A COMPARATIVES STUDY ON THE NUTRITIONAL AND ANTI – NUTRITIONAL VALUES OF THE SEEDS OF *PIPER GUINEENSE*, *MONODORA MYRISTICA* AND *OCIMUM GRATISSIMUM* AS POPULAR SPICES USED IN SOUTH EASTERN NIGERIA

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ABSTRACT

Chemical and anti-nutrient content of three seed spices commonly consumed in the South East of Nigeria was investigated using standard methods. Results reveal that the chemical and anti-nutritional composition of these edible Nigerian seed spices, *Piper guineense, Ocimum gratissimum and Monodora myristica*, are rich in protein, fat, fiber, and carbohydrate in the range of 6.23to 12.50%, 9.84 to 16.21%, 0.23 to 41.60% and 0.17 to 42.60% respectively. Antinutrients present include alkaloids 1.33 to 2.01%, flavonoids 0.15 to 1.87%, saponins 0.15 to 0.17%, HCN 0.16 -3.04%, Tannin 0.21 to2.50%, anthocyanins 0.16 to 0.31%. The present study therefore reveal the health and nutritional importance of the spices as commonly used in south eastern Nigeria.

Keywords: Seed, Spices, anti-nutrients, *Piper guineense, Monodora myristica and Ocimum gratissimum.*

INTRODUCTION

Spices are used to season insipid foods and to add zest to an otherwise monotonous diet. They stimulate the appetite and increase the flow of gastric juice. For this reason they are often referred to as food accessories or adjuncts. They also play a role in many of the industries, and are used in perfumery, soaps, incense, as dyes in histology and in various acts (Onyesom and Okoh, 2006). Studies on spices have been mostly on their exciting flavors and aromas, medicinal values and as flavorings agents. Generally, the leaf or seeds of a plant used in cooking may be referred to as a culinary herb and any other part of the plant, often dried as a spice (Asaolu *et al*., 2012). Many of the aromatic seeds called spices are actually gathered from herbal plants when they have finished flowering (Alaribe, 2008; Nwa-chukwu *et al*., 2010). These spices are said to be therapeutically useful in the management of convulsion, leprosy, stomachache, inflammation and/or rheumatoid pains, cough and loss of appetite (Valko *et al*., 2007). The spices are used for preparing soups for mothers from the first day of delivery to prevent postpartum contraction and aid lactation. They are also used for spicing meat, oil bean salad, and foods. Most of these spices have been associated with abundant bitter principle which is claimed to reduce blood sugar levels, and their liquor taken as a purge for colic, stomach pains, and worm infections. It is also believed that newborn babies grow rapidly when they are fed with food made of these spices (Roger, 2002). The spices grow commonly in high forest areas of the South Eastern region of Nigeria, as climbers, perennial creepers, or slim shrubs and trees and are available all year round (Sofowora, 1993). Proximate and nutrient analysis of medicinal plants, edible fruits and vegetables plays a crucial role in assessing their nutritional significance (Pandey *et al*., 2006). As various medicinal plant species are also consumed as food along with their medicinal benefits,

evaluating their nutritional significance can help to understand the worth of these plant species (Pandey *et al.*, 2006).

There are also various claims about the usefulness of these spices, especially their use in fattening homes, and remarkable growth of new born babies whose mothers use these spices. This study therefore focuses on the chemical and anti-nutritional composition of these seed spices. The nutritional value and anti - nutritional composition of culinary herbs such as uziza seed (*Piper guineense)*, Ehuru (*Monodora myristica)* and scent leaf seed (*Ocimum gratissimum*) are scarcely discussed. Many people consume only the leafy species and do not concern themselves with their seeds. This study therefore focuses on the proximate composition and anti nutrient composition of these seed spices.

Research findings from this work will not only help to sensitize the ignorant masses on the importance and benefits of incorporating these seed spices in their diet but also assessing their nutritional content.

MATERIALS AND METHODS

The seeds were bought from New market, Aba, Abia State of Nigeria, and identified taxonomically at the Department of Plant Science and Biotechnology Research institute Umudike, Abia State. The samples were sorted and stored in a plastic container until use.

Processing of samples

The seeds of *P. guineense, O. gratissimum, and M. myristica* were all dried in the oven at 65°C. The dried samples were milled in an Arthur Thomas coated milling machine and screened through 1 mm sieve to obtain a fine powder of each samples.

Determination of chemical composition

The proximate analysis (carbohydrate, fats, protein, moisture and ash) of spices sample was determined by using AOAC (1995) methods. Carbohydrate was determined by difference method (100– (protein + fat + moisture + ash)). The nitrogen value, which is the precursor for protein of a substance, was determined by micro– Kjeldahl method (Guebel *et al*., 1991). The nitrogen value was converted to protein by multiplying to a factor of 6.25. The moisture and ash were determined using weight difference method while determination of crude lipid content of the spices sample was done using Soxhlet type of the direct solvent extraction method. The solvent used was petroleum ether (boiling range 40 to 60°C). All the proximate values were reported in percentage (AOCS, 2000; Okwu and Morah, 2004).

Determination of antinutrients

Preparation of fat free samples

2 g of each sample were defatted with 100 ml of diethyl ether using a soxhlet apparatus for 2 h, and then used for the determination of antinutrients. Alkaloids and cyanogenic glycosides were determined by the gravimetric precipitation method as described by (Harbone, 1973). Flavonoids and anthocyanins were determined following the method of Boham and Kocipai – Abyazan (1994). While tannin was determined by Makka (1989). Spectrophotometric methods as described by Obadoni and Ochuko (2002) were used to determine the phytosterol and Saponin content.

Statistical analysis

Data were expressed as Mean ± SEM. The data were subjected to one-way analysis of variance {ANOVA}, and Scheffe's post test:
(Scheffe, 1959). SPSS software was used to analyze data. $p<0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

Table 1. Antinutrient content of spices (%)

Sample	Alkaloid	Flavonoid	Saponin	Steroid	HCN	Tannin	Anthocyanin
P. guineense	2.01±0.02	0.81±0.04	0.15±0.03	2×10^{-5}±0.04	0.21±0.05	2.50±0.03	0.31±0.04
O.gratissimum	1.36±0.03	1.87±0.02	0.17±0.03	1.80±0.04	0.16±0.04	0.23±0.04	0.16±0.04
M. myristica	1.33±0.01	0.15±0.04	0 .16±0.05	1.11 ±0.03	3.04±0.04	0.21±0.02	0.18±0.03

HCN: Hydrogen cyanide.*Values are mean ±SD of triplicate determinations.

Table 2. Proximate composition of the spices (%)

Sample	Protein	Fat	Fiber	Ash	CHO	Moisture	Dry matter
P. guineense	6.23±0.04	10.20±0.01	0.23±0.03	0.43±0.03	0.17±0.05	82.43±0.06	84.14±0.06
O.gratissimum	12.50±0.06	9.84±0.02	41.60±0.04	20.18±0.04	42.60±0.04	64.20±0.04	60.50±0.04
M. myristica	6.10±0.05	16.21±0.03	27.42±0.05	7.54±0.03	30.15±0.04	41.02±0.0	67.121±0.05

Values are mean ± SD of triplicate determinations.

Table 2 shows the proximate composition of the seed spices of *Ocimum gratissimum* had a significantly higher ($p<0.05$) protein content than all samples analyzed 12.50±0.06%, while *M. myristica* had a significantly ($p<0.05$) higher fat content 16.21±0.03% and *O.gratissimum* the least 9.84%. The samples are rich in fiber 41.60±0.04% for *O. gratissimum,* which was significantly ($p<0.05$) higher than 0.23±0.03% for *P. guineense* as the least. Carbohydrate content of *Ocimum gratissimum* 42.60±0.02% was significantly ($p<0.05$) higher compared to 0.17±0.05% for *P. guineense* as the least. *P. guineense* had a significantly ($p<0.05$) higher moisture content 84.11±0.06% compared to 41.02±0.04% as the lowest for *M. myristica. p. guineense* also had significantly ($p<0.05$) high dry matter content 84.14±0.06%, compared to *O. gratissimum which* had the least 60.50±0.04%.The results showed that the seed spices are rich in nutrients (Table 2), but low in antinutrients (Table 1).The protein content of *O. gratissimum,* 12.50±0.06% is significantly ($p<0.05$) higher compared to 6.23±0.01% and 6.10±0.04% for *P. guineense and M. myristica* respectively (Table 3). Fat content of *M.*

myristica 16.21±0.03% is significantly ($p<0.05$) higher compared to 9.84±0.01% and10.20±0.02% for *O. gratissimum*, and *P. guineense respectively*. Fiber content is equally high (0.23±0.03) for *O. gratissimum*, as the least and *p. guineense* having a significantly ($p<0.05$) higher content of41.60±0.04% compared to the others. Carbohydrate ranged between 0.17±0.05% to 42.60±0.02%, with *O. gratissimum*, having a significantly ($p<0.05$) higher content of 42.6±0.02% compared to the others. Moisture content ranged between 41.02±0.04% to 82.43±0.06%, while dry matter ranged between 60.50±0.04% to 84.14±0.04% which are significantly ($p<0.05$) higher compared to the lower value of 15.34±0.03%. Regular use of plant foods rich in protein makes a valuable addition to a diet (Wardlaw and Kessel, 2002). Fats insulate and protect body organs and also transport fat-soluble vitamins. The minimal intake of carbohydrate is 50 to 100 g per day, 60% of total energy intake is a typical recommendation (Wardlaw and Kessel, 2002). High carbohydrate; low fat diet aids control of hypertension and prevent obesity. Fat and protein stimulate the release of the hormone –gastric inhibitory peptide from the walls of the small intestine. gastric inhibitory peptide slows the release of stomach contents into the small intestine (Wardlaw and Kessel, 2002).The high chemical content of these spices tend to lend support for the benefits the consumer may derive. Rich macronutrients of food are beneficial to the body (Okaka and Okaka, 2001). The antinutrient content (Table 1) shows that all the spices contain alkaloids, flavonoids, saponins, steroids and tannins. *P. guineense* contains 2.01±0. 02% of alkaloid, which seems to be on the high side. The other spices contain between 1.36±0.01% to 1.334±0.01% which is probably on the low side. Alkaloids are one of the most efficient therapeutically significant bioactive substances in plants. Scent leaf seed (1.03 %) had the highest flavonoid content than uziza (0.53 %) seed which was significantly ($p < 0.05$) different. Flavonoids, saponins and steroids occur in the range of 0.15±0.04% to 1.87±0.04%; 0.15±0.05% to 17. 0±0.03% and 2×10^{-5}±0.04% to 1.80±0.04% respectively. *O. gratissimum*, seed having the highest content of flavonoid inferred that scent leaf seed could perform biological functions such as anti - oxidation as reported by (Alobi *et al*., 2012) of the scent leaf. Flavonoids are potent water soluble antioxidants and free radical scavengers which prevent oxidative cell damage and have strong anticancer and anti-ulcer activity and protection against the different levels of carcinogenesis (Agbaire, 2011). *P. guineense has the highest* tannin content (2.50±0.03) when compared to other spices which has 0.23±0.04 and 0.21±0.02 respectively. *P. guineene , O.gratissimum* and *M. myristica* contains hydrogen cyanide 0.21_0.01%, 0.126±0.05% and 2.04±0.04% respectively. The concentrations of these phytochemicals in these spices are not on the high side as to constitute a health hazard, as they are within the safe level (Brown, 2007).The low concentration of antinutrients makes the seed spices safe for use. Anti-nutrients are required in low concentrations to effect biochemical changes; hence the spices may be effective as ethnomedicine (Okaka and Okaka, 2001).

Nutritionally, *O. gratissimum* with 12.50±0.04% protein, 9.84±0.02% fat, 41.60±0.04% fiber, 20.18±0.02% ash, 42.60±0.04% CHO, 64.20±0.04 moisture, seems to be of a higher nutritional value, since the antinutrient content is equally low.

CONCLUSION

The results obtained show that the important active chemical constituents found in the seed spices which were products of secondary metabolism such as saponin, phenol, alkaloid, flavoinoid, and better proximate composition were found to be higher in scent leaf seed than uziza seed except for the fat and dry matter contents were uziza seed was higher than scent. Never the-less, the regular use of scent seed and uziza seed in our daily diet should be

recommended. This could enable derivation of full dose of the required proximate and phytochemical compositions and better therapeutic effects could be also obtained.

REFERENCES

Alaribe. S. I. (2008). A survey of the importance and problems of traditional health care medicine: A case study of Ezinihitte Mbaise L.G.A Imo State. Unpublished B.Sc. Project, A. I. F. C. E Owerri. Imo State.

Asaolu, S. S., Adefemi1, O. S., Oyakilome, I. G., Ajibulu, K. E. and Asaolu, M. F. (2012). Proximate and mineral composition of Nigerian leafy vegetables. Journal of Food Research 1(3): 2014 – 2018

AOAC (1995). Official Methods of Analysis. 13th Edn. Association of Analytical Chemists, Washington, DC, USA.

AOCS American Oil Chemist Society (2000). Official Methods of Analysis. 5th Edn., Association of Official Analytical Chemists, Washington, DC, USA.

Boham BA, Kocipai-Abyazan R (1994). Flavonoids and condensed tannins from leaves of Hawaiian *Vaccinum vaticulatum* and *V. calycinium.* Pac. Sci., 48: 458-463.

Brown AC (2007). Chemistry of Food Composition: Understanding Food: Properties and preparation 3rd Edn., Wadsworth Publishing Co., United States, pp. 46-49.

Guebel DV, Nudel BC, Giulietti F (1991). A simple and rapid micro- Kjeldahl method for total nitrogen analysis. Biotech. Technol., 5(6): 427-430.

Harbone JB (1973). Phytochemical Methods: A Guide to Modern Techniques in Plants Analysis. Chapman and Hall, London, p. 26.

Makka HPS (1989) Protein precipitation methods for quantitation of tannins: A review. J. Agric. Food Chem., 37(4): 1197-1202.

Nwachukwu, C. U. Umeh, C. N and Kalu, I. G (2010). Identifi-cation and traditional uses of some common medici-nal plants in Ezinihitte Mbaise L.G.A., of Imo State, Nigeria. Report and Opinion 2 (6): 1 - 8.

Obadoni BO, Ochuko O (2002). Phytochemical studies and comparative efficacy of the crude extracts of some homeostatic plants in Edo and Delta States of Nigeria. Global J. Pure Appl. Sci., 8(2): 203–208.

Okaka JC, Okaka ANO (2001). Food composition, spoilage and shelflife extension. Ociarco Academic publishers, Enugu, Nigeria, pp. 54- 57, 61-66.

Okwu DE, Morah FN (2004). Mineral and nutritive value of *Dennettia tripetala* fruits. Fruits, 59(6): 437–442.

Onyesom I, Okoh PN (2006). Qualitative analysis of nitrate and nitrite contents in vegetables commonly consumed in Delta State, Nigeria. Br. J. Nutr., 96(5): 902-905.

Pandey MAB, Abidi S, Singh RP (2006). Nutritional evaluation of leafy vegetables paratha. J. Hum. Ecol., 19: 155–156.

Roger GPD (2002). Encyclopedia of Medicinal Plants. Vol. 1. Education and Health, Library Editorial Saleliz S.I. Spain, pp. 153-154.

Scheffe H (1959). The analysis of variance. In: Sample size to detect a planned contrast and a one degree-of-freedom interaction effect. New York: Wiley. Wahlsten, Douglas, (1991).ed

Shah MT, Begum S, Khan S (2009). Pedo and Biogeochemical studies of mafic and ultra mafic rocks in the Mingora and Kaba areas, Swat. Pak. Environ. Earth Sci., 60: 1091-1102.

Smith G, Cleeg M, Keen C, Grivetti L (1996). Mineral values of selected plant foods common to Southern Burkina Faso and to Niamey, Niger West Afr. Int. J. Food Sci. Nutr., 47: 41-53.

Sofowora EA (1993). Medicinal plants and traditional medicine in Africa. Spectrum Books Ltd, Ibadan, pp. 55–71.

Valko M, Leibfritz D, Moncol J, Cronin MT, Mazur M, Telser J (2007). Free radicals and antioxidants in normal physiological functions and human disease. Int. J. Biochem. Cell Biol., 39: 44-84.

Wardlaw GM, Kessel MW (2002). Perspectives in Nutrition. 5th Edn., McGraw Hill, New York, pp. 162-452.

Wright K (2002). Healing Foods. Geddes and Grosset, Scotland. pp. 8- 31.