 (Simpson and Conner-Ogorzaly, 1986). Other contributions of renowned naturalists and scientists in America and Europe have been elaborately reported by Cotton (1996). Earlier, economic botanists dominated the field. Ethnologists, archaeologists and linguists have also identified with the history and development of the discipline. This

identification led to series of scientific meetings, conferences and collaborations on traditional plant knowledge, evolution, and transmission. The meetings resulted in the formation of international societies and the launch of specific journal outlets for the publication of ethnobotanical research works. Prominent among these are *Economic Botany* (first published in 1947 by the American Society for Economic Botany), *Journal of Ethnobiology* (first published in 1981 by American-based Society of Ethnobiology, and more recently *Ethnobotany Research and Applications* (first published in 2003 by the Botanical Research Institute of Texas). Other outlets that publish sundry manuscripts on people and plants, and applied ethnobotany are *Journal of Medicinal Plants Research, Journal of Ethnopharmacology, Ethnobiology and Conservation, Conservation Biology, Biodiversity Conservation, Bulletin of African Ethnobotany Network, American Anthropologist,* and *Social Pharmacology.*

Ethnobotany became fully academic following the first doctoral degree awarded to David Barrows in 1900 by the University of Chicago; this was followed by the establishment of master's programme in ethnobotany by Castetter between 1930 and 1950 at the University of New Mexico with undergraduate studies in ethnobotany and economic botany (Cotton, 1996). Ethnobotany became a research subject and applied science in China in 1960s, as a taught subject in China in 1987 (Hamilton et al., 2003), an academic programme in the Kumming Institute of Botany, Chinese Academic of Science in 1987, an academic discipline in Thailand in 1990 (Trisonthi and Trisonthi, 2002), an academic institution in China in 1996, and as an academic programme in the UK in 1996 (Hamilton et al., 2003). As at 1996, there were no reports of African institutions offering courses and/or programmes in Ethnobotany and Economic Botany (McClatchey et al., 1999).

Apart from its academic value, many scientists have now recognised the practical value of ethnobotanical data. This has led to a relatively new field known as "applied ethnobotany", which refers to the practical application of ethnobotanical data in such areas such as bio-prospecting and conservation (Cotton, 1996), or simply as ethnobotany applied to conservation and sustainable development (Hamilton et al., 2003).

Much of the early ethnobotanical investigations carried out in the New World were casual observation and free-listing of useful plants. Hence, the field was regarded as non-scientific in scope. Phillips and Gentry (1993a, b) suggested the application of quantitative techniques in the analysis of contemporary plant-use data. This was illustrated in the publication of Soleri and Smith (1995) since studies of multivariate nature are common in ethnobotanical research (Hoft et al., 1999). The employment of quantitative methods in ethnobotanical data collection, processing, and interpretation has improved the indicative value of ethnobotanical studies (Hoft et al., 1999).

This paper aimed to provide an extensive review of ethnobotany in Nigeria. However, it is non-exhaustive of all materials on the subject matter. The objectives of this paper were to: (1) Prepare a review on the current state of ethnobotany as an academic discipline in Nigeria; (2) Highlight the future promise of ethnobotany in Nigeria, and (3) Relate the socio-cultural significance of ethnobotanical studies in Nigeria with biodiversity conservation.

METHODS

Books and journals indexed by Scopus and Science Direct databases were reviewed. Direct search was also made on the official websites of journals specializing in Ethnobotany (*Ethnobotany Research and Applications, Economic Botany, Journal of Ethnobiology and Ethnomedicine*) and allied outlets (*Journal of Ethnopharmacology, Ethnobiology and Conservation, Conservation Biology, Biodiversity Conservation, Journal of Medicinal Plants Research, Bulletin of African Ethnobotany Network, American Anthropologist,* and *Social Pharmacology*). Only papers relating to ethnobotany were considered. Personal interviews of local participants at the 24th Annual Conference of the Botanical Society of Nigeria (BOSON, 2016) held at the Department of Botany, University of Ibadan, Nigeria were also conducted. Information on participants' level (student, lecturer, field researcher etc.), research interests, and undergraduate or graduate programmes focusing on ethnobotany and/or economic botany, and level of programme (academic subject, module within a course or postgraduate course) were solicited.

RESULTS

Ethnobotany as an academic subject in Nigeria

Hitherto, there is no Faculty or Department of Ethnobotany in any Nigerian universities. The subject was incorporated following individual interest (by professors of international exposure) in the field. The first introduction was as a result of the implementation of curriculum review. In some institutions (e.g. University of Ibadan, Ibadan and University of Lagos, Akoka), ethnobotany is regarded as an academic subject and administered up to PhD level while professional programmes in Economic Botany are floated as Master of Economic Botany (MEB). In other institutions Ethnobotany and Economic Botany are offered as courses or modules within an undergraduate programme in Botany or Biological Sciences (e.g. Federal University of Agriculture Abeokuta; Ondo State, University of Science and Technology, Okitipupa, and University of Nigeria, Nsukka) or as postgraduate diploma programme

in Ethnobotany and Phytomedicine (e.g. University of Port Harcourt). In some other institutions, students are required to take courses such as Forest Resources and Utilization, Forest Taxonomy etc. These "outside" courses present parts of ethnobotany as ethnomedicine, non-timber forest products, and conservation of plant resources. It is believed that with the present campaign for the inclusion of traditional medicine in the curriculum of medical sciences in Nigeria and the official integration of traditional medicine into Western medicine, ethnobotany will regain its natural glory.

Ethnobotanical studies in Nigeria

Ethnobotanical studies in Nigeria were initially carried out generally on the uses of plants by different ethnic groups (Bhat et al., 1990; Fasola and Egunyomi, 2005; Aiyeloja and Bello, 2006; Erinoso and Aworinde, 2012; Ariwaodo et al., 2012). Later specific research works, classified as ethnomedicine, ranging from plants used in the management of arthritis (Gbadamosi and Oloyede, 2014), sickle cell anaemia (Egunyomi et al., 2009; Gbadamosi et al., 2012), sexually transmitted infections (Gbadamosi and Egunyomi, 2014), breast cancer (Gbadamosi and Erinoso, 2016), infant illnesses (Aworinde and Erinoso, 2015), to skin infections (Ajibesin, 2012; Gbadamosi and Oyedele, 2012; Erinoso et al., 2016) etc. were conducted and reported. Lately, there has been a shift in emphasis from free-listing and systematic botany to a nexus between ethnomedicine and phytochemistry (Gbadamosi et al., 2011; Fasola et al., 2013; Gbadamosi and Oloyede, 2014; Aworinde et al., 2016; Gbadamosi and Aboaba, 2016).

Although most Nigerian supervisors and students share common interest in ethnobotany research and application, majority of the project areas are basic and involve either documentation of traditional botanical knowledge (market surveys and oral interview of herb sellers, farmers/hunters, and traditional doctors) or phytochemical analyses of plants implicated in such surveys. Little or no attention is given to quantitative ethnobotany or test of hypothesis. However, laboratory experiments to confirm ethnomedicinal claims are common (Egunyomi et al., 2010; Gbadamosi and Oyedele, 2012; Gbadamosi and Ogunsuyi, 2014; Aworinde et al., 2016).

A large percentage of the plants implicated in ethnomedicinal studies in Nigeria have not been scientifically validated up to the pre- or clinical stages. Although at the institutional level, active research to evaluate ethnomedicinal claims is being carried out within the available laboratory resources of the Drug Research and Production Unit of the Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, Nigeria, and Department of Medicinal Plant Research and Traditional Medicine, National Institute for Pharmaceutical Research and Development, Abuja, Nigeria. Many pharmaceutical companies in Nigeria have showed little or no interest in the funding of ethnobotanical researches in spite of the fact that ethnobotanical studies are valuable sources of new data on plants especially drug plants. McClatchey (2005) noted that in the last 30 years, not one new traditional plant use has been reported and subsequently converted into a pharmaceutical. This may be as a result of some respondents (who hold traditional botanical information) reluctantly disclosing or declining to share information relating to plant use (Sofowora, 2008) and as such no modern inductees into global pharmacopoeia. Cotton (1996) submitted that the collection of useful ethnobotanical data requires some preliminary understanding of the knowledge system in terms of acquisition and subsequent transfer to successive generations.

One of the authors of this paper personally noted a lack of respect for the discipline during his postgraduate studies. At departmental seminars, students and lecturers often referred ethnobotanists as "traditional doctors" or "herbal practitioners" and argued that the subject lacked scientific reputation. As expected, the field attracted little or no funding. However, proposals advertising pharmacognosy/medical botany are funded.

DISCUSSION

Current state of ethnobotanical studies in Nigeria

In Nigeria, traditional medicine is filling the gap of inequalities in access to healthcare and health outcomes (Kadiri et al., 2010). Unlike other science disciples, ethnobotanical research projects in Nigeria have received little or no funding. Individual researchers have carried out ethnobotanical studies with personal earnings. Although most Nigerian institutions have provisions for research and publication allowances, the implementation is subject to availability of funds. It is noteworthy that collaborative efforts geared toward efficient health service delivery is essential to universal health coverage.

The primary focus of most ethnobotanical works in Nigeria has been the cataloguing of useful plants which, more often than not, fall in the domain of medicinal and food plants. Other areas such as plants used as cosmetics, dyes, musical instruments, basketry and household utensils, are rarely recorded. Hitherto, published work on Nigerian ritual plants is non-existent. Available reports are those of Mushroom in Yoruba myths and beliefs with particular attention to their origin and medicinal uses (Oso, 1975, 1977). Also, published information on the ethnobotany of specific tribes or plant species in Nigeria is scarce, as occurs in reports for tribal communities (Smith, 1923; Bussmann, 2006), individual plant species (Houssou et al., 2012; Dafni et al., 2005), plant family (Chhetri, 2010), and socio-cultural

significance (Dafni et al., 2006; Dafni, 2007).

The knowledge of plants and their uses has continued to spread in like pace with the plants themselves. The cultural relevance of plants has deep roots in tribal customs and beliefs. Nigeria as a nation is not an exception. Indigenous societies/peoples hold strategic positions in botanical knowledge acquisition, transfer, and development. Indigenous plant knowledge is now considered as a part of national heritage especially with respect to cultural diversity and integration. This traditional botanical knowledge (TBK) has encouraged acculturation and cultural perceptions are incorporated into Western ideas to form an integrated knowledge system (IKS). The integration of TBK and Western Knowledge offers enhanced approach in the management of diseases/ ailments, improvement in healthcare services and delivery, sustainable agricultural systems and better nutrition. This synergy has resulted in a unique synthesis of medical belief and practice, along with the development and processing of innovative and effective drugs.

After a period of relegation of plant significance, causes of which include industrialization, urbanization, and western influence, the usefulness of plants are now gaining new interest, and as such newspaper columnists and television anchors are promoting public awareness on plant-human relations especially in the area of ethnomedicine (e.g. natural healthcare column in Nigerian national dailies: Punch, Guardian, Nigerian Tribune etc.: Nigerian Tribune, Thursday, 28 February, 2013, and other Thursday editions).

The contribution of herbalism to primary health care in Nigeria has been appraised by Kadiri et al. (2010). In Nigeria, the role of traditional medical practitioners, herbalists, herb sellers, traditional orthopaedic specialists, and birth attendants/midwives has made herbal medicine practice worthwhile and commendable. The bulk of ethnobotanical information is held by older people. Thus, in most traditional societies, young fellows acquire TBK and many practical skills as they work alongside parents or older siblings or during apprenticeship programme.

Graduates of botany (especially those having interest in ethnobotany) are myopic as regards occupational prospects of this promising field. McClatchey et al. (1999) informed that pharmaceutical companies, herbal medicine and food industries, state and federal ministries of agriculture, and land management firms employ ethnobotanists. There are also opportunities in conservation organizations, schools and colleges, or field research stations.

Early reports of ethnobotanical researches conducted in other West African countries (Benin, Burkina Faso, Ghana, Togo etc.) followed the same qualitative trend of uses of plants for food, medicine, fuel etc. Later, works on quantitative ethnobotany were reported. In the Republic of Benin, for example, quantitative indices such as use values, use frequency of plant properties, credibility level, use equitability, interviewee diversity value, specific reported use, intra-specific use value etc. have been explored by Fadohan et al. (2010), Assogbadjo et al. (2011), Avocevou-Ayisso et al. (2011) and Koura et al. (2011) on the ethnic differences and use patterns of some plants in Benin. Also, Laleye et al. (2015) investigated and reported plants used in the traditional treatment of diabetes. The authors applied a generalized linear model with a Poisson distribution to assess the effects of social factors on informants' knowledge. Other research papers combining some aspects of ethnobotany and biodiversity conservation have been published by Lokonon et al. (2013), Agoyi et al. (2014), and Salako et al. (2014). A national-scale analysis of plants used in traditional medicine in Burkina Faso (Zizka et al., 2015) showed that indices such as relative importance, relative frequency of citation and use categories lend credence to ethnobotanical studies and could help identify conservation priorities as well as facilitate future research in drug prospection. Asase et al. (2005) combined the fields of ethnobotany and ecology in the study of some Ghanaian antimalarial plants. The authors investigated the range and abundance of the plant species identified during the ethnobotanical survey, and analyzed the data for taxonomic diversity, growth forms, preference etc. In the central region of Togo, Karou et al. (2011) interviewed some traditional healers who were members of a "Study and Research in Applied Medicine Centre". The authors documented indigenous plants used in the management of diabetes and hypertension, and emphasized the sustainable use of plant resources. In contrast, assessment of quantitative parameters in ethnobotanical studies in Nigeria is scarce.

Future promise of ethnobotany and its application in Nigeria

Individual responsibilities

Ethnobotanical data can be generated from historical, religious, literary, linguistic, and pharmacological viewpoints (Pirani et al., 2011). These data serve as useful information regarding indigenous food production, traditional agricultural systems, and source for the development of new medicines. The people of a particular region or locality represent major stakeholders in the health services of a nation. Researchers therefore should allow the spirit of "give and take" which is the hallmark of ethnobiological studies (Bridges, 2004). This could be in the form of community-support assistance (Bridges, 2004) or equitable sharing (with host communities) of the benefits from pharmacological development (Cox, 2001) as well as the protection of the intellectual property rights of the informants.

Liengme (1983) in his review of ethnobotanical research conducted in southern Africa listed uses of plants under

food, medicine, magic, ritual and customs, building, household utensils, musical instruments, and firewood. Although the author's paper captured published and unpublished manuscripts, museum and herbarium materials, the review stated the ethnobotanical researches and knowledge in South Africa as carried out by missionaries, botanists, medical experts and cultural anthropologists. Also, the publication of Kose et al. (2015) on the medicinal plants used in the Maseru district of Lesotho, South Africa further emphasized the need to document traditional medicinal practices since ethnobotanical knowledge in majority of human societies is passed on orally from one generation to another. Active documentation reveals gaps in knowledge and new records of medicinal plant use.

Government responsibilities

In Ghana, Mali, Zambia, and Nigeria, 60% of children suffering from malaria/fever receive their first line of treatment from herbal medicine (Abdullahi, 2011). Accreditation or documentation of traditional healers and herbal medicine vendors as well as policies to regulate herbal practice should be the primary concern of the government. Although there is distrust between traditional and modern doctors (Abdullahi, 2011), public awareness (televisions, newspapers, magazines etc.) aimed at botanical literacy and biological diversity should be encouraged by the government. Governments (at state and federal levels) need to encourage herbal medicine apprenticeship (through entrepreneurship and traditional medicine fair programme) as well as the establishment of traditional medicine department in all primary health care centres. Herbal drug regulation, quality assurance and control fall in the domain of government responsibility.

Institutional roles

Institutions and research centres have roles to play in botanical training, plant collection, identification, and screening of plants for possible bio-activity. Because of the inter-disciplinary nature of ethnobotany, knowledge of the environment and cultural significance of plants is considered essential. For many years, aboriginal peoples have used knowledge of their local environment to sustain themselves and to maintain their cultural identity. These natives are better understood when there is no language barrier. Institutes of languages, therefore, can play effective roles in linguistics training as well as professional services of interpretation especially when the researcher is not familiar with the local language of the people. Ethnobotanical inventories to document economically important plants as well as field and laboratory studies to confirm ethnobotanical claims should be conducted. "Traditional Medicine" or "Medicinal Plants" should be taught as part of curriculum of medical schools. Ethical guidelines and equitable sharing of benefits earned from the commercialization of bioactive compounds from source locations should be instituted and implemented.

Socio-cultural consideration and biodiversity conservation

Ethnobotanical studies help in cultural identification and preservation of botanical knowledge. The idea that plants are natural gifts and abundant, and so cannot be exhausted should be relegated. The enforcement of sustainable use of plant resources and the establishment of conservation centres are social interventions required of the government. Idu (2009) informed that the benefits derivable from bio-resources should be considered in the light of environmental concerns and biodiversity conservation; the author further submitted that quantitative evidence, precision and statistical analysis of ethnobotanical data should form the core values of modern ethnobotanical research. Conservation of indigenous plant resources requires the integration of ethnobotanical knowledge into developmental programmes and policies of any nation (Avocevou-Ayisso et al., 2011). Although differences abound in local knowledge, use, and conservation of plant resources among different cultures (Hilgert and Gil, 2006), the socio-economic relevance of these resources may enhance our understanding of the management practices and conservation efforts at local and regional level (Dalle and Potvin, 2004).

CONCLUSION AND RECOMMENDATIONS

This review has highlighted the current status and the future promise of ethnobotany in Nigeria. The field of ethnobotany manifests in all facets of human activities and relates to cultural and sociological relevance of plants. Governments need to encourage herbal medicine apprenticeship, establish traditional medicine department in all primary health care centres as well as herbal drug regulation, quality assurance and control. Researchers should support host communities with benefits gained from the commercialization of pharmaceuticals. The sustainable use of plant resources will ensure continued access. Curriculum development and inclusion of Ethnobotany (as a distinct subject) in Nigerian schools will direct future investigations in this promising field. "Traditional Medicine" or "Medicinal Plants" should be taught as part of curriculum of medical and other related sciences.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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