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Ethnobotanical Survey of Plants Used as Memory Enhancer in Three States of Southwestern Nigeria

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ABSTRACT

This study sought at documenting plants locally used for memory enhancement by the people of three States of Southwestern Nigeria, predominantly inhabited by the Yoruba tribe. A combination of social survey, direct field observations and semi structured questionnaires were administered among the local herb vendors, traditional medicine practitioners (TMPs) and knowledgeable people in plant usage. A total number of 260 respondents were interviewed across the States. The total populations of the respondents were made up of the herbalists (32%), herb sellers (40%) and "other occupation" comprising students and artisans (28%). The total population consisted of 55.4% males and 44.6% females with ages ranging from 10 to 75 years. Thirty seven medicinal plant species belonging to twenty eight families were gathered. Of all the plant species, *Bacopa floribunda* (R.Br) Wettst and *Scoparia dulcis* L belonging to the same family Scrophulariaceae had the high ranked of 40 and 27 respectively. A link between plant local names and their usage for memory enhancement was established.

INTRODUCTION

Traditional medicine is a combination of knowledge and practice, whether explicable or not, used in diagnosing, preventing and eliminating a physical, mental or social disease. It may rely exclusively on past experience and observation handed down from generation to generation verbally or in writing, otherwise known as herbalism, the ancient method of curing disease through the use of plant (Soladoye, 2010). Herbal medicine has been a significant element in the cultural patrimony which still remains the main recourse for a large majority of people for addressing health problems Lawal *et al.,* 2014. In the modern day, the use of medicinal plants is gaining more recognition. However, in most developing countries; the knowledge on the use of these plant resources for medicine is vast disappearing due to lack or scanty documentation of this invaluable biological resource. In Nigeria, the documentation of indigenous knowledge on the use of plants for medicinal purposes exists but, inadequate and almost lacking in some parts of the country (Elufioye *et al.,* 2012). The use of medicinal plants for memory enhancing and anti-aging is popular among the Yoruba folk of western Nigeria. Local remedies for memory loss and aging are popularly referred to as "*Ogun isoye* and *Ajidewe*" respectively which is adopted sometimes used by man as food or in form of medicine which modify the functioning of the central nervous system (CNS) (Elufioye *et al.,* 2012). Memory could be described as the ability of an individual to record sensory stimuli, events and information; retain them over short or long periods of time and recall the same at a later date when needed. Neurodegenerative disorders like Alzheimer's disease (AD), Parkinson disease (PD), depression, schizophrenia and others are associated with impairments in learning and memory (Jewart *et al.,* 2005; Adewusi *et al.,* 2010) characterized by disturbance of multiple cortical functions, including memory, judgment, comprehension, learning capacity and language, (Robert and Claudia, 1998). Poor memory, lower retention, and slow recall are common problems in today's stressful and competitive world, especially with associated ageing process evolving from malfunctioning of different biochemical pathways.

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The drugs currently available in market for the treatment of various learning and memory disorders are associated with several side effects, indicating need of substitute medication from alternative system of medicine (Schneider, 2001). Some medicinal plants have been used for decades in different cultures to improve memory and ameliorate aging effects such as; *Lycium barbarum* L (China), *Corydalis* spp (Denmark) and *Melissa officinalis* (Iran) (Akhondzadeh *et al.*, 2003; Yu *et al.*, 2005; Adsersen *et al.*, 2006). In Nigeria, the Yoruba traditional medicine offers a number of safe treatments for central nervous system related disorders such as anxiety, aging and memory loss.

Quite a number of Yoruba traditional remedies for the treatment of age related cognitive disorders and other diseases have been recorded. Fatumbi, 1995, who spent many years living with natives and studying medicinal herbs. Elufioye *et al.*, (2012) reported some plants used for memory enhancement and anti-ageing in Sagamu, Nigeria. Cyril–Olutayo *et al.*, (2012) also reported some of the plants used as memory enhancer and anti-ageing in Ondo State, Nigeria. Many prescriptions and recommendations that claim to prevent or restore cognitive and memory deficits have not shown any actions in established test systems. Moreover, just a small number of herbs traditionally used for the CNS disorders have been gathered and evaluated pharmacologically regarding their mechanism of actions in terms of our modern understanding of brain functions.

Therefore, this work aimed at documenting plant species locally used for memory enhancement by the people of Ondo, Ekiti and Osun States of Nigeria mainly inhabited by the Yoruba tribe to enhance the previously documented species in South west states for scientific validation. This would serve as information for further research to assess the evidence of the efficacy of the various plants locally attributed to memory enhancers. The active ingredient that may improve brain function may attract sufficient research in the regard to juxtapose their potential effectiveness for the treatment of neurodegenerative diseases.

MATERIALS AND METHODS

Study area

Ethnobotanical survey was conducted in three different States of Southwest Nigeria; Ondo State, Ekiti State and Osun State (Fig. 1). Ekiti State comprises of Oja Oba market in Ado Ekiti of Ekiti State Ikoro Ekiti, Ijero; Osun State (Ikeji Ile of Oriade local government and Ilesha) and Akure town of Ondo State comprising the Oja Oba Market and Federal University of Technology Akure (FUTA) Campus. The three states are primarily agricultural states having many rural areas largely of subsistence farmers and peasant fishermen. The indigenous people of the states peak same Yoruba language although many of them identified as student can speak both Yoruba and English languages.

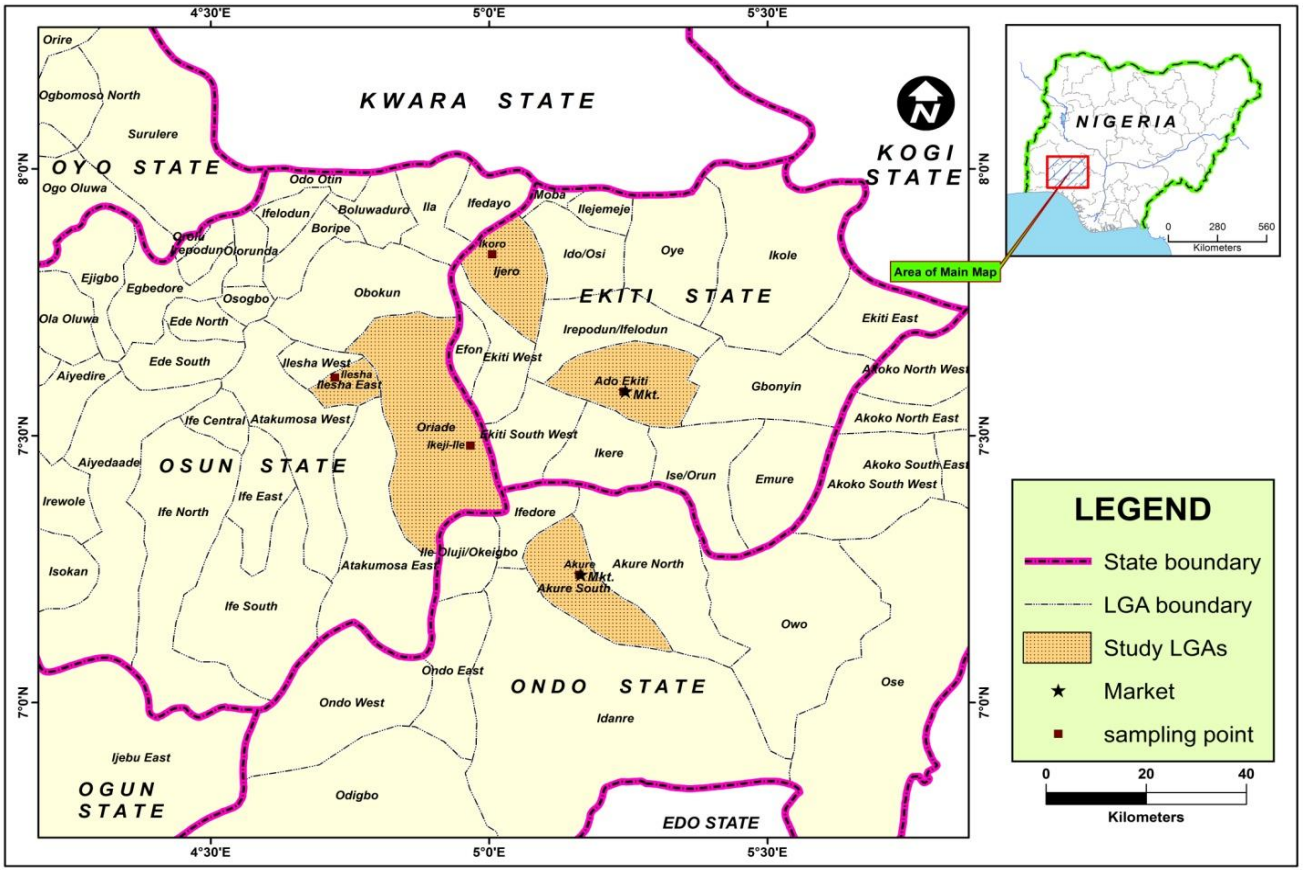

Fig. 1: Map showing Studied Local Government Areas of Nigeria.

Data collection

Samples were collected between August 2013 and March 2014 at various locations of the three States. A combination of social survey, direct field observations comprising literatures, through friends, internets and semi structured questionnaires administered among the local herb vendors, traditional medicine practitioners (TMPs), artisans and students in higher institutions with a view to determine the utilization of medicinal plants for memory enhancement were used in this study. Following the methods of (Cyril–Olutayo *et al.*, 2012 and Elufioye *et al.*, 2012), the structured questionnaire was prepared in English language and discussion with most of the respondents was conducted in Yoruba language. The respondents were enlightened on the purpose of the interview and their consent to publish the findings obtained was sought before questioning. After some explanations to the herb vendors, the anonymous questionnaires were given to be filled by those who could. Where not, they were filled by the author through a non-oriented conversation. Information gathered during the conversation was transferred to a structured form in the questionnaire and samples were bought from the herb vendors before dishing out details of their knowledge. A total of 260 respondents were randomly interviewed in the three State including Ekiti State, Ondo State and Osun State. Plant specimens were collected and identified at the herbarium of Botany Department of Ekiti State University, Ado Ekiti, where specimens were deposited.

RESULTS

Figure 1 shows the detailed map of the study area comprising of Ekiti, Ondo & Osun State of Southwestern Nigeria. Table 1 shows the demographic features of the respondents. A total number of 260 respondents were interviewed in the course of this research across the three States. The total population of the respondents was made up of the herbalists (32%), herb sellers (40%) and "other occupations" which comprised of the students and artisans (28%). Out of these, 55.4% were males and 44.6% were females, their ages ranged from 10 to 75 years. About 71.2 % of the respondents were married, 25% were single while others were elderly ones mostly above 70 years and those that have lost their spouse were 3.8%.

Table 2 shows the list of plants locally used for memory enhancement. A total of thirty seven medicinal plants species belonging to twenty eight families (Table 2) were identified as plants locally used for memory enhancement among the three states.

Of all the plant species gathered, *Bacopa floribunda* and *Scoparia dulcis* belonging to the family Scrophulariaceae had high frequencies of 40 and 27 respectively. Other plant families of plant with appreciable frequency includes *Parquetina nigrescen* of Asclepiadaceae also (27); *Aframomum melegueta* (20) of Zingiberaceae; *Cordia millenii* (30) of Boraginaceae; *Spondias mombin* (25) of Anacardiaceae; *Cola acuminate* (24) of Sterculiaceae and *Elaeis guineensis*, Palmae (16). Among the plant species, trees are the predominant habit of the plants indicated (Fig. 3).

The medicinal uses are varied and the plant species parts used range from leaves, roots, stems, barks to fruits, or a combination of two or more in a species or with those of other species, but the predominant parts used are the leaves. Table 3 revealed the peculiarity in the suffix of the syllables of the local names (in Yoruba language) of some plants used for memory enhancement which are linked to notions of memory and intelligence.

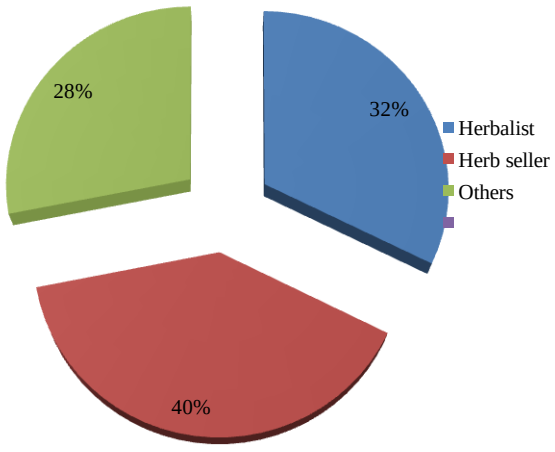

Fig.2: Occupation Distribution of the Respondents Across Three States Of Nigeria

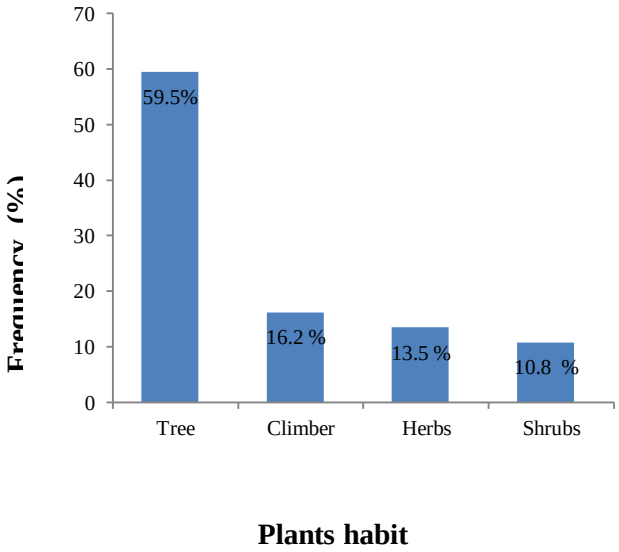

Fig. 3: Habit of plants used as memory enhancer.

Table 1: Demographic Features of Ethnobotanical Respondents.

	Osun State		Ekiti State		Ondo State		Total	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Gender								
Male	27	38.6	65	59.1	52	65	144	**55.4**
Female	43	61.4	45	40.9	28	35	116	**44.6**
Total	**70**	**100**	**110**	**100**	**80**	**100**	**260**	**100**
Age (years)								
10 – 30	13	18.5	10	9.1	19	23.8	42	**16.1**
31 – 50	40	57.1	79	71.8	36	45.0	155	**59.6**
51 – 70	15	21.4	16	14.6	25	31.2	56	**21.5**
Above 70	2	2.9	5	4.5	-		7	**2.7**
Total	**70**	**100**	**110**	**100**	**80**	**100**	**260**	**100**
Marital Status								
Married	46	65.7	85	77.2	54	67.5	185	**71.2**
Single	22	31.4	21	19.1	22	27.5	65	**25.0**
Others	2	2.9	4	3.6	4	15	10	**3.8**
Total	**70**	**100**	**110**	**100**	**80**	**100**	**260**	**100**

Table 2: Plants Locally Used for Memory Enhancement.

S/N	Name	Family	Local Name	Habit	Part Used	Freq
1	*Abrus precatorius*	Fabaceae	Omisinmisin	Climber	Aerial part	8
2	*Adansonia digitata* Linn	Bombacaceae	Oshe	Tree	Leaves and stem bark	3
3	*Aframomum melegueta* K Schum	Zingiberaceae	Atare	Herb	Seed	20
4	*Alstonia boonei* De Wild	Apocynaceae	Ahun	Tree	Leaves	4
5	*Bacopa floribunda* (R.Br)Wettst	Scrophuliaceae	Ewe Oniyemuye	Herb	Aerial parts	40
6	*Bambusa vulgaris* Schrad. ex J.C. Wendl	Poaceae	Oparun	Shrub	Young leaves	4
7	*Baphia nitida* Lodd.	Papilinionaceae	Owiwi, Iyereosun	Shrub	Leaves, stem bark, wood and root	2
8	*Carica papaya* Linn	Caricaceae	Ibepe	Tree	Leaves and root	7
9	*Chrysophylum welwitschii*	Sapotaceae	Asiyele	Climber	Leaf	1
10	*Cocos nucifera* Linn	Palmae	Agbon	Tree	Roots	4
11	*Cola acuminata* (P. Beav) Schott and End	Sterculiaceae	Obi abata	Tree	Seeds	24
12	*Cordia millenii* Bak.	Boraginaceae	Omoh	Tree	Stem bark	30
13	*Crossopteryx febrifuga* (Afzel.) Benth	Rubiaceae	Ayeye	Tree	Bark	3
14	*Detarium microcarpum* Guill. &Perr.	Caesalpiniaceae	Ariran	Tree	Stem and leaves	12
15	*Dichapetlum toxicarium Bail (G.Don)*	Dichapetalaceae	Itakun	Woody Climber	Leaf and twigs	3
16	*Dioscorea mangenotiana* J. Miège	Dioscoreaceae	Esusu	Climber	Leaves	4
17	*Elaeis guineensis* Jacq.	Palmae	Ope	Tree	Young leaves	16
18	*Ficus exasperate* Vahl	Moraceae	Ipin	Tree	Leaves	5
19	*Garcinia kola* Heckel	Gutiferae	Orogbo	Tree	Seed	9
20	*Harungana madagascariensis* Lam. ex Poir	Harungaceae/ Clusiaceae	Arunje, Asunje	Tree	Leaves	4
21	*Khaya ivorensis* A. Chev	Meliaceae	Oganwo	Tree	Stem and root bark	1
22	*Lophira alata* Banks ex Gaertn. f	Ochnaceae	Eki	Tree	Seed, root, leaves and stem bark	2
23	*Moringa oleifera* Lam.	Moringaceae	Ewe moloye	Tree	leaves	1
24	*Montandra guineensis* L	Apocynaceae	Asifirin	Tree	Roots	1
25	*Musa sapientum Linn*	Musaceae	Ogedewewe	Tree	Stem	18
26	*Parquetina nigrescen* Baillon.	Asclepiadaceae	Ogbo	Climber	Stem, Leaves	27
27	*Picralima nitida* Stapf Th. & H. Dur	Apocynaceae	Abeere	Tree	Fruits and seeds	3
28	*Quassia undulata* (Guill. &Perr.) D.Dietr.	Simaroubaceae	Oriji	Tree	Leaves	2
29	*Scoparia dulcis L*	Scrophulariaceae	Olomuyinrin, Oyin-gogoro	Shrub	Leaves	27
30	*Senecio abyssinicus* A.Rich	Asteraceae	Amunimuye	Herb	Aerial parts	13
31	*Solanum incanum* L	Solanaceae	Ikan, Igba	Herb	Leaves, fruits and roots	3
32	*Spondias mombin* L	Anacardiaceae	Iyeye, Okika, Ekikan	Tree	Leaves	25
33	*Tectona grandis* L.	Verbanaceae	Agala	Tree	Young leaves	1
34	*Tetrapleura tetraptera* (Schumm. &Thonn.) Taub	Mimosaceae	Aridan	Tree	Fruits	2
35	*Thaumatococcus daniellii* (Benn.) Benth	Marantaceae	Eeran	Rhizome	Leaf	5
36	*Uraria picta* (Jacq.) DC	Leguminosae-Papilionoideae	Alupayida	Climber	Leaves	7
37	*Zea mays* Linn	Poaceae	Agbado	Shrub	Leaves	3

Table 3: Suffix of Plants Name In Relation to their Syllabic Meaning.

Suffix Of Plant Name (Yoruba Language)	Meaning	Reference Plant
As/iye/le	In which we understand	*Chrysophylum welwitschii*
A/ye/	Makes one understand	*Crossopteryx febrifuga*
/Iye/	Memory	*Spondias mombin*
/Iye/ye	To understand and live	*Spondias Mombin*
/Iye/ Ataare	Memory alligator pepper	*Aframomum melegueta*
Ko/oye/jo	Focus memory	Not identified
Oniye/n/iye/	Master of knowledge	*Bacopa floribunda*
/Oye/	Understanding	Not identified
/Ye/ye/	Understand	*Spondias mombin*
Abo /imo/	Female wisdom	*Elaeis guinensis*
Eemo	That sticks in one memory	Not identified
Imo ope	Knowledge palm tree	*Elaeis guinensis*
/Omo/	Knowledge	*Cordia milleni*
Alaran	Reminds	Not identified
Aparan	To beat to remember	Not identified
Eeran	Remembrance	*Thaumatococcus daniellii*
Eeran esin	Memory like of a horse	Not identified
Iran	Remembrance	*Thaumatococcus daniellii*
Ogbo	You hear.	*Parquetina nigrescen*

DISCUSSION

In our effort to document the medicinal plants used for memory enhancement in Southwestern Nigeria, table 1 reflects that across the states, that the males (55.4%) participated were more aware about the use of memory enhancing plants than the females (44.6%). Oyelakin, (2009) reported that among the Yoruba ethnic group of Nigeria, traditional medicine practice is dominated by males due to secrecy in transmitting the knowledge from generation to generation. This was not different from the report that males are culturally seen as the heirs of family heritage for preservation and continuity with the belief that females leave the family after marriage (Elufioye *et al.,* 2012).

The result (Fig.1) also showed that the artisans and students which are within category of "other occupation" (28%) are less informed about plants used for memory enhancement across the study areas when compare with the herbal practitioners. Also, majority of the middle aged people (31-50) and the elderly ones (51-70), mostly all married (71.2%) were more knowledgeable about traditional medical practice than the younger ones. This is an indication that our indigenous traditional practice is not totally lost among the younger generations. Although there were comments and reports from the respondents of loss of interest in TMP and that there exists an expanding information gap between the older generations and the younger due to differences in lifestyle and career preferences and urban migration therefore leading to unavailability for receiving information (Olatunji *et al.,* 2014, Ogumefun *et al.,* 2015).

Due to the specificity of the objective of this survey, observations gathered from this survey revealed that the knowledge of most of the respondents were inclined more to other forms of herbal medicine like pediatrics, sexually transmitted diseases, food supplements and so on, which this study did not cover. This might be the reason for the discrete number of plants gathered which invariably results to not much variability in the knowledge of the respondents about the mentioned plants used for this purpose among individuals across the three states. The reason may also be that there is a kind of networking in form of knowledge sharing among the TMP across the region covered. *Bacopa floribunda* belonging to family Scrophulariaceae was found to be mostly mentioned among of the memory enhancing plants. The species *Bacopa monniera and B. floribunda* have been reported in Ayurvedic medicine and in traditional treatments for a number of disorders, particularly those involving anxiety, intellect, and poor memory (Cyril–Olutayo *et al.,* 2012, Sigh and Dhawan, 1997). Several other works have established the use of *Bacopa species* and other plants as memory enhancers (Sigh *et al.,* 2010, Sudharani *et al.,* 2011, Deval *et al.,* 2011). Almost the same importance was placed on *Scoparia dulcis* which also belongs to the same family Scrophulariaceae. It was mentioned to be very useful for memory enhancement among Yoruba speaking parts of Nigeria different from this present study area (Cyril–Olutayo *et al.,* 2012, Elufioye *et al.,* 2012). The plant has been reported to show a markedly protective role against lipid peroxidation induced in brain and erythrocytes (Ahmed *et al.,* 2011).

It was also gathered from the field and literature that the plants that stimulate the mind have a peculiarity in the suffix of the syllables of their names (Table 3) which were linked to notions of memory and intelligence. Stimulants belong to different kinds and grades, ranging from mental stimulants 'Isoye' to stimulant of virility, 'aremo', and body stimulants, 'marale or mu ara le', all interpreted in Yoruba language (Fatumbi, 1995). There are also stimulants which are able to make people crazy, antidotes that protect against craziness and remedies that cure craziness. Other stimulants includes those linked to notions of memory and intelligence: 'ye', to understand (recipe from *Spondias mombin, Bacopa floribunda*), 'mo', to know 'ran or ranti', to remember, 'gbo', to hear, (recipe from *Perquitenia nigeriscence*) 'gbon', to be wise among which majority of the plants listed in Table 2 belongs. The fact that many of the practitioners could not explain why in many cases two or more plants or plant parts are used jointly makes it difficult to be sure which plant or part actually

responsible for the memory enhancement. According to the respondents, the challenge faced is that many of these plant species are being sourced from the wild and they are becoming scarce as a result of over exploitation, urbanization and industrialization of these areas. Soladoye *et al.*, 2006, recommended that the vulnerability of medicinal plants to over exploitation and extinction needs to be dealt with seriously. Issues relating to the conservation of these medicinal plants should be addressed by the government and non-governmental organizations. Conservation methods such as *In-Situ* and *Ex-Situ* should also be adopted to protect our natural biodiversity.

CONCLUSION

This study has revealed that ethno-medicinal practices are well accepted by the people of the mentioned areas. Information made available by the respondents revealed that the use of these plants for the purpose of memory enhancement are limited in number but preserved and unaltered as inherited from their forefathers and may likely continue to remain in the future if properly documented and conserved. It is suggested that an enduring and sustainable conservation efforts be put in place by the community and government to safeguard these important medicinal plants as no curiosity to know about more of these kinds of rare plants. Although the acclaimed properties of these plants cannot be scientifically verified there is need to validate the traditional believe in the use of the plants for brain enhancement (*Oogun Isoye*). As a matter of fact, if the plants really have enhancement effect on a normal person especially adult, it should definitely have a positive effect on a person suffering from cognitive disease like Parkinson disease or Alzeimer disease.

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