Journal of Global Biosciences
ISSN 2320-1355
Volume 4, Number 8, 2015, pp. 3024-3031
Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

PROXIMATE AND QUANTITATIVE MINERALS COMPOSITION OF SOME NIGERIAN INDEGENOUS VEGETABLES

[1]Hussaini Bello, [1]AngamaPwano, [2]Musa Thomas, [1]Patrick Daniel Sudi,[1]Hauwa S. Mohammed and [1]Ishaku Peter

[1]Department of Chemical Science Technology, Federal Polytechnic Mubi. Adamawa State, Nigeria
[2]Department of Biological Science Technology, Federal Polytechnic Mubi. Adamawa State, Nigeria.

Abstract

Some selected vegetables from southern Nigeria were analyzed for their nutritional potential. Proximate analysis and concentration of minerals (iron, calcium, potassium, magnesium, and sodium) were determined. Chemical composition of Gongronema latifolium , Pterocarpus soyauxii and Piper guineansesleaves was determined using standard methods. Aqueous extracts of G. latifolium P. soyauxii and P. guineanse extracts contain minerals(iron, calcium, potassium, magnesium, and sodium). The values for proximate chemical composition range are as follows: Crude protein,22.44% - 27.56%ash;5.50% - 9.00%,, crude fibre;10.30% - 12.80%moisture content ;42.60% - 48.00%, and fats content; 3.71% - 4.40%, and carbohydrate are: ; 4.59% - 10.85% .The values of minerals ranges are: Potassium, 2.59mg/100g - 6.21mg/100g, sodium; 4.36mg/100g - 5.56mg/100g, calcium; 0.98mg/100g - 4.09mg/100g,magnesium;1.09mg/100g - 4.61mg/100g and iron 0.91mg/100g - 1.18mg/100g.From this study, it can be conclude that P. guineense G. latifolium and P. soyauxii possess some potent nutrient which can ameliorate nutrients deficiency diseases.

Key words: *Gongronema latifolium*, *Pterocarpus soyauxii* , *Piper guineanses* , Chemical composition, Nutritive values, Indigenous Vegetables, Minerals concentrations and Bioavailability.

INTRODUCTION

Vegetables are important in rational nutrition; take to it rich content of nutrients for energy. Vegetables are also considered as a favorable influence on the functions of the physiologic human organism. The science of nutrition, studies processes by which the body uses food for energy maintenance, development of a strong body and promotes good health (Valeria 1970).There is a current shift towards evaluating the chemical composition and nutritive value of tropical plants, many of which are medicinal. Aletor and Adeogun, (1995) reported on the nutrient components of 17 leafy vegetables in Nigeria. Apori*et al.,* (2000) reported on the chemical composition and nutritive value of *Chromolaenaodorata* leaves.

In Nigeria different regions have their common vegetables which were based on their availability, regional traditions, and cultural food and beliefs of individual community. For instance, these three vegetables (*Pterocarpus soyauxii, Piper guineanses,* and *Gongromena* *latifolium)* vegetables are more commonly found insouth-south and south-eastern Nigeria. These three leafy vegetables are respectively known in Igbo as; *Utazi* for *P. guineanses*; *Uziza* for *G. latifolium*, and *Oha* for *P. soyauxii* .

G*ongromena latifolium*

G*ongromena latifolium* (African salad) is a rain forest plant belongs to the family*Asclepiadaceae* it is a berry that grows wild in the evergreen forest of Africa. The plant is commonly called *Amaranthglove*. Almost every part of the plants has economic importance. But the most important part is the leaf which is embedded for the management of some diseases ethnomedically apart from its uses as spices (Afolabi, 2007). The aqueous and ethanolic extracts of *G. latifolium*had hypoglycemic, hypolipidemic and antioxidative propertiesUgochukwu and Babady (2003), Ugochukwu*et al*.,(2003) and Ogundipe*et al.,(*2003) that it hasshowed to have anti-inflammatory propertiesMorebise*et al.*,(2002) These reports were focused mainly on the medicinal properties of the plant with little attempts at investigating their nutritivepotential and food processing/preservation values.

Piper guineense

Piper guineense is a WestAfrican species of Piper; the spice derived from its dried fruit is known as West African pepper, as Ashanti pepper, Benin pepper, false cubeb, Guinea cubeb, uziza pepper or (ambiguously) "Guinea pepper", and called locally *kale*, *kukauabe*, *masoro*, *sasema* and *sorowisa*. *Piper guineanses* leaf and seeds are used for different varieties of food, including pepper soup, yam porridge, as spices for preparing soup for post-partum women.Aletor and Adeogun, (1995).

Pterocarpussoyauxii (African Padauk or African Coralwood) is a species of *Pterocarpus* in the family *Fabaceae*, native to central and tropical West Africa, from Nigeria East to CongoKinshasa and South to Angola. The leaf is eaten as a vegetable in the south eastern Nigeria. Bark extracts are used in cording animal skin in ethno ternary practice. The pulverized bark is mixed with palm oil in making pomade as cosmetic (Dule, 1981).

Vegetables generally containgreat varieties of phytochemicals; some of which have been demonstrated to have anti-oxidant, antibacterial, antifungal, and carcinogenic suppressant properties Nijveldt*etal*, 2001). Some vegetables contain fibre which is important for healthy hairs, and skin as well. Diets containing recommended amount of vegetables may help to lower the risk of heart disease REFF. Such diet may also help protect against incidence of cancer and decrease bone loss (H, 2002.)
Composition and nutritional quality of vegetables contains nonvolatile acids, mineral salts, surplus volatile compounds which impart flavor in diet. The vegetable color also depend on the pigments they contain e.g. anthocyanin impart blue, purple and red. Chlorophyll is a coloringagent for green vegetables leafy once and green bears, while carotenoids are responsible for yellow colors ones (Ebang and Johnson, 1995).
Searching for high quality but cheap sources of energy, proteins, minerals and vitamins continues to be a major concerned to responsible individuals. Nutrition also plays an important role in both preventive and curative medicine. The effectiveness of its role depends upon continued investigation into the metabolism of nutrients (Oyenuga, 1968).

MATERIALS AND METHODS

Materials and reagents

The major raw material used in this work is freshly harvested (*P. soyauxii, G. latifolium,* and *P. guineanses*) leaves were obtained from local farm in Enugu, Enugu State Nigeria. The three samples were taken to Botany Department Universityof NigeriaNsukka (UNN) for identification and packed in clean sterile sample bags.. All reagents used wereanalar grade.

Sample preparation

Leafy parts of freshly harvested *G. latifolium*, *P. soyauxii* and *P. guineanses*) leaves were cut, rinsed, shade-dried, milled, packaged in sterile 1 mm thick high-density polyethylene sachet, labeled and stored in a refrigerator [(3±1) °C] until used.

Preparation of the extract

Ten grams (10g) of dry-milled (*G. latifolium P. soyauxii* and *P. guineanses*)leaves respectively were extracted with 200 ml of distilled water with continuous heating and stirring (30 min) on a mechanical shaker. The resulting slurry was centrifuged (10000 r/min, 15 min), filtered under vacuum (using the Buchner funnel) and concentrated to solid over water bath at 50°C to obtain aqueous extract (AqEx)

Proximate and mineral analysis

Dry-solid extracts of vegetables(*P. soyauxii, G. latifolium,* and *P. guineanses*)respectiveleaves were analyzed for fat (method No. 930.09), crude fiber (method No. 930.10) and total ash (method No. 930.05) as described by AOAC (1990). Crude protein was determined by (N×6.25) using the Leco-N nitrogen determinator (Model FP-428, Leco Corporations, MI, USA). The nitrogen free extractive (NFE) was obtained by difference. The moisture content was determined by drying the sample to a constant weight in an air circulating oven at 70~80 °C. The mineral contents, namely: Na, K, Ca, Mg and Fe contents were determined as described by Whiteside and Milner (1984) using a PyeUnicam SP9 atomic absorption spectrophotometer (PyeUnicam Ltd., York Street, Britain). Regression equations were used to calculate the amount of metals in each sample (using their absorbance and dilutions).

Extract preparation

Each sample of extract was divided into three (3) labeled for;*G. lanfolium*(A1, A2 &A3),*P. soyauxii*(B1, B2& B3) and *P. guineanses*(C1, C2& C3). Studies were carried out for proximate analysis and respectiveconcentrations of sodium, potassium, calcium, magnesium, and iron was determined in triplicates.

Standard preparation

Four (4g) of sodium hydroxide in 100ml volumetric flask and made to mark with deionized water, likewise 2g of boric acid in 100ml volumetric flask and made to mark with deionized water.

Statistical Analysis

Means of triplicate measurements was determined for each sample using standard statistical procedures.

RESULTS

Table 1: Result of the proximate composition of the three selected indigenous vegetables in percentage (%).

vegetables	Moisture Content (%	Crude Protein (%)	Crude Fibre (%)	Fat content (%)	Ash Content (%)	Carbohydrate Content (%)
G. latifolium	48.00	27.56	10.30	4.05	5.50	4.59
P. soyauxii	43.20	22.44	12.80	3.71	7.00	10.85
P. guineanses	42.60	25.35	12.35	4.40	9.00	6.05

Table shows the percentage proximate composition of respective indigenous vegetables. Moisture content recorded the highest proximate component ranges from (42.30, 43.20 and 48.00%), followed by crude protein (22.44, 25.35 and 27.56%) crude fibre. (10.30, 12.35 and 12.80 %), carbohydrate (4.59, 6.05 and 10.85%), ash (5.50, 7.00 and 9.00%), and fat (3.71, 4.05 and 4.40%) was the lowest.

Table 2: Results of minerals content of the three selected indigenous vegetables in mg/100g

vegetables	Sodium mg/100g	Potassium mg/100g	Calcium mg/100g	Magnesium mg/100g	Iron mg/100g
G. latifolium	4.36	6.21	2.52	1.09	1.18
P. soyauxii	5.13	4.55	0.98	4.61	0.98
P. guineanses	5.56	2.59	4.09	1.52	0.91

Table shows the elements concentration. Averagely the element with highest recorded concentration was sodium with (4.36, 5.13 and 5.56mg/100g), followed by potassium; (2.59, 4.55 and 6.21mg/100g), calcium; (0.98, 2.52 and 4.09mg/100g), magnesium; (1.09, 1.52 and 4.61mg/100g) and iron; (0.91, 0.98 and 1.18mg/100g).

DISCUSSION

Vegetables are low in energy generation, contribute moderate quantities of proteins, and are rich sources of vitamins and minerals. They also contribute roughage to diet when the solid matter is considered since vitamin (A, E and C) present in vegetables are soluble. Vegetables are likely to influence cellular protein with enzymatic activity. Vegetable extracted enzyme influenced maker for myocardial infraction which is most often established by the measurement of marker enzymes (Adam and Bitrus, 1993).

P. soyauxii, P. guineanses, and *G. latifolium* are good source of protein. Their respective protein contents (22.44, 25.35 and 27.56%) are quite high except for *P. soyauxii*whencompares favorably with percentdaily mean(DM) values reported for chickpea (24.0%), cowpea (24.7%), lentil (26.1%), greenpea (24.9%), fluted pumpkin leaves (22.4%), *Tamarindusindica* (24.3%), *Mucunaflagellipes* (24.9%), *Hibiscus esculentus* (23%) and *Parkiabiglobosa* (20.9%) (Glew*etal*., 1997; Akwaowo*et al*., 2000; Ajayi*et al.,* 2006; Iqbal*et al*., 2006). Consumption of 100 g (DM) of *P. soyauxii, P. guineanses*and*G. latifolium* may be capable of providing22, 25, and 27 g of protein which satisfies recommended daily allowance of protein for children. These vegetables are good source of proteins more than (3.3%) recorded by USA nutrient Database for standard reference. Their protein content makes it beneficial for the maintenance of good health by providing essential amino acids found in the proteins. For instance, glutamine was known to have anti-inflammatory properties Morebise*et al., (*2002).

The crude fat content of *P. soyauxii, P. guineanses*and*G. latifolium* (3.71, 4.05 and 4.40%)are significant compare favorably with percent DM values reported for leafy vegetables like*Brachystegiaeurycoma* (5.87%) and *Tamarindusindica* (7.20%) (Ajayi*et al*., 2006). A child consuming 100 g of *P. soyauxii, P. guineanses*and*G. latifolium* would be ingesting approximately 3.7, 4.0 and 4.4g of fatty acid which translates into 33.7,38.4 and 40.6 kcal of energy or about 2%~3.% of their daily total energy requirement. Apart from providing energy, the lipid fraction of *G. latifolium*as an example, contains modest but useful amounts of the essential fatty acid, linoleic acid (31.1%) (Afolabi, 2007). Linoleic acid is an important component of membrane phospholipids, a precursor to another critical fatty acid one finds in virtually all tissue membranes of humans, namely arachidonic acid (Glew*et al.,*2004). Arachidonic acid is important because, it is metabolized to various prostaglandins which regulate many normal processes, including blood pressure and gastric acid secretion (Lauritzen *et al.,* 2001). These fatty acids are important from the nutritional and stability point of view. Nutritionally, edible triglycerides, such as those in olive oil (which are rich in oleic acid), have cardio-protective effects, as opposed to dietary fats that are rich in saturated fatty acids and which are associated with increased risk of macro-vascular diseases e.g., stroke and heart attack (Glew *et al*., 2004). The presence of poly-unsaturated fatty acid (PUFA) is very important in human feeding and physiology, the most important ones being n-3 fatty acid which are predominant in cold water and deep sea fishes. With the current emphasis on increasing polyunsaturated and monounsaturated fats intake, the use of *G. latifolium* leaf oil in food processing/formulations may be acceptable. The chemical composition of *G. latifolium* suggests that its use in food/feed formulation/supplementation operations is vital. This would be particularly so where protein content is of prime importance.

The results of the biochemical analysis of the three vegetables for moisture, fibre, ash, protein, fatand carbohydrate contents showed that moisture value for all the vegetables are: 42.60 - 48.00%. The turgidity of vegetable depends on the water content which may sometime be between 75%-95% (Smith, 1982).The leafy vegetables are rich in fibre value 12.8% in *Pterocarpussoyauxii*, 12.35% in *P. guineases* and 10.3% in *Gongromenalatifolia*.However, the proportion of the fibre in the vegetables depends on the stage of maturity. Fibre generally is useful for maintaining bulk, motility and increasing anti- inflammatory properties. The dietary fibre in these vegetables increases bulk and reduces food transit time in the gastrointestinal tract and reduces the incidence of constipation and other related diseases. These vegetables are valuable in maintaining alkaline reserve in the body and have tendency to provide high amount of carotene, ascorbic acids, and micro minerals which plays important roles in nutrient metabolism (Szeto*et, al*. 2002). Fibre also cleanses the digestive tract with potential removal of carcinogens from the body by binding to the cancer causing chemicals keeping them away from the cells (Ensminger and Ensminger, 1996). Fibre also prevents the absorption of excess cholesterol which is also a beneficial effect in lowering blood cholesterol levels. The carbohydrates in vegetables consist mainly of indigestible fibre material such as cellulose, hemicellulose and lignin; these are in addition to small quantities of sugars such as glucose, fructose and sucrose.

Ash of the substance is the inorganic residue remaining after the organic matter has been burnt away. The ash content is an index of minerals content (Osua, 2008).The presence of iron, calcium, potassium sodium and magnesium are important in maintaining the electrolyte balance in the body. The high moisture content facilitates bacterial action resulting into spoilage which is common with all fresh vegetables. These vegetables has lower moisture contents which signifies slow bacterial action and less or extended spoilage time.

Calcium presencecan serve as a major factor sustaining strong bones and plays part in muscle contraction and relaxation, blood clotting, synaptic transmission and absorption of vitamin B (Ebang and John, 1995).Especially the higher calcium contents of *P. guineanses* (4.09%) and *G. latifolia* (2.52%) will be more advantageous to the body in the function associated with the mineral and deficiency of calcium that lead to malformation of bones especially in young animals and formation of shell-less eggs.

Iron normally serves as an essential trace mineral that plays numerous biochemical roles in the body, including oxygen binding in hemoglobin and existing enzymes activities. It also plays a role in the production of DNA, phospholipids, ATP and protein metabolism. Iron also helps to convert tyrosine into pigment that colors the skin and hairs. Itplays a role in providing healthy nervous system and formation of collagen.Iron is an element component of heme pigments. Consumption of these fresh vegetables may prevent deficiency disease (hypothombinea) and increase lost susceptibility to infectious diseases.

Sodium and potassium play a role in chemical reaction within the cells, and regulate the transfer of nutrients to the cell. Sodium works in conjunction with potassium for extra cellular fluid balance (Okoka and Oke, 2001).These vegetables known to have high content of both sodium and potassium may help to prevent the formation of kidney stones.

Magnesiumplays a role in any biochemical process in an organism, by promoting balance of minerals and for normal activity of the muscle, nervous system and hormones (Okoka andOke, 2001). It presence also provides energy maintenance/manufacture, effective immune system and regulation of an arterial pressure together with calcium.

Consumption of fresh vegetables is well represented in the composition of numerous minerals such as those of calcium, iron, potassium, phosphate, magnesium, zinc, phosphorus, sodium among others that are commonly found in vegetables. These Leafy greens were found to be a rich source of iron, calcium, potassium, magnesium and sodium, which are generally important in sustaining the electrolyte balance in our body. Theseconcentrations were much higher than recommended values. Though, not all the nutrients present were liable to be assimilated due to bioavailability factors.

In conclusion, the proximate and elemental analysis of these indigenous vegetables has revealed their respective nutritional values.These three vegetables are all good for consumption if possible on dailybases for maintenance of healthy body and also prevent nutritional/mineral deficiency diseases. The nutrient information reported in this study would enhance efforts to promote wider use of the plant as part of a broader program aimed at educating local populations on the nutritional benefits of the many wild plants existing in their environment.

REFERENCES

Adam, B. and Bitrus, A. (1993). Handbook of Food Science Technology and Engineering. 54-65.

Afolabi F. Eleyinmi (2007) Chemical composition and antibacterial activity of *GongronemalatifoliumJ Zhejiang Univ Sci*. 8(5): 352–358.

Ahamefule F.O., Obua B.E., Ibeawuchi J.A., Udosen N.R.(2006)The nutritive value of some plants browsed by cattle in Umudike, southeastern Nigeria. Pakistan J Nutr.;5(5):404–409.

Ajayi I.A., Oderinde R.A., Kajogbola D.O.,Ukponi J.U.(2006) Oil content and fatty acid composition of some underutilized legumes from Nigeria. Food Chem.;99(1):115–120.

Akwaowo E.U., Ndon B.A., Etuk E.U.(2000) Minerals and antinutrients in fluted pumpkin (*Telfairiaccidentalis* Hook f.) *FoodChem*.;70(2):235–240.

Aletor VA, Adeogun OA. Nutrient and anti-nutrient components of some tropical leafy vegetables. *FoodChem*. 1995;53(4):375–379.

All, A. (2009). Proximate and Mineral Composition of the Marchubeh (Asparagus Officiallys). *World Dairy and Food Science*. 4(2), 142-149.

Association of Analytical Chemistry (2000) *Methods of Analysis*, 17th Edition. Association of Official Analytical Chemist, Washington DC, USA.

Association of Official Analytical Chemist(1990). Official Methods of Analysis. 15th Ed. Washington, DC: Association of Official Analytical Chemists;.

Apori S.O., Long R.J., Castro F.B., Ørskov E.R. (2000). Chemical composition and [; value of leaves and stems of tropical weed *Chromolaenaodorata .Grass and Forage Science.;*55(1):77–81.

Ball G. F. M. (2000). Vitamins in food analysis bioavailability and stability CRC aylor and Francis, Boca Raton.64-68.

Balogun P. F. (1986) *Focus on Nutrition*. Olabisionabanjo, ayo-inoye, Nigeria.34-45

Corlett J.L., Clegg M.S., Keen C.L., Grivetti L.E. (2002). Mineral content of culinary and medicinal plants cultivated by Hmong refugees living in Sacramento, California*. Int J Food Sci Nutr*.;53(2):117–128.

Dule J. A. (1981) *CaesalpiniaSpinsa*. In Hard book of Legumes of World Economic Importance. Penum press, New York. 32-33.

Ebang, D. and Johnson P.(1995). Textbook; Nutritional Composition of Vegetables. 403-409.

Ensminger and Ensminger, (1996). Handbook of Food Science and Technology. CRC Press. ISBN 1-57444-551-0. 423-428

Eleyinmi A.F, Bressler D.C, Amoo I.A, Sporns P, Oshodi A.A (2006). Chemical composition of bitter cola (*Garcinia kola*) seed and hull. *Polish J Food Nutr Sci*.;15/56(4):27–32.

Farombi E.O. (2003) African indigenous plants with chemotherapeutic potentials and biotechnological approach to the production of bioactive prophylactic agents*. Afr J Biotechnol*.;2(12):662–671.

Glew R.H., VandeJagt D.J., Lockett C., Grivetti L.E., Smith G.C., Pastuszyn A., Millson M.(1997) Amino acid, fatty acid and mineral composition of 24 indigenous plants of Burkina Faso*. J Food Comp Anal*.;10(3):205–217.

Glew R.S., VanderJagt D.J., Huang Y.S., Chuang L.T., Bosse R, Glew R.H. (2004). Nutritional analysis of the edible pit of *Sclerocaryabirrea* in the Republic of Niger (*daniya*, Hausa) *J Food Comp Anal*.; 17(1):99–111.

Nijveldt , R.J, Van Nood, D.E.C, Van Horn, P.G., Boelens, K., Van Norren and Van Leeuwen, P.A.M. (2001). Flavonoids: a review of probable mechanisms of action and potential applications.Am..J .Clin. Nutr.,74; 418-425.

OgundipeO.O.. Moody J.O, Akinyemi T.O, Raman A (2003). Hypoglcemic potentials of methanolic extracts of selected plant foods in alloxanized mice. *Plant Foods Hum Nutr*. 58(3): 1-7

Okaka and Oke, A.(2001), Leafy vegetables and anti-nutrients treatment processing. 3rd Edition. 314-318.

OsuaIgwe.(2008), Fresh Vegetables and Dies Quality for maintenance of Good Health. 6thEdition 77-80.

Oyenuga O. C. (1968), *Nutritional and economic aspect of protein.* 10-30.

Smith B. and James A.(1982). Textbook: *Composition and Nutritional Quality of vegetable* 342-348.

Szeto Y.T., Tomlinson B. and Benzie F. F.,(2002) Total antioxidant and ascorbic acid contents of fresh fruits and vegetables. Implications of dietary planning and food preservation. *Brit. J Nutr.*87:55-59.

Ugochukwu NH, Babady NE, Cobourne M, Gasset SR.(2003) The effect of *Gongronemalatifolium* leaf extract on serum lipid profile and oxidative stress of hepatocytes of diabetic rats. *J Biosci*;28:1–5.

UgochukwuO.andBadaby E.(2003*), Food Chemistry*: Balance between Nutrients and Antinutrients 145-149.

Valeria, H. R. (1970),*Nutrition today*. New York Academic Press, 20-26

Whiteside PJ, Milner BA. (1984)PyeUnicam Atomic Absorption Data Book. 6th Ed. Cambridge, England: PyeUnicam Ltd;. p. 72.