ETHNOBOTANICAL STUDIES OF TRADITIONAL LEAFY VEGETABLES AND SPICES OF EBONYI STATE, NIGERIA: POTENTIALS FOR IMPROVED NUTRITION, FOOD SECURITY AND POVERTY REDUCTION

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ABSTRACT

Traditional leafy vegetables represent inexpensive but high quality nutritional sources, for the poor segment of the population especially where malnutrition is wide spread. The objectives of this research were a) to identify and document the traditional leafy vegetables and spices of Ebonyi State, and b) to assess their nutritional values with a view of enhancing their selection as components of cooked food. Market and field surveys were carried out for traditional leafy vegetables and spices in three major clans in Ebonyi North senatorial zone, Ebonyi State: Izzi, Izhia and Ngbo clans. Informal interviews were also conducted with some indigenes on the vegetables and spices identified, including where, when and how they were obtained for sale in the markets. Finally, proximate and Mineral content analysis of three of the traditional leafy vegetables was done to know their nutritional as well as mineral content. Results identified twenty-seven traditional leafy vegetables and five spices from 23 plant families. 46.7 % of the plant collections were seen and collected from the wild, while 40 % were cultivated. 33.3 % of the leafy vegetables were tree species, 30 % were herbaceous plants, and 23 % were climbers, while 13.3 % were shrubs. 60 % of the species were propagated by seed, while 36.7 % were propagated by vegetative means. The parts consumed were mainly the leaves (76.7 %), the stem, flower and the seeds. 40 % of the materials collected were major income earners for the rural populace, 36.7 % earned some income, although small, while 23.3 % had the potential of being transformed into large scale income earner. Results also indicated that three of the vegetables analysed were good sources of micro-nutrients. Their calcium content ranged between 54.06 - 90.10 mg/100 g, while zinc and lead which are antioxidants were absent. The ash content of the three plants ranged from 8.10 - 6.30 %, while protein ranged from 5 – 10 % of fresh weight or 13 - 30% for dry weight. Their fiber (roughage) content was high and will promote digestion and prevent constipation when consumed.

Keywords: Ethnobotanical, Leafy vegetables, Spices, Nutrition, Food security, Poverty reduction

INTRODUCTION

Vegetables are important protective foods, which are highly beneficial for the maintenance of good health and prevention of diseases. They contain valuable food nutrients, which can be successfully utilized to build up and repair the body. They are rich sources of carotene,

ascorbic acid, riboflavin, folic acid and minerals like calcium, iron and phosphorous (Sheela *et al.,* 2004; Nnamani *et al.,* 2010). In nature there are many underutilized traditional leafy vegetables of promising nutritive values, which can nourish the ever-increasing human population. Traditional leafy vegetables are vegetables of a locality which originated from an area and may or may not be confined to that particular region (Guarino, 1997). They account for about 10% of the world higher plants often regarded as weeds. Some of them grow in the wild and are readily available in the field as they do not require any formal cultivation (Nnamani *et al.,* 2008). Many of them are resilient, adaptive, and tolerate adverse climates (Raghuvanshi and Singh, 2001). Although, they can be raised comparatively at lower management cost even on poor marginal lands, they have remained underutilized due to lack of awareness and popularization of technologies for their proper utilization (Chweya and Eyzaguirre, 2002; Odhav, 2007).

Agriculture is a heritage occupation of the people of Ebonyi State, especially those of the Izzi and Ngbo/Izhia clan. Notwithstanding, stunting growth and deficiency of some micronutrient (vitamin A, iron, iodine and zinc) are prevalent. The World Health Organization (1992) reported that chronic under nutrition affects over 200 million people or 42% of the population in Sub-Sahara Africa. The long-term malnutrition problem of the poor nations cannot be solved by food aid or food trade with the affluent countries but rather by the adequate utilization of indigenous plant foods (Ihekoronye and Ngoddy, 1985). This is because traditional food resources can make substantial contribution in meeting the nutritional needs of the population, especially the low income group and particularly in times of seasonal scarcity (Okeke *et al.,* 2008).

Traditional leafy vegetables represent inexpensive but high quality nutritional sources, for the poor segment of the population especially where malnutrition is wide spread. Even though the bulk of their weight is water, leafy vegetables represent a veritable natural pharmacy of minerals, vitamins and phytochemicals (George, 2003). For example, the potassium content of leafy vegetables is good in the control of diuretic and hypertensive complications, because it lowers arterial blood pressure. The fiber content of vegetables contribute to the feeling of satisfaction and prevents constipation (Noonan and Savage, 1999), while the proteins in vegetables are superior to those found in fruits, although inferior to those found in grains and legumes (George, 2003). Characterization of the species is the first and most important step in understanding the entire food system of indigenous peoples (Okeke *et al.,* 2008). Increasing pressure caused by human activities is continually disrupting the existence, balance and natural regeneration of bioresources, with the result that some of the traditional leafy vegetables are already endangered. This gradual loss of genetic diversity may deprive future generations with useful resources for the enhancement of their health (Ayodele, 1996). Documentation of the wild and cultivated fruits and vegetables in some parts of Nigeria has been made (Okafor, 1975; Dania-Ogbe *et al.,* 2001), but none has been done for Ebonyi State, Nigeria.

The aims of this research were to: (i) identify and document the traditional leafy vegetables and spices of Ebonyi State and (ii) assess their nutritional values with a view of enhancing their selection as components of cooked food, thereby improving the nutritional statuses of both rural and urban dwellers.

MATERIALS AND METHODS

Plant Collection and Identification: Market surveys were carried out for traditional leafy vegetables and spices in two major clans in Ebonyi North senatorial zone, Ebonyi State: Izzi, Ezza and Ngbo/Izhia communities. Major markets in these clans were targeted: Nwakpu, Iboko, Iziogo, Nwaida and Nkwagu in Izzi clan and Eke Izhia, Okwor and Affia opfu (Odeatang Akpaka) in Ngbo/Izhia clan. The traditional leafy vegetables and spices on sale in these markets were recorded. Informal interviews were conducted with some of the marketers as to the variety of vegetables, where, when and how they are obtained for sale in the markets.

At other times, field surveys were carried out in at least three villages each in the three communities under study.

The researcher went into the farms and forests with at least two villagers for observations on the habits and forms of the plants. Identification of plants was done in the fields and markets. Plants that could not be readily identified were carried to the curator in the herbarium at the Department of Botany, University of Nigeria, Nsukka. Vouched specimens were deposited in the herbarium. Authorities for some of the species were sited from (Keay, 1989; Inyang, 2003).

Proximate analysis: Freshly harvested leaves of *Zanthoxylum zanthoyloides* Herms (Hercules club, 'Nka'), *Vitex doniana* Sweet (Black plum, 'Uchakuru') *and Adenia cissamploides* Zepernick, (Planch, 'Isororo') were collected from Izzi area of Ebonyi State and washed, cut and oven dried at 90°C for 6 h. The dried leaves were pulverized, packaged in airtight sterile bottles, labelled and stored in a refrigerator until used. The chemical analysis of percentage crude protein, crude fiber, moisture, ash, fat and carbohydrate were carried out using methods described by Pearson (1976). The crude protein was obtained by determining the organic nitrogen content of the sample using micro-Kjeldah method and multiplying the nitrogen by a protein conversion which is usually 6.25. The ash content of the leaves was estimated by igniting the weighed sample in the weighed crucible at a temperature of 500°C for about 3 h in a muffle furnace, while the moisture content was determined using oven method. The crude fiber and fat determination were done by hydrolyzing the sample with 0.128 ml of H2SO4 and 0.223 ml of KOH and Soxhlet extraction method, respectively. The carbohydrate content was determined by their difference.

Mineral Content Analysis: The mineral contents of the plant leaves, namely, Ca, Mg, Cu, Mn, Pb, P, Zn, were determined using dry ashing procedure as described by Association of Agricultural Chemists (AOAC, 1990). About 2 g of the sample was pre-ashed in a crucible for 1 - 2 h until the sample was completely charred on a hot plate. The pre-ashed sample was then placed on a muffle furnace and ashed at 500°C for about 3 h or until the ash was white.

After ashing the sample was cooled and weighed. This was transferred into a 50 ml volumetric flask by carefully washing the crucible with 5 ml of 30% HCl. The solution was diluted to volume with iodized water. The solution was then used for individual mineral determination using spectrophotometer and flame photometer.

RESULTS AND DISCUSSION

Traditional Leafy Vegetables and spices of Ebonyi State of Nigeria: Twenty-seven traditional leafy vegetables and five spices were identified and documented from the two clans studied. The scientific names, families, local and English names of the varieties, and their source localities were recorded (Table 1). The vegetables and spices belonged to 23 plant families including Pipilionaceae, Cucurbitaceae, Tiliaceae, Moraceae etc.

Leafy vegetables constituted 83.3 % of the plant collected, 10 % were spices, while 6.6 % could be used both as a vegetable or a spice. Out of these plants, 46.7 % are seen and collected from the wild, while 40 % are cultivated (Table 2). Among the cultivated species, 43.3 % are cultivated in compound farms (backyard gardens), 20 % in outlying farms, and 6.6 % still seen in the wild.

Leafy vegetables from tree species constituted 33.3 % of the plant collected, 30 % were herbaceous plants and 23 % were climbers, while 13.3 % were shrubs. 26 % of the plant materials identified are threatened, including *Newbualdia leavis* (P.Beauw) Seemann Bureau (Family Bignoniaceae), *Ipomoea aquatica* Forsk (Family Convolvulaceae), *Lecaniodiscus cupaniodes* (Family Sapindaceae), *Zanthoxylum zanthoxyloids* Lam (Family Rutaceae), *Occimum gratissimum* L. (Family Tiliaceae), *Piper guinensis* Schum and Thonn (Family Piperaceae), *Gongronema latifolia* Benth (Family Asclepiadaceae) and *Monodora myristica* (Family Annonaceae). Sixty (60) % of the plant species are propagated by seed, while 36.7 5 are propagated by vegetative means.

Table 1: Traditional Leafy Vegetables and spices of Ebonyi State of Nigeria

S/N	Scientific Name	Family	Local Name	English Name	Source
1	***Abelmoschus esculentus*(L)Monench**	Malvaceae	Okro, opfhuru	Ladies finger	Izzi, Ngbo/Izhia
2	***Adenia cissampeliodes***	Passifloraceae	Isororo	Planch,	Izzi
3	***Amaranthus spinosus* L.**	Amaranthaceae	Inene	Thorny pigweed, spiny amaranth	Izzi, Ngbo/Izhia
4	***Bombax bounopozense* L. Gaertn.**	Bombacaceae	Apkuto	White silk cotton	Izzi
5	***Capiscum frutescens* L.**	Solanaceae	Ekwuigbapu, akpoko	African pepper	Izzi, Ngbo/Izhia
6	***Citrullus vulgaris* Schrad var Colocynthis Lin O. Ktze**	Cucurbitaceae	Egusi, Ahu	Wild grourd Melon	Izzi, Ngbo/Izhia
7	***Colocasia exculentus* L.**	Araceae	Opoto nkashi	Cocoa yam	Izzi, Ngbo/Izhia
8	***Corchorus olitorius* L.**	Tiliaceae	Arira	Bush Okra	Izzi
9	***Cucurbita pepo* L.**	Cucurbitaceae	Ugboma	Pumpkin	Izzi, Ngbo/Izhia
10	***Ficus capensis* Thunb.**	Moraceae	Ekwuakpuru	Fig	Izzi, Ngbo/Izhia
11	***Ficus ottoniifolia***	Moraceae	Ekwuogbu	Hedge fig	Izzi, Ngbo/Izhia
12	***Gongronema latifolium* Benth**	Asclepiadaceae	Utamashi	Swallow apple, Sodom apple	Izzi
13	***Ipomoea aquatica Forsk***	Convolvulaceae	Ekwuuda	Swamp mor.glory	Izzi
14	***Ipomoea batatas (*L.) Lam.**	Convolvulaceae	Ekwoku	Sweet Potato	Izzi
16	***Lecaniodiscus cupaniodes***	Sapindaceae	Ukpocha	-	Izzi, Ngbo/Izhia
17	***Monodora myristica* Gaertn Dunal**	Annonaceae	Ehuru	Calabash Nutmeg	Izzi, Ngbo/Izhia
18	***Moringa olerifera* Lam**	Moringaceae	Ekwuesisa	Drum stick plant	Izzi, Ngbo/Izhia
19	***Newbualdia leavis* (P.Beauw) Seemann Bureau**	Bignoniaceae	Omirima	Boundary tree	Izzi
20	***Nuaclea diderrichii* (DeWild &Th. Due.) Merrill**	Rubiaceae	Uvuru	Opepe	Izzi
21	***Occimum gratissimum* L.**	Tiliaceae	Ahunji	Tea bush	Izzi, Ngbo/Izhia
22	***Piper guinensis* Schum &Thonn**	Piperaceae	Uzuza	Guinea blackpepp	Izzi, Ngbo/Izhia
24	***Pterocarpus santalinoides L, Herit ex D C***	Papilionaceae	Uturupka		Izzi, Ngbo/Izhia
25	***Pterocarpus soyauxii* Taub.**	Papilionaceae	Oha, Adudu	African padauk	Izzi
26	***Senna occidentalis* Linn**	Caesalpinaceae	Oshigbuomma	Negro Coffee	Ngbo/Izhia
27	***Solanum nigrum* Linn**	Solanaceae	Igbagba, anara	Black nightshade	Izzi, Ngbo/Izhia
28	***Talinum triangulare* Willd**	Portulacaceae	Ngbolodi	Water leaf	Izzi, Ngbo/Izhia
29	***Teliferia occidentalis* Hook**	Cucurbitaceae	Ugu	Fluted pumpkin	Izzi, Ngbo/Izhia
30	***Venonia amygdalina* Del.**	Asteraceae	Olubu	Bitter leaf	Izzi, Ngbo/Izhia
31	***Vitex doniana* Sweet**	Verbenaceae	Uchakuru	Black plum	Izzi, Ngbo/Izhia
32	***Zanthoxylum zanthoxyloids* Lam**	Rutaceae	Nkaa	Ata	Izzi, Ngbo/Izhia

Table 2: Characteristics of traditional leafy vegetables and spices of Ebonyi State Nigeria

S/N	Scientific Name	Local Name	Commodity Grouping	Status of domestication	Land Use Location	Life Form
1	***Abelmoschus esculentus***	Okoro	V	C	CF	S
2	***Adenia cissampeliodes***	Isororo	V	W	W	C
3	***Amaranthus spinosus*** **L.**	Inene	V	C	CF	H
4	***Bombax bounopozense*** **L. Gaertn.**	Apkuto	V	W	CF/W	T
5	***Capiscum frutescens*** **L.**	Ekwuigbapu, akpoko	V/SP	C	CF	H
6	***Citrullus vulgoris***	Egusi	v	C	OF	H
7	***Colocasia exculentus*** **L.**	Opoto nkashi	V	C	CF	H
8	***Corchorus olitorius*** **L.**	Arira	V	SW/C	OF	H
9	***Cucurbita pepo*** **L.**	Ugboma	V	C	OF	C
10	***Ficus sur*** **Thunb.**	Ekwuakpuru	V	W	W	T
11	***Ficus ottoniifolia***	Ekwuogbu	V	W	W	T
12	***Gongronema latifolia*** **Benth**	Utamashi	SP	C/W	OF	C
13	***Ipomoea aquatica Forsk***	Ekwuuda	V	W	W	C/H
14	***Ipomoea batatas (*****L.**) **Lam.**	Ekwoku	V	C	CF	C/H
15	***Lecaniodiscus cupaniodes***	Ukpocha	V	W	W	T
16	***Monodora myristica***	Ehuru	SP	SW	W	T
17	***Moringa olerifera*** **Lam**	Ekwuesisa	V	C/SW	CF	T
18	***Newbualdia leavis*** **(P.Beauw) Seemann Bureau**	Omirima	V	W	CF/W	T
19	***Nuaclea diderrichii*** **(DeWild &Th. Due.) Merrill**	Uvuru	V	W	W	T
20	***Occimum gratissimum*** **L.**	Ahunji	V/Sp	C	CF	H
21	***Piper guinensis Schum &Thonn***	Uzuza	SP	W	CF	C
22	***Pterocarpus santalinoide***	Uturupka	V	W	CF	T
23	***Pterocarpus soyeaxii*** **Taub.**	Oha	V	W	CF	H
24	***Senna occidentalis***	oshigbuomma	*V*	W	*W*	S
25	***Solanum nigrum***	Igbagba, anara	V	C	CF	H
26	***Talinum triangulare*** **Willd**	Ngbolodi	V	C	CF	H
27	***Teliferia occidentalis*** **Hook**	Ugu	V	C	OF	C/H
28	***Vernonia amygdalina*** **Del.**	Olubu	V	C	CF	S
29	***Vitex doniana*** **Sweet**	Uchakuru	V	W	OF	T
30	***Zanthoxylum zanthoxyloids*** **Lam**	Nkaa	V	W	W	S

Table 2 continues

S/N	Scientific Name	Method of propagation	Status of the species	Part Consumed	Frequency (Occurrence)	Cash Income
1	***Abelmoschus esculentus***	SD	NT	L	F	M
2	***Adenia cissampeliodes***	VG	NT	L	O	P
3	***Amaranthus spinosus* L.**	SD	NT	L/ST	O	P
4	***Bombax bounopozense* L. Gaertn.**	SD	NT	L	O	S
5	***Capiscum frutescens* L.**	SD	NT	L	F	M
6	***Citrullus vulgoris***	SD	NT	L	O	P
7	***Colocasia exculentus* L.**	VG	NT	L	F	S
8	***Corchorus olitorius* L.**	SD	NT	L	O	S
9	***Cucurbita pepo* L.**	SD	NT	L	F	S
10	***Ficus sur* Thunb.**	SD	NT	L	O	S
11	***Ficus ottoniifolia***	SD	NT	L	F	S
12	***Gongronema latifolia* Benth**	VG	T	L/ST	F	P
13	***Ipomoea aquatica Forsk***	VG	T	L	O	S
14	***Ipomoea batatas (*L.) Lam.**	VG	NT	L	F	M
15	***Lecaniodiscus cupaniodes***	SD	T	L	O	S
16	***Monodora myristica***	SD	T	SD	F	M
17	***Moringa olerifera* Lam**	SD/VG	NT	L/ST/FL/SD	O	P
18	***Newbualdia leavis* (P.Beauw) Seemann Bureau**	VG	T	L	O	S
19	***Nuaclea diderrichii* (DeWild &Th. Due.) Merrill**	SD	NT	L	O	S
20	***Occimum gratissimum* L.**	SD	T	L	O	M
21	***Piper guinensis Schum &Thonn***	SD	T	SD/L	F	M
22	***Pterocarpus santalinoide***	VG	NT	L	F	P
23	***Pterocarpus soyeaxii* Taub.**	VG	NT	L	F	M
24	***Senna occidentalis***	SD	NT	L	O	S
25	***Solanum nigrum***	SD	NT	L /FT/ SD	F	M
26	***Talinum triangulare* Willd**	SD	NT	L	O	M
27	***Teliferia occidentalis* Hook**	SD	NT	L/SD	F	M
28	***Vernonia amygdalina* Del.**	VG	NT	L	F	M
29	***Vitex doniana* Sweet**	VG	NT	L	O	P
30	***Zanthoxylum zanthoxyloids* Lam**	VG	T	L	O	S

Key:

Land of location	***Commodity grouping***	***Part Consumed***	***Method of Propagation***	***Life form***	***Status of the species***	***Status of domestication***	***Frequency***	***Cash income***
CF = Compound farm	*V = Vegetable*	*L = Leaves*	*SD =Seed*	*T = Trees*	*T= Threat Slight*	*W = Wild*	*A= Abundant*	*M = Major*
OF = outlying farm	*SP = Spice*	*SD = Seed*	*VG=Vegetative*	*SH = Shrub*	*E = Endangered*	*SW = Semi wild*	*F = Frequent*	*S = Small*
W = Wild forest		*ST = Stem*	*NT= No Threat*	*C = Climber*	*2=Substantial*	*C = Cultivate*	*O = Occasional*	*P = Potential*
		Fl= Flower		*H= Herbs*	*3=Greatest*			

Table 3: Uses, income generation prospects and seasonality of the leafy vegetables and spices of Ebonyi State Nigeria

S/N	Scientific Name	Attributes: uses, medicinal values	Gender M, F	Unit of Sale	Unit price (N)*	Seasonality	
						R	D
1	***Abelnoschus esculentas***	Used for making soup	Female			R	D
2	***Adenia cissampeliodes***	Fresh fruit used in making soup	Female	bowl/a small heap	**350/50**	+	
3	***Amaranthus spinosus* L.**						D
4	***Bombax bounopozense* L. Gaertn.**	used for the preparation of yam	Female	Bundle	**20**	R	
5	***Capiscum frutescens* L.**	used for the preparation of yam and water yam	Female	Bundle	10	D	+
6	***Citrullus vulgoris***	Used for spicing food	female	Milk Cup	50	+	+
7	***Colocasia exculentus* L.**	Used as a major soup ingredient; moulded into lumps in special soups (a delicacy) during festivals. Egusi soup is highly valued in Ngbo/Izhia and used during major traditional functions and festivals	Female	Milk cup	**50**	R	
8	***Corchorus olitorius* L.**	Used for making soup					
9	***Cucurbita pepo* L.**	Used for soup and cooking yam pottage				R	
10	***Ficus capensis* Thunb.**	Leaves used as vegetables in soup. Also used to cook yam or cocoyam. It is soft when Cooked and high in B-carotene	Female	Bundle	20	+	
11	***Ficus ottoniifolia***	Used for making soup	Female	Bundle			+
12	***Gongronema latifolia* Benth**	Used for making soup	Female	Bundle			+
13	***Ipomoea aquatica Forsk***	Has a bitter after taste; Used for pregnant, lactating mothers and for sick people.	Female	Bundle	50	+	
14	***Ipomoea batatas (*L.) Lam.**	Also used to spice Goat/beef/chicken/fresh fish pepper soup					
16	***Lecaniodiscus cupaniodes***	Used as spice for making soup for new nursing mothers		Bundle		+	+
17	***Monodora myristica***	Tubers are eaten as staple food		Bundle		+	
18	***Moringa olerifera* Lam**	Used for making soup		Bundle			
19	***Newbualdia leavis* (P.Beauw) Seemann Bureau**	Used in making soup for pregnant and lactating mothers. Mixed with peanut butter and other traditional foods for flavour	Female	1 seed	20		
20	***Nuaclea diderrichii* (DeWild &Th. Due.) Merrill**	Used for making soup and for treating several ailments		Bundle/milk cup		+	+
21	***Occimum gratissimum* L.**	Used for making soup		Bundle		+	+

Table 3 continues

S/N	Scientific Name	Attributes: uses, medicinal values	Gender M, F	Unit of Sale	Unit price (N)*	Seasonality	
22	***Piper guinensis Schum &Thonn***						+
23	***Pterocapus mililbraedii ?***	Used as a spice in the preparation of pepper soup etc and as a medicinal plant	Female	Bundle	20	+	+
24	***Pterocarpus santalinoide***	Used to spice food especially for lactating mothers to clear womb and in pepper soups				+	
25	***Pterocarpus soyeaxii*** **Taub.**	Tender leaves used for preparing soups	Female	Bundle	20	+	+
26	***Senna occidentalis***	Tender leaves used for preparing soups	Female	Bundle	20		+
27	***Solanum nigrum***	Used for soup. Also acts as a laxative for children (Okeke *et al.,* 2008)	Female	1 bucket	200		R
28	***Talinum triangulare*** **Willd**	Leaves used as vegetable in soup. Fruit used for entertaining guest, eaten with spiced peanut butter. Smaller seeds from other species used in preparing yam pottage.	Female	Bundle	50	+	+
29	***Telifairia occidentalis*** **Hook**	Used for soup preparation.	Female	Bundle	20	+	
30	***Vernonia amygdalina*** **Del.**	Used for soup preparation. Washed extract is used in treating anaemia and	Female	Bundle	20	+	
31	***Vitex doniana*** **Sweet**	in building up blood for pregnant mothers					
32	***Zanthoxylum zanthoxyloids*** **Lam**	Used in cooking soups and other dishes. Some varieties can be chewed raw after washing. Used for the treatment of malaria and recommended for diabetics				+	+

* *Threshold prices for a bundle or cup of the item*

The parts consumed were mainly the leaves (76.7 %). Others include the stem, flower and the seeds. Majority of the plants collections have potential for generating income for the smallholder farmers, especially women

Uses, Income Generation Prospects and Seasonality of the Leafy Vegetables and Spices of Ebonyi State Nigeria: Table 3 indicates the uses of the traditional leafy vegetables/spices, including their medicinal values. In all the cases, it is women that either cultivates or collect the vegetables from the wild as an income generating commodity or to supplement Family's meal. At every season of the year, there are always some vegetables/spices for sale. However, most of them are abundant during the rainy season.

Proximate Composition of Three Traditional Leafy Vegetables: The result of the proximate analysis of three traditional leafy vegetables are presented in Figure 1 as culled from Nnamani *et al.* (2010). Their moisture contents were 9.6, 10.2 and 10.8 % in *Z. zanthoxyloides*, *V. doinana* and *A. cissampeloides*, respectively. This was low, but was attributed to the fact that the leaves were oven dried before analysis. Higher percentage moisture content is expected in freshly harvested leaves.

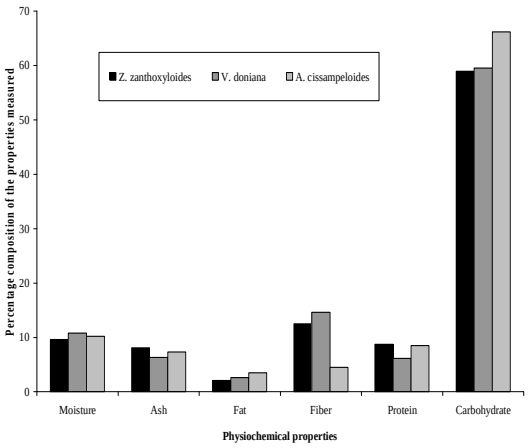

Figure 1: Proximate composition of three indigenous leafy vegetables

The ash content of the three plants, a measure of the mineral content of food ranged from 8.10 - 6.30% (Figure 1) with *Z. zanthoxyloides* having the highest and *V. doinana* having the least value. These results differed with the results of Ajayi *et al.* (2006) who reported an ash content of some leafy vegetables that ranged from 0.6 – 34%. Crude protein had values ranging from 8.74 - 5.12% (Figure 1) with *V. doinana* having the lowest and *Z. zanthoxyloides* the highest value. The amount of protein which is about 75 % (when converted) of the total nitrogen in the leafy vegetables was variable for the three plants, ranging from 5 – 10 % of fresh weight or 13 - 30% for dry weight. These percentages were higher than the 3 – 8% and 11 – 28% result reported by Oyenuga and Fetuga (1975), but lower than values reported for *Telfairia occidentalis* leaves (22.4%), *Tamarindus indica* (24.3%), *Hibiscus esculentus* (23%) and *Parkia biglobosa* (20.9%) reported for dry milled samples (Glew *et al.,* 1997; Akwawowo *et al.,* 2000; Igbal *et al.,* 2006). So consumption of 100 g of *V. doinana, Z. zanthoxyloides* and *A. cissompeloides* may not be capable of providing 27 g of protein which satisfies the recommended daily allowance of protein for children (FAO, 1986). The crude fat content of *A. cissompeloides*, *V. doinana* and *Z. zanthoxyloides* ranged from 3.50 to 2.10% (Figure 1) may not compare favourably with dry milled percentage values reported for *Brachystegia eurycoma* (5.78%) and *T. indica* 4.2% (Ajayi *et al.,* 2006). However, it is higher than the dry milled percentage values for other vegetables like *Celosia argentea* (0.7%), fluted pumpkin (1.8%), *Gnetum africanum* (1.2%) (Okafor, 1995). A child consuming 100 g of *V. doinana*, *A. cissompeloides*, *Z. zanthoxyloides* would be ingesting approximately 2.60, 3.5 and 2.10 % of fatty acid which translates to 22.2, 30.4 and 21.3 kcal of energy, and is approximately a high amount.

The fibre content of these leafy vegetables (Figure 1) ranged from 12.50 - 4.50%. These exceeded the fiber content of *T. triangulare* (2.0%) *T. occidentalis* (1.7%) and *C. argentea* (1.8%) (Akachukwu and Fawusi, 1995). This indicates that the fiber (roughage) content of these plants are high and will promote digestion and prevent constipation when consumed. The carbohydrate level of the

underutilized indigenous vegetable (Figure 1) ranged from 58.94 % in *Z. zanthoxyloides* to 66.20 % in *A. cissampeloides*. These values are high compared to the carbohydrate level of 8.0 g in *T. occidentalis* (FAO, 1986). This indicates that the indigenous vegetables can act as better food supplement in providing carbohydrate.

Mineral Content: The three vegetables studied are good sources of micro-nutrients. Results indicated that calcium content ranged between 54.06 - 90.100 mg/100 g (Figure 2). The highest value was obtained from *Z. zanthoxyloides,* followed by *V. doinana* and *A. cissompeloides*. Including these calcium rich vegetables in daily diet would ensure 20 – 25% of the daily requirement for calcium that aid strong bones and healthy teeth (Raghuvanshi and Singh, 2001). The result of the mineral analysis (Figure 2) also showed complete absence of zinc and lead which are antioxidants. This is of significant interest because it potentially indicates that the plants are endowed with essential nutrients good for human consumption.

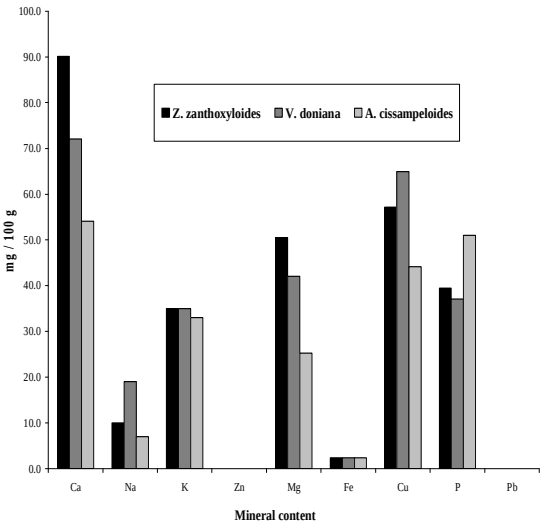

Figure 2: Physiochemical compositions of three indigenous leafy vegetables

Conclusion: Several traditional leafy vegetables and spices of Ebonyi State have been identified with potentials for income generation for the smallholders especially women. The plants were endowed with essential nutrients required for maintenance of good health. The presence of various phytochemicals in these plants has helped in meeting the nutritional needs of the rural farm families, thereby assisting in primary Health Care Delivery, since most of them cannot assess the general health care services beef up

The projection of Sub Saharan Africa for the next two decades, particularly as regards life expectancy and food security is rather bleak and challenging. Practical intervention in health and nutrition are needed. Identifying some of these underutilized traditional leafy vegetables and their inculcation into our diet could potentially address some of these challenges. The income generating potentials of the identified traditional vegetables is essential in alleviating the poverty level of rural farm families especially women on whose shoulders the responsibilities of caring for the Family rests.

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