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Ethno- medicinal and Conservation Studies on the Indigenous Vegetables in Akinyele Local Government Area of Oyo State, Nigeria

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Abstract: *The ethno- medicinal and conservation status of indigenous vegetables in Akinyele Local Government Area (LGA) of Oyo State, Nigeria were examined with a view to evolving strategies that will conserve them. A combination of social surveys and direct field observations was used. Farm and market surveys were conducted. Five farm settlements and three major markets were used. 10 each of farmers and vegetable vendors were randomly selected and interviewed with aid of semi-structured questionnaire matrix to obtain information on the vegetables in the farms and those sold in the markets. Results obtained suggested the existence of gender specificity in agricultural activities in the study area. Women were responsible for the cultivation, harvest and haulage of vegetables. A total of 33 vegetables belonging to 18 families were identified in the study area. 21 were sampled in farm settlements and markets, 11 in farm settlements only and 1 in market only. Not all the identified vegetables have been utilized as source of income. The family Amaranthaceae has the highest number of species and their ecological success may be attributed to the fact that they are mostly herbs, a few shrubs, under-shrubs, annual or perennial with efficient tap root system and adaptation to varieties of soil. The vegetables were sourced from diverse habits including herbs, shrub and trees. The leaf constituted the major part used for vegetables. All identified vegetables were rich in phytochemicals and used to manage an array of diseases. Strategies that could enhance continuous supply of the vegetables were proposed.*
Keywords: *ethno-medicine; conservation; indigenous vegetables; Nigeria*

I. Introduction

Ethnobotany is the study of how people of a particular culture and region make use of indigenous plants. Thus it is the study of the interrelationship between plant and people. It is considered to encompass all studies which concern the mutual relationship between plants and traditional people (Cotton and Cox, 1996; Balick 1996). Hence it involves the documentation of the uses of local flora in the environment used for medicines, food, energy, construction and as raw materials.

An important group of plants used as food are the vegetables. Vegetables are parts of plants or food that are consumed by humans or other animals as food. It is an edible plant matter, including the flowers, fruits, stems, leaves, seeds (Omale and Ugwu, 2011). They are the fresh and edible portions of herbaceous plants, which can be eaten raw or cooked (Dhellot *et al.*, 2006). They contain both essential and toxic elements over a wide range of concentrations (Okorondu *et al.*, 2013) which can be successfully utilized to build up and repair the body as well as maintain alkaline reserve of the body (Okolo *et al.*, 2015).

Vegetables also act as buffering agents for acidic substances produces during the digestion process (Badau et al., 2013, Kayode et. al. 2020). They are cheap and most readily available source of protein, minerals and essential amino acids (Aja et al., 2010; Olaposi and Adunni, 2010; Saramma and Padmaja, 2013).

Vegetables make up a major portion of the diet of humans in many parts of the world and play a significant role in human nutrition, especially as sources of phyto nutriceuticals, vitamins (C, A, B_1, B_6, B_9, E), minerals, dietary fibers and phytochemicals (Dias and Ryder, 2011). Some phytochemicals of vegetables are strong antioxidants and are thought to reduce the risk of chronic diseases by protecting against free-radical damage, modifying metabolic activation and detoxification of carcinogens or ever influencing processes that alter the course of tumor cells (Southern 2000). They also serve as medicine for the treatment of some diseases. Some are used in traditional medicine for weight management in reducing the risk of cancer and heart diseases and also to improve immune function (George *et al.*, 2004; Chaturvedi *et al.*, 2007). Hyson (2002) reported that the consumption of vegetables in the daily diet have been strongly associated with overall good health, reduced risk for some forms of stroke, diabetes, anemia, gastric ulcer, rheumatoid arthritis and other chronic diseases. Also, Mullie and Clarys (2011) noted that a high vegetable diet has been associated with lower risk of cardiovascular diseases in humans.

Vegetables constitute the main portion of the diets of rural and urban households across Africa, particularly in Nigeria, where the daily diet is dominated by starchy staple foods, the leafy vegetables are the cheapest and most readily available sources of important proteins, vitamins, minerals and essential amino acids (Aja *et al.*, 2010; Olaposi and Adunni, 2010; Saramma and Padmaja, 2013; Adjatin *et al.*, 2013). Some of them are cultivated while some grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently of direct human action (Heywood, 1999; Kayode *et al.*, 2020), that is, they grow as wildlings.

Recent initiatives revealed that rapid changes in land use, modernization of agricultural practices, deforestation and adoption of new varieties have narrowed genetic base of the indigenous vegetables and have contributed to the rapid disappearance of many cultivated and the wild species (Amujoyegbe *et al.*, 2007), the conservation of the indigenous species is of upmost concern (Gockowski *et al.*, 2003) to vegetation scientists, nutritionists and ecologists.

Consequent on the above, the study being reported here identified and documented the indigenous vegetable species in Akinyele Local Government Area of Oyo State, Nigeria, their ethno-medicinal values and abundant status. It aimed to identify the rare species and propose sustainable strategies that would conserve them in the study area.

II. Research Methods

2.1 The Study Area

The study was conducted in Akinyele Local Government Area (LGA) of Ibadan, Oyo State Nigeria (Figs. 1, 2). It has an area of 518km^2 and a population of 105, 594 males and 106, 217 females (NPC, 2006). Its geographic coordinates are 7°23' 47" N and longitude 3°55' 0" E (Efenakpo *et. al.* 2016). Inhabitants were mostly farmers that cultivate vegetables among other crops.

2.2 Methods

A combination of social surveys and direct field observations (after Lipp 1989) was used in this study. Farm and market surveys were conducted. Five farm settlements were selected randomly within the LGA. These settlements were Aba- Onidundu, Ajibode, Balogun-Ibikunle, Laniba and Onidundu. Also 3 major markets in the LGA were used for the study. These markets were Bodija, Ojoo and Sango markets. In these markets both agricultural and non-agricultural goods were sold.

In each settlement and market, 10 farmers and 10 vegetable vendors were randomly selected respectively and interviewed with aid of semi-structured questionnaire matrix to obtain information on the cultivated and non-cultivated vegetables in the farms and vegetables sold in the markets respectively. Information most sought from the farmers were most on the indigenous technical knowledge on the production of the identified vegetables in the study area while information sought from the vendors was centered on the ethnomedicinal and nutritional values of the identified vegetables.

Figure 1. *Map of Nigeria showing, Ibadan, Oyo State, Nigeria*

Figure 2. *Map of Oyo State showing the study area.*

Also during the survey, information obtained included the names of the vegetables, their cultivation status, the part(s) consumed, their cultivation status, and abundance. The indigenous, medicinal and nutritional values were also obtained. Voucher specimens of the identified vegetables were obtained, photographed and taken to the Herbarium of the Department of Plant Science and Biotechnology, Ekiti State University for authentication.

Group interviews were conducted during the farm and market surveys. This was done to obtained group consensus on the information provided during the individual interviews described above (Ajayi *et. al.* 2020). Three group interviews were conducted in each of the farm settlements and the market used in this study. Key informants, made up of health officers in the LGA were identified and interviewed. Secondary information was obtained from records, journals and web (internet). The data obtained were analyzed using descriptive statistics.

III. Results and Discussion

The results obtained revealed that the bulk of the respondents in this study, in both farm settlements and markets used, were women (78% and 100% respectively, Table 1). It was observed during the field surveys that most men approached to serve as respondents declined voluntarily once the issues of vegetables were raised. This tends to suggest the existence of gender specificity in agricultural activities in the study area. Information revealed that most vegetables were cultivated when farms were being prepared. While men were concerned with making heaps, the women immediately broadcast vegetable seeds of their choices. Women were also identified as being responsible for harvesting and haulage of vegetables for sale. These assertions stipulated that women were actively involved in vegetable production, harvesting and marketing in the farm settlements used in this study. Study by Nakwe et. al. (2018) made similar observation.

Table 1. Socio-economic classification of respondents in Akinyele Local Government Area of Oyo State, Nigeria

Feature	Description	Proportion (%) of Respondents*	
		Farm Settlements (n = 50)	Markets (n = 30)
Gender	Male	22	0
	Female	78	100
Age (Yrs)	20-40	32	10
	41-60	58	73
	> 60	10	7
Marital Status	Single	18	3
	Married	82	97
Educational Status	Literate	52	78
	Illiterate	48	12
Religion Status	Christian	72	43
	Muslim	28	57

* n = Number of respondents

The respondents were diverse in age (mostly adults), marital, educational and religious status. They were observed to be versed on issues relating to vegetables thus suggesting that the socio-economic classifications were not pre-requisites to their knowledge on vegetables. A number of studies, such as Ayeni et. al. (2018), Raaijmakers et. al. (2018), Ajayi et. al. (2020) and Kayode et. al. (2020) have previously subscribed to this assertion.

Table 2 shows that a total of 33 indigenous vegetables belonging to 18 families were identified in the study area. 21 of these vegetables were sampled in the farm settlements and markets (F&M, Table 2), 11 in Farm settlements only (F, Table 2) and 1 in market only (M, Table 2). This suggests that not all the identified indigenous vegetables have been utilized as source of income hence some of these vegetables were untapped economic potential. Most of these yet to be commercialized vegetables were those from trees. Field observation revealed that residents of the study area often pilfer the tender leaves of these trees. Study by Taylor and Moss (1982) revealed that many indigenous vegetables have potential for commercial exploitation and production for human consumption The sampling limitation of *B. ferruginea* to the markets only could be attributed to its source, usually from debarked stems and its economic returns as commercialized product. Its recognition in the farm settlements might have been hindered as field surveys emphasized cultivation, harvesting and haulage to the points of sale.

The family Amaranthaceae has the highest number of species (5, Table 2). The families Asteraceae, Malvaceae and Solanaceae, each has 4 species each. Family Euphorbiaceae has 2 species while others possessed a species each (Table 2). The ecological success of members of the family Amaranthaceae may be attributed to the fact that they are mostly herbs, a few shrubs, under-shrubs, annual or perennial with efficient tap root system (Yashasvi 2020). They are medicinal and adapt to varieties of soil (Mersha et. al. 2016).

The identified vegetables were sourced from diverse habits. 18 (55%, Table 2) of the vegetables were herbs, 11 (33%) were trees and 4 (12%) were shrubs. The leaves and stems of 52% (L&S, Table 2), leaves only (L, 33%), Leaves and fruits (L&F, 9%), Fruits only (F, 3%) and stem only (S, 3%) of the identified species were consumed as vegetables. Thus the leaves constituted the part mostly used for vegetable in the study area. This observation lends credence to earlier reports of Kebede *et al*. (2017) and Kayode *et al*. (2020). Though most of the identified vegetables were cultivated (26 species [79%], Table 2), 10 of the cultivatable species, also grow as wildlings in the study area. Ogunrotimi et. al. (2018)

The perception of the respondents on the medicinal values of the identified vegetables revealed a wide array of diseases were either cure or manage with the vegetables (Table 3). The utilizations of the vegetables for these diseases were more of preventive than curing. Numerous studies, such as Chaturvedi *et al.* (2007), reported the medicinal use of vegetables for numerous health reasons. Secondary information used in this study revealed that the identified vegetables are rich in phytochemicals (Table 4) which have significant effects on the health and nutrition of humans (Hai Liu 2004). Phytochemicals are nonnutritive, naturally occurring biochemicals (Tiwari et.al. 2013; Shuruq et. al. 2017). Recent initiative now revealed that people from all around the world are depending on medicinal plants that contain phytochemicals for their health care needs as these plants result in lower adverse side effects compared to synthetic drugs as well as their immense health effects on human body that associated with assisting in reducing the risk of having certain chronic diseases. Carotenoids, organosulfur compounds, curcumin, phytosterols and flavonoids are different types of phytochemicals that found in these plants that have a wide range of therapeutic indications with a great variety of biological properties such as antioxidant, provitamin, antibacterial, antiviral, anticancer and anti-inflammatory activities (Nyamai 2016; Shuruq et. al. 2017).

Table 2. Checklist of indigenous vegetables identified in Akinyele Local Government Area of Oyo State, Nigeria

S/n	Name of the identified vegetable			Family	Part(s) Used	Habit	Cultivation Status	Sampling Area
	Botanical	Common	Vernacular					
1	*Abelmoschus esculentus* (L.) Moench	Okra	Ilasa/Ewe Ila	Malvaceae	L & F	H	C	F & M
2	*Amaranthus dubius* Mart ex Thell	Red amaranth	Teteabalaye/Atetedaye	Amaranthaceae	L & S	H	U	F & M
3	*Amaranthus spinosus* L.	Spiny amaranth	Dagunro	Amaranthaceae	L & S	H	U	F
4	*Amaranthus viridis* L.	Green amaranth	Arowojeja	Amaranthaceae	L & S	H	C	F & M
5	*Anacardium occidentale* L.	Cashew	Jebele/Odo cashew	Anacardiaceae	L	T	C	F & M
6	*Basella alba* L.	Malabar spinach	Amunututu/Gbagana/Popo/Safara	Basellaceae	L & S	H	C/U	F & M
7	*Bridelia ferruginea Benth*	Bridelia	Ira	Phyllanthaceae	S	S	U	M
8	*Ceiba pentandra* (Linn) Gaertn	Kapok tree	Egigun	Malvaceae	L	T	U	F
9	*Celosia argentea* L.	Lagos spinach	Shoko/Sokoyokoto	Amaranthaceae	L & S	H	C	F & M
10	*Celosia leptostachya* Benth	Wool flowers	Ajefawo/Ajemawofo	Amaranthaceae	L & S	H	C	F
11	*Cnidoscus acontifollus* (Mill)	Tree spinach	Iyana ipaja	Euphorbiaceae	L & S	S	C	F
12	*Colocasia esculenta* Taro.	Taro plant or Red stem Rhubarb	Odokoko pupa/Omunu kokopupa	Araceae	L	H	C/U	F
13	*Corchorus olitorius* L.	Jute mallow	Eweedu	Malvaceae	L	H	C/UC/U	F & M
14	*Crassocephalum cecropidiodes* (Benth) Somoore	Fireweed	Ebolo/Ebire	Asteraceae	L & S	H	C	F & M
15	*Erigeron floribundus* Kunth	Fleabane	Olowonjeja	Asteraceae	L & S	H	U	F & M
16	*Hibiscus sabdariffa* L.	Roselle	Shapa/Isapa	Malvaceae	F	H	C	F
17	*Launeae taraxacifolia* (wild). Amin	Wild lettuce	Yanrin/Efo gbenuoke	Asteraceae	L & S	H	C/U	F & M
18	*Manihot esculentus* crantz	Tender leaf of cassava	Odo ege/Jebele ege	Euphorbiaceae	L	S	C	F & M
19	*Moringa oleifera* Lam.	Moringa/Drumstick tree	Adagbamalero/Ewe ile/Ewe-igbale	Moringaceae	L & F	T	C	F & M
20	*Ocimum basilicum* L.	Sweet basil	Ewe curry/Efinrin wewe	Lamiaceae	L	H	C	F & M
21	*Ocimum gratissimum* L.	African basil	Efinrin	Lamiaceae	L & S	H	C	F & M
22	*Pergularia daemia* (Forssk-chiov)	Trellis-vine	Efo dede	Apocynaceae	L & S	H	C	F
23	*Piper guineense* schum	West African Pepper	Uziza/Iyere	Piperaceae	L	H	C	F & M
24	*Senecio biafrae* Olive and Hiern	English spinach	Worowo	Solanaceae	L & S	H	C/U	F & M
25	*Sesamum radiatum* Schum & Thonn	Vegetable sesame	Eku/Aparun	Pedaliaceae	L	H	C/U	F
26	*Solanum macrocarpon* L.	African eggplant	Gbagba/Papantako	Solanaceae	L & F	H	C	F & M
27	*Solanum nigrum* L.	Black night shade	Odu	Solanaceae	L & S	H	U	F & M
28	*Solanum scabrum* Mill	Garden huckleberry	Ogunmo	Solanaceae	L & S	H	C	F
29	*Talinum triangulare* Jaca wild	Waterleaf	Gbure	Portulaceae	L & S	H	C/U	F & M
30	*Telfairia occidentalis* Hook F.	Fluted Pumpkin	Ugu/Apiroko	Cucurbitaceae	L & S	H	C	F & M
31	*Thaumatococcus daniellii* (Benn.) Benth	Miracle fruit	Ewe ojuku/Eran	Marantaceae	L	H	C	F
32	*Triplochiton scleroxylon* K. Schum	African white wood or Obeche	Odo igi arere	Sterculiaceae	L	T	U	F
33	*Vernornia amygdalina* Del.	Bitter leaf	Ewuro/Efo amunise	Asteraceae	L	S	C/U	F & M

Table 3. Respondents' perception of the medicinal values of vegetables identified in Akinyele Local Government Area of Oyo State, Nigeria

S/n	Ethno-medicinal Value	Vegetables
1	Aid defecation, have laxative properties	*A. esculentus, A. dubius, A. viridis, A. occidentale, C. argentea, C. cecropidiodes, H. sabdariffa, M. oleifera, T. triangulare.*
2	Aids healing after surgical operation i.e. after severe operation	*C. olitorius.*
3	Anti-stress/Reduce stress	*H. sabdariffa.*
4	Blood cleanser/ prevents blood clotting	*C. argentea, P. guineense, T. scleroxylon.*
5	Boost blood/Supply blood to the body	*A. esculentus, A. dubius, A. viridis, B. alba, C. argentea, C. esculenta, C. olitorius, C. cecropidiodes, E. floribundus, O. basilicum, P. guineense, S. biafrae, S. radiatum, S. macrocarpon, S. nigrum, T. triangulare, T. occidentalis, V. amygdalina.*
6	Charm neutralizer/Neutralizing charm or spiritual attack	*L. taraxacifolia*
7	Contain antibacterial property or anti-inflammatory or anti bacteriocidal or antidiabetic.	*A. esculentus, L. taraxacifolia, O. gratissimum, V. amygdalina.*
8	Control weight loss	*C. cecropidodes*
9	Cure cough	*A. occidentale.*
10	Cures back pain	*O. basilicum.*
11	Cures body pain/pain reliever	*C. esculenta, M. oleifera.*
12	Cures dysentery	*O. gratissimum.*
13	Cures erectile dysfunction or hypotense	*V. amygdalina.*
14	Cures loss of appetite	*V. amygdalina.*
15	Cures malaria	*A. occidentale, L. taraxacifolia, M. oleifera, O. gratissimum, V. amygdalina.*
16	Cures mouth odour	*A. occidentale.*
17	Cures pile	*O. basilicum, O. gratissimum, M. oleifera*
18	Cures sour throat	*A. occidentale.*
19	Cures stomach ache	*A. esculentus, M. esculentus, M. oleifera, O. gratissimum.*
20	Cures swollen breast	*L. taraxacifolia.*
21	Cures Typhoid	*A. occidentale, C. olitorius.*
22	Enhance good sight	*O. gratissimum, V. amygdalina.*
23	Enhance sound health	*P. guineense.*
24	Fight diseases/protect the body	*A. viridis, B. ferruginea, C. olitorius, S. radiatum, T. triangulare, V. amygdalina.*
25	For safe/Easy delivery/Smooth delivery	*C. olitorius, S. radiatum, T. triangulare.*
26	Lowers blood pressure/treat hypertension	*B. alba, C. cecropidiodes, S. biafrae, S. macrocarpon, S. nigrum, V. amygdalina.*
27	Prevent Anaemia	*C. olitorius.*
28	Prevent cancer (colon cancer)	*T. triangulare.*
29	Prevent stroke	*S. macrocarpon.*
30	Smoothening of the body/Cures rashes.	*M. esculentus, T. occidentalis.*
31	Treatment of constipation	*L. taraxacifolia, S. biafrae, S. macrocarpon.*
32	Treatment of measles	*L. taraxacifolia, V. amygdalina.*

Table 4. Phytochemical constitutents of the identified vegetables in in Akinyele Local Government Area of Oyo State, Nigeria

S/n	Vegetables	Phytochemical constituents
1	*Abelmoschus esculentus*	Tannins, terpenoids and glycosides.
2	*Amaranthus dubius*	B-carotene, Thiamin, riboflavin, niacin, ascorbic acid.
3	*Amaranthus spinosus*	Flavonoids, tannins, saponins, glycosides.
4	*Amaranthus viridis*	Thiamine, riboflavin, niacin, ascorbic acid.
5	*Anacardium occidentale*	Alkaloids, saponins, tannins, anthraqinones, flavonoids and cardiac glycosides.
6	*Basella alba*	Alkaloids, cardiacglycosides, flavonoids, saponins, tannins, pentoses and carbohydrates
7	*Bridelia ferruginea*	Alkaloids, flavonoids, tannin, cardiac glycosides, anthraquinone, phlobatinnin and saponins.
8	*Ceiba pentandra*	Alkaloids, cyanogenic glycosides, flavonoids, phenols, saponin, steroids, tannin
9	*Celosia argentea*	Alkaloids, cellulose, flavonoids, phenols, steroids, starch, terpernoids, tannins,
10	*Celosia leptostachya*	Alkaloid, steroids, cardiacglycosides, tannins and flavonoids.
11	*Cnidoscus acontifollus*	Alkaloids, cyanodenicglycosides, flavonoids, phenols, saponnins, steroids, tannins.
12	*Colocasia esculenta*	Alkaloid, flavonoids, tannins.
13	*Corchorus olitorius*	Alkaloid, flavonoid, saponin, tannin, inulin.
14	*Crassocephalum cecropidiodes*	Tannins, alkaloid, flavonoids,
15	Erigeron floribundus	Alkaloids, flavonoids, saponnin
16	*Hibiscus sabdariffa*	Alkaloids, tannins, saponnins, glycosides, phenols and flavonoids.
17	*Launeae taraxacifolia*	Cardiacglycosides, flavonoids, saponnins, steroids, tannins,
18	*Manihot esculentus*	Alkaloids, anthraquinones, anthrocyanosides, cardiacglycosides, flavonoids, phlobatinnins, saponins, tannin.
19	*Moringa oleifera*	Phenolic acids, flavonoids, alkaloids, phytosterols.
20	*Ocimum basilicum*	Hexadecanoic acid, heta-9,10,11-trienoic acid, octadecenoic acid, heptadecane, eicosane aldehyde and octadecyl vinylether.
21	*Ocimum gratissimum*	Alkaloid, flavonoid, saponin, tannin, inulin.
22	*Pergularia daemia*	Cardenolides, alkaloids, triterpenes and saponins.
23	*Piper guineense*	Alkaloids, tannins, saponnins, flavonoids, phenols.
24	*Senecio biafrae*	Alkaloid, flavonoid, saponin, tannin
25	*Sesamum radiatum*	Alkaloids, flavonoids, phenols, saponnins, tannins.
26	*Solanum macrocarpon*	Alkaloid, flavonoid, saponin, tannin.
27	*Solanum nigrum*	Alkaloid, saponins, tannins, flavonoides, protein.
28	*Solanum scabrum*	B-carotene, ascorbic acid, methionine.
29	*Talinum triangulare*	Alkaloids, flavonoids, saponnins, tannins.
30	*Telfairia occidentalis*	Alkaloids, flavonoids, phenols saponins, tannins
31	*Thaumatococcus daniellii*	Flavonoids, polyphenols, alkaloids and saponins
32	*Triplochiton scleroxylon*	Carbohydrate, saponins, tannins, steroids, flavonoids and phlobatannins.
33	*Vernornia amygdalina*	Alkaloids, flavonoids, saponin, inulin.

IV.Conclusion

The documentation of ethnobotanical knowledge of indigenous vegetables among the various ethnic groups and across different vegetation is now necessary for their sustainable utilization that will take care of the need of the present generation while maintaining their potentials to cater for the future generations. Field observation in this study revealed a rapid conversion of the vegetation to housing and industrial estates. These anthropogenic factors will have untoward effects on the non-cultivated vegetables identified in this study. Public awareness to arouse the consciousness of the populace to this development should be embarked upon now. This will, no doubt, sustain the cheap means of maintaining good health through the consumption of vegetables.

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