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NUTRITION AND ANTI-NUTRITION COMPONENTS OF TWO POPULAR LESSER-KNOWN VEGETABLES IN FARMING COMMUNITIES OF CROSS RIVER STATE, NIGERIA

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ABSTRACT

Cross River State, Nigeria, is basically a farming State. However, most of the crops are produced in the northern part of the State from where the three (3) Local Government Areas (Ogoja, Bekwara and Obudu) were chosen for the study. Two lesser-known but commonly consumed leafy vegetables (*Ceiba. pentandra* and *Adenia. cissampeloides*) were collected, prepared and analyzed for proximate composition, mineral element contents, toxicants and anti-nutrition contents as well as vitamins. It was observed that much consumption preference (53.66%) is given to *C. pentandra* than *A. cissampeloides* (46.34%) as a feed stuff for human. On preference for other uses which was mainly on medicinal value, *A. cissampeloides* was higher (71.41%). They ascertained that *A. cissampeloides*, is used for the treatment of lumbago and reduction of blood pressure. Carbohydrate (2.50 g/100g), Total ash (0.15 g/100g) and protein (23.0 g/100g) were seen to be higher in content in *A. cissampeloides.* Essential oil (3.20 g/100g) and free fatty acid (9.10 g/100g) were more in *C. pentandra.* Except for iron and copper, *C. pentandra*, had more of the other elements analyzed for, in this study. All the toxicant and anti-nutrition factors analyzed were higher in *A. cissampeloides* than *C. pentandra.* Vitamins A and C were more in *A. cissampeloides* while *C. pentandra* had higher contents of B_1 and B_2. The results of this research show that *A. cissampeloides* is capable of contributing more energy to people of these farming communities than *C. pentandra* but, the vegetable must be prepared to remove the high toxicants and anti-nutrition factors before consumption.

KEYWORDS: Cross River State, *C. pentandra, A. cissampeloides*, Consumption Preference

INTRODUCTION

Most communities in the northern part of Cross River State are mainly into farming. Inhabitants of these communities are known to live marginally. In these communities, consumption of local diets is very popular.

In Nigeria today, increasing numbers of local seeds and vegetables made up of indigenous species have been incorporated into family diets to augment the low levels of proteins in food arising from high cost of meat and other forms of protein sources.

According to Martin (1976), malnutrition due to lack of purchasing power for conventional food stuffs has an adverse effect on the economic growth of any nation, especially the rural areas. This is because it affects the efficiency of non-healthy people to do work.

Studies carried out on some local seeds and vegetables show that most of them contain high levels of the crude protein ranging from 20 to 40% dry weight. This is higher than the level in fresh meat. True proteins in wild seeds contribute more than 80 percent of the crude protein (Rankin and Hildreth, 1974). In vegetables like *Gnetum africanum*,

total carbohydrate represents 36 to 67% of dry matter. Fibre contributes more than 50% dry matter in other vegetables. Fibre plays a great role in digestion (Kirby, 1978). According to FAG (1980), most wild fruits are known to be rich in vitamin C. *Ximinia americana* is known to contain 8.1mg/100g wet weight. *Spondias monbin* contains 100g and *Clenocepsis* ce*rasiformis* contains 51.2%.

Vegetables are similar to fruits in their high water content, and except for beans and peas, low protein. Vegetables generally have higher mineral and vitamin contents than fruits (Pimental *et al*, 1979). In Africa generally and in West Africa in particular, vegetables are indispensable constituent of human diet (Oguntona, 1986). Generally, they are consumed as cooked complements to the major staples like cassava, cocoyam, guinea corn, maize, millet, rice and plantain. Indeed most of the meals based on these staples are considered incomplete without a generous serving of cooked green leaves. They are therefore essential for a nutritionally balanced diet and are major sources of vitamins A and C, calcium, iron as well as supplying part of other nutrients (FAO, 1980). In addition, they add variety, palatability, enjoyment and a sense of satisfaction to the diet because of their appealing colour and flavour (Akhigbe, 1987).

According to Ross and Bacin (1997), some of the vegetables eaten by local inhabitants possess medicinal values and are prepared into soups. Wang and Wu (1995) have shown that it is only within recent years that knowledge has been well established of the significance of wild vegetables and fruits as sources of vitamins in food. It is nevertheless true that many centuries, what are now known as deficiency diseases were related to certain types of food.

It was then recognized that scurvy could be prevented or even cured by the consumption of some fruits and green vegetables. It has been demonstrated that scurvy was due to nothing more than a total abstinence from fresh vegetable foods, for it could be cured by the addition of relatively very small quantities of these to a faulty diet (Ansa-Asamoa, 1976, Darwish, 1981). According to Cobley (1976), poverty is seldom an excuse for the poor mental and physical health of school children. Poor diet can be most disastrous among the young members of the urban centers where ignorance over the importance of wild seed and vegetables chiefly operate.

According to Ross and Bacin (1997) many of the edible wild vegetables and seeds contain cardiacglycosides. This suggests that apart from the nutritional satisfaction, they could be useful for the treatment of dropsy, high blood pressure and other diseases related to the malfunctioning of the heart.

Adenia cissampeloides belongs to the family *Passifloranceae* and is used mainly as a leafy vegetable. The leaves are first boiled to remove the cyanide before being prepared into soup. In the Southern part of Nigeria, the raw leaves are medicinal and are used for the treatment of lumbago.

In Gold Coast (Ghana) the leaves are rubbed on the breast after child birth to promote lactation. The stem when roasted pounded and thrown into water, serves as a fish poison (1rvine, 1980).

Ceiba pentendra belongs to the family Bombacaceae. It grows wild in many countries but in Nigeria, it has been domesticated due to its usefulness (Paris and Monye-Mignon, 1981). The leaves and seeds are the edible portion of this tree but during flowering which takes place generally from December to January, the tree becomes leafless. The young leaves produce copious mucilage though in Nigeria, the main reason for its domestication, its use as green leafy vegetable.

The seeds are an important product on account of their oil content. The oil obtained from the seeds is of agreeable taste and smell and is used generally for lubrication, culinary practices and soap making. The residual cake is a fairly good feeding stuff. The oil content of seeds is 22% - 25% and is very suitable for edible purposes (Irvine 1980).

MATERIALS AND METHODS

Study Site

Three (3) Local Government Areas (Ogoja, Bekwara and Obudu) were selected from the northern part of the State for the study. Choice of site was based on the rate consumption of these leafy vegetables.

Data Collection

Pre-tested structured questionnaires were administered to fifty (50) respondents in each of the three Local Government Areas (Ogoja, Bekwara and Obudu) under study thus, one hundred and fifty (150) questionnaires were administered in all. These respondents were also given in-depth interview.

Collection and Identification of Plant Materials

The plant materials were collected randomly in the wild from the local environment where they are consumed. The methods of collection and treatment of plant samples were as recommended by Joslyn (1970), A.O.A.C., (1985) and Udo, *et al.* (2006), Information on the plants was obtained through interviews with the consumers. Their local names were identified' as well as the information on their other local non-food uses. The vegetables were identified in the Herbarium of the Department of Biological Sciences, Cross River University of Technology, Calabar.

Preparation of Samples

The leafy vegetables were collected fresh, put in porcelain and taken to the laboratory after which the healthy (tender) consumable ones were selected and washed under a flowing tap in the laboratory. The plant samples were shredded into small pieces with a knife. Drying of samples was done under a shed at room temperature ($27\pm1^{o}C$) for 5 days. The dried samples were then ground into fine powder, sieved and stored in refrigerators in air tight glass bottles. Fresh samples were used for moisture content and Vitamins (C, A, B1 and B2) determination.

Plant Samples Analysis

Analysis was carried out on plant samples to determine their proximate composition, mineral element composition, anti-nutritive content and vitamins. This was carried out using standardized methods by (A.O.A.C, 1985).

RESULTS AND DISCUSSIONS

Consumption Preference

Table 1 shows results of analysis of information given by respondents in the questionnaires administered. From the result, it was observed that much preference (53.66%) is given to *C. pentandra* than *A. cissampeloides* (46.34%) as a feed stuff for human. Most respondents preferred *C. pentandra* on the basis of its taste and lack of scent as compared to *A. cissampeloides*. They also imagined it to be very nutritious because of its succulence. However, this was meant to be proved by results of this research.

On preference for other uses which was mainly on medicinal value, *A. cissampeloides* was higher (71.41%). They ascertained that *A. cissampeloides*, is used for the treatment of high blood pressure and lumbago.

Table 1: Percentage (%) of the Lesser Known Leafy Vegetables as Preferred by 150 Respondents

S/n	Plant	Percentage Preference for Food	Percentage Preference for Other Uses
1	*A. cissampeloides*	46.34	71.41
2	*C. pentandra*	53.66	28.59

Proximate Composition Analysis

The results of analysis carried out on the proximate composition are presented in Table 2. Carbohydrate (2.50 g/100g), Total ash (0.15 g/100g) and protein (23.0 g/100g) were seen to be higher in content in *A. cissampeloides* than in *C. pentandra*. However, Crude fibre (0.20 g/100g), Moisture (67.46 g/100g), Essential oil (3.20 g/100g) and Free fatty acid (9.10 g/100g) were more in *C. pentandra.* In the northern part of Cross River State, most of the vegetables eaten are fresh and freshness which is a function of the time lag between harvest and analysis is related to the moisture content of the vegetables. (Osuna-Gracea *et al* 1998) The moisture content of fresh leafy vegetables is estimated at a range between 72% and 93% in leaves of cassava and water leaf respectively. The amount of moisture in a food affects the packaging, keeping qualities, the nutrients provided and also the type and rate of microbial infection (Joslyn, 1970).

Accordicng to Joslyn (1970), the range for management of moisture content of fresh vegetables varies from 66% in green lime beans to 96% in cucumber. From Table 1 It is observed that the two vegetables analyzed have high moisture content. This implies that the keeping quality of these food items is reduced and if kept for too long, rancidity will occur. High moisture content normally leads to oxidative, non-enzymic browning affects the vitamins found in the vegetables, (Dutta, 1991). The inorganic residues after ignition at about 525% constitute ash of the food product. The food ash may be acidic alkaline of neutral and these characters would appear to have a considerable bearing upon the maintenance of health.

From the result *A. cissampoloides* has very high ash content. Because of the high ash content of *A. cissampaloides*, only very small quantity of it should be consumed daily if it must be consumed daily.

According to Wardlow (1999), the required daily allowances (RDA) for protein intake for a typical 70g man is 56g while a typical 55kg woman needs 44g. This implies that between 300–500g of each of these vegetables is needed to meet the RDA.

Table 2: Proximate Composition of the Assay Leafy Vegetables

S/N	Plant	Proximate Composition (g/100g)						
		Crude Fibre	CHO	Moisture	Total Content	Essential Ash	Free Oil Acid	Protein Fatty
1	*A. cissampeloides*	0.10	2.50	62.74	0.15	3.05	2.40	23.0
2	*c. pentandra*	0.20	1.49	67.46	0.05	3.20	9.10	18.5

Mineral Elements Composition

Table 3 presents the results on mineral elements composition. It was observed that except for iron and copper, *C. pentandra,* had more of the other elements analyzed for, in this study. The presence of higher quantity of calcium signifies the calcification of bones and teeth, fastening up the clotting of blood and lymph and maintenance of nervous system excitation for proper conduction of impulses. In its absence, rickets supervenes. Sodium maintains body fluids composition particularly their water content and as well helps in the body acid-base balance. Potassium plays the same role as sodium. Magnesium is a part of enzyme system in carbohydrate metabolism. Its presence in muscles speeds up glycolysis. Phosphorus strengthens the bones and teeth. Manganese plays a role in the activities of the reproductive glands. Zinc is a coenzyme in carbonic anhydrase which is an important respiratory enzyme. Iron colors the hemoglobin giving it more affinity for oxygen and in its absence, anemic condition results. Copper is always rare in plants but when present, assists in the role played by iron though, not in humans.

Given the roles played by these mineral elements, *C. pentandra* is higher in nutritional contents compared to *A. cissampeloides.*

Table 3: Mineral Element Composition of the Assay Leafy Vegetables

S/N	Plant	Mineral Element (mg/100g)								
		Ca	Na	K	Mg	P	Mn	Zn	Fe	Cu
1	*A. cissampeloides*	9.6	316.1	665.2	17.3	16.3	1.1	1.6	54.0	0.67
2	*c. pentandra*	12.7	413.0	785.0	18.7	21.2	2.5	2.0	13.2	0.53

Toxicants and Anti-Nutrition Factors

Toxicants and anti-nutrition factors in food substances interfere with system metabolism and availability of some mineral elements and food elements during digestion. All the toxicants and anti-nutrition factors were higher in *A. cissampeloides* than in *C. pentandra* (Table 4) High Hydrocyanide contnt in the system leads to respiratory failure and in most cases promotes the formation of goitre . Phytate and total oxalate interfere with mineral elements availability in the system. Tannin interferes with protein digestibility while Saponnin affects intestinal permability (Githens, 1987). All the toxicant and anti-nutrition factors analyzed for were higher in *A. cissampeloides* than *C. pentandra.*

Table 4: Toxicant and Anti-Nutrition Factor of the Assay Leafy Vegetables

S/N	Plant	Toxicant and Anti-Nutrition Factor				
		Hydrocyanide	Phytate	Total Oxalate	Tannin	Saponnin
1	*A. cissampeloides*	0.96	33.6	18.4	8.0	5.20
2	*c. pentandra*	0.92	9.70	3.70	5.60	1.37

Vitamins Contents

Ceiba pentandra (Table 5) had higher vitamins A (1620RE) and C (0.070mg/100g) content while higher values were scored for vitamins B1 (0.09mg/100g) and B2 (1.32mg/100g). Vitamin A is used in the formation of rhodopsin, a pigment in retina rod concerned with dim light vision. It also plays a role in the prevention of cold and other infection of the respiratory tract (Githens, 1987). Its deficiency leads to impaired vision and respiratory tract infection. Vitamin B_1 deficiency leads to a disease condition known as beri-beri and vitamin B_2 deficiency affects the respiratory system (Garcia, 2001)

Table 5: Vitamin Content of the Assay Leafy Vegetables

S/N	Plant	Vitamins			
		A (RE)	C (mg/100g)	B_1 (mg/100g)	B_2 (mg/100g)
1	*A. cissampeloides*	0.96	33.6	18.4	8.0
2	*c. pentandra*	0.92	9.70	3.70	5.60

CONCLUSIONS

The Local Government Areas chosen for the research are made up of indigenes whose main occupation is farming. To build up energy required for labour in the farm requires balanced diets with little or no toxicants (Fukuka-Parr *et. al.,* 2002). Energy to do work and perform body functions is derived from carbohydrate, proteins and lipids. These nutrients therefore contribute to the caloric value of any food. The 4-9-4 rule for carbohydrate, fat and proteins used to determine energy content of the food. From results, it can be seen that *A. cissampeloides* samples analyzed has the potentials to contribute more energy to the body than *C. pentandra*. However, the high content of toxicants and anti-nutritive factors in *A. cissampaloides* is suggestive of the fact that this vegetable must be boiled and washed properly before being prepared into soup; otherwise it will be unsuitable for consumption. Since it has been known locally as having potency on some diseases, it is recommended here that more research into its medicinal value be carried out for possible development of drugs from this plant.

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