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Antinutritional Evaluation and *In vitro* Protein Digestibility of Some Nigerian Cucurbits

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Abstract: The antinutritional factors of three Nigerian cucurbits namely, 'snake tomato' *Trichosanthes cucumerina*, 'pumpkins' *Cucurbita pepo* and *Cucurbita moschata* were analyzed. The antinutritional factors evaluated were tannin ranging from 0.23 to 0.49%; oxalate, 0.01 to 0.23%; cyanogenic glycosides, 0.43 to 0.44% and trypsin inhibitor, 6.32 to 11.58 TI unit/g. There were significant differences ($p<0.05$) in some of the antinutritional components of the cucurbits evaluated. The samples exhibited high protein digestibility but low levels of antinutrients which showed that the cucurbits studied cannot be toxic for human consumption postulating that the samples are of high nutritional quality so large scale production should be encouraged.

Key words: Antinutrients, cucurbits, evaluation, factors, protein digestibility

INTRODUCTION

Some Nigerian cucurbits, snake tomato *Trichosanthes cucumerina* used in thickening stew, Pumpkins *Cucurbita pepo* and *Cucurbita moschata* eaten normally as porridge, have shown to be staples in the Nigerian diet. The family cucurbitacaea is a moderately large family of about 130 genera and 900 species. It is represented in Nigeria by 21 genera and 41 species (Jeffery, 1964). Cucurbits are among the most economically grown crops worldwide (Pirat *et al*., 1999; Paris, 2001; Bisoginin, 2002; Sanjur *et al*., 2002). Snake tomato are grown close to trees, sticks or walls. The bright red pulp surrounding the mature seeds is extracted and used in cooking like tomatoes. A few people use the whole mature fruits or even the immature ones (Okoli, 1984). The ripe fruits are fibrous and bitter (Purseglove, 1984). The pumpkins are cultivated in Northern Nigeria for their fruits. In Southern Nigeria, they are cultivated for both the leaves which constitute an important vegetable "ugboguru" in Eastern part of Nigeria and for the fruit whose pulp is eaten when cooked. The rind is usually discarded (Okoli, 1984).

At present the antinutritional composition of these Nigerian species have not been widely reported. Despite their agronomic, cultural and culinary importance, these plants lack attention from research and development (Chweya and Ezaguire, 1999).

The limit of proper knowledge especially of their nutritive value, methods of production, preservation and utilization is an important deterrent to their wider production which should result in food security and increased income for peasants (Loukou *et al*., 2007). The present study aims at providing information on the *in vitro* protein digestibility and antinutritional factors of three species of cucurbits grown in Nigeria and to determine the possibility of the wider cultivation and consumption of these foods in a larger scale.

MATERIALS AND METHODS

Cucurbita pepo and *Curcurbita moschata* were purchased from Igwurita market in Ikwerre Local Government Area of Rivers State, Nigeria. The *Trichosanthes cucumerina* was obtained during field trips to Ogbogoro farms in Obio/Akpor Local Government Area of Rivers State.

Sample preparation: The cucurbits were washed and their rind discarded. The samples were then cut into slices and dried to a constant weight at 105°C for 48 hrs. The dried samples were then ground into powder and put in dried air tight containers and stored in a cool dry place.

Determination of antinutritional factors: Tannin was determined by Folin-Denis Spectrophotometric method as described by Pearson (1976). Oxalate was determined by the method of Munro and Bassir (1969). Trypsin inhibitor was determined by the method of Arntifield *et al*. (1985). Cyanogenic glycoside was determined by the AOAC method (1990).

Determination of *in vitro* protein digestibility: The *in vitro* protein digestibility was carried out using pepsin/pancreatin method as described by Oke and Umoh (1974).

Statistical analysis: Data analysis was performed using the Statistical Package for the Social Sciences software (SPSS, version 11.0). Data is displayed in mean±SD. The statistical method of one way Analysis of Variance (ANOVA) was used to compare the mean values obtained among different groups. Differences were considered significant whenever the p-value is $p<0.05$.

Table 1: Composition of antinutrients of three cucurbits found in Nigeria

Samples	Tannin (%)	Oxalate (%)	Trypsin inhibitor (Tiu/g sample)	Cyanogenic glycoside (%)
Trichosanthes cucumerina	0.49±0.00[a]	0.01±0.00[a]	8.43±0.21[a]	0.43±0.00[a]
Cucurbita pepo	0.29±0.01[b]	0.23±0.01[b]	11.58±0.71[b]	0.44±0.01[b]
Cucurbita moschata	0.23±0.01[c]	0.21±0.01[c]	6.32±0.00[c]	0.43±0.00[a]

Means bearing different superscripts in the same vertical row are significantly different (p<0.05)

RESULTS AND DISCUSSION

Table 1 shows the values of the antinutrients analysed in the various cucurbits. The samples exhibited low levels of the antinutrients, tannins, oxalate, trypsin inhibitor and cyanogenic glycoside. The low levels of the antinutrients in the samples showed that the samples cannot be toxic for human consumption. *Tricosanthes cucumerina* had the highest tannin content (0.49%). This could be attributed to the red colour of the pulp used for the investigation. Polyphenol levels in common beans are quite variable and are related to the colour of the seed with white containing very low amounts, while red, black and bronze have significant higher levels (Bressani *et al*., 1983). Cooking can reduce the levels of tannin contents in food. Looking at the percentage oxalate levels of the samples (0.01 to 0.23), it was obvious that the values fell within the range (0.1-85%) obtained by Turner (1980) for the oxalate content of plant species. Oxalic acid occurs in a large number of plant species where it is often found as crystals of insoluble calcium salt. Turner (1980) opined that calcium oxalate serves protective functions and because of this, they need to be located peripherally. The values for the trypsin inhibitor ranged from (11.58 Tiu/g) in *cucurbita pepo* which had the highest value to (8.43 Tiu/g) in *Trichosanthes cucumerina* and 6.32 Tiu/g) in *cucurbita moschata*. The values obtained are comparable to the values obtained by Singh and Jambunatham (1981) for pigeon pea which ranged from 12.5 to 82.4 Tiu/g. Trypsin inhibitors could provide chemical resistance against some insect pests. Elevated levels of trypsin inhibitor activity in cowpea have been reported to confer resistance against the attack of bruchid beetle (Singh and Jambunatham, 1981). The cyanogenic glycosides values for the different samples are 0.44% for *Cucurbita pepo* while *Trichosanthes cucumerina* and *Cucurbita moschata* had the same value 0.43%. The levels of the cyanogenic glycosides in the samples are very low so the samples cannot be toxic for human consumption. However, the control of this toxin in food is thus by eliminating the hydrogen cyanide through soaking, frying, cooking and fermentation of the food (Ziniye, 1991). Table 2 shows the results of the *in vitro* protein digestibility of the cucurbits studied. *Cucurbita moschata* had the highest digestibility (86.52%) followed by *Trichosanthes cucumerina* (84.20%) with *Cucurbita pepo* having the least digestibility (82.61%). The low value obtained for *Cucurbita pepo* could be attributed to its high level of trypsin inhibitors. Singh and Jambunatham (1981) had similar results where their samples with the lowest value of *in vitro* digestibility had the highest value of trypsin inhibitor and he suggested that the low protein digestibility could be due to the presence of high levels of protease inhibitors.

Table 2: *In vitro* protein digestibility of three cucurbits found in Nigeria

Samples	Percentage digestibility
Trichosanthes cucumerina	84.20±0.07[a]
Cucurbita pepo	82.61±0.01[b]
Cucurbota moschata	86.52±0.14[c]

Means bearing different superscripts in the same vertical row are significantly different (p<0.05)

REFERENCES

Arntifield, S.A., M.A. Ismond and E.D. Murray, 1985. The fate of antinutritional factors during preparation of feba bean protein isolate using micellization technique. J. Food Sci. Technol., 18: 132-143.

AOAC, 1990. Official method of Analysis. 15th Edn., Wash D.C. Association of Official Analytical Chemists.

Bisoginin, D.A., 2002. Origin and evolution of cultivated cucurbits. Ciecia Rural, 32: 715-723.

Bressani, R., L.G. Elias, A. Wolzak, A.E. Hagerman and L.G.A. Butler, 1983. Tannin in common beans, methods of analysis and effects on protein quality. J. Food Sci., 48: 1000-1001.

Chweya, J.A. and P.B. Ezaguire, 1999. The biodiversity of traditional leafy vegetables. Rome IPGRI.

Jeffery, C., 1964. Key to the cucurbitaceae of West tropical Africa, with a guide to localities and little known species. J. W. Afr. Sci. Assoc., 9: 79-97.

Loukou, A.L., D. Gnakri, Y. Dje, A.V. Kippre, M. Malice, J.P. Baudoin and I.A. Zoro Bi, 2007. Macronutrient composition of three cucurbit species cultivated for seed consumption in Cote d' Voire. Afr. J. Biotechnol., 6: 529-533.

Munro, A. and O. Bassir, 1969. Oxalates in Nigeria vegetables. W. Afr. J. Appl. Chem., 12: 14-18.

Oke, O.L. and I.B Umoh, 1974. Nutritive value of leaf protein. *In vitro* and *in vivo* methods. Nutr. Rep. Int., 10: 397-403.

Okoli, B.E., 1984. Wild and cultivated cucurbits in Nigeria. J. Econ. Botany, 38: 350-357.

Paris, H.S., 2001. Characterization of the cucurbita pepo collection at the newe Ya'ar research center Isreal. Plant Genet. Res. Newslet., 162: 41-46.

Pearson, D., 1976. The chemical analysis of foods. Churchill Livingstone London.

Pirat, M., M.C. Chaucet and C. Foury, 1999. Diversity, history and production of cultivated cucurbits. Acta Hort., 492: 21-28.

Purseglove, J.W., 1984. Cucurbitaceae. Tropical crops. Dicotyledons, 1: 100-138.

Singh, U. and R. Jambunatham, 1981. Protease inhibitors and *in vitro* protein digestibility of pigeon pea *Cajanus cajan* and its wild relatives. J. Food Sci. Technol., 18: 246-247.

Sanjur, O.I., D.R. Pipero, T.C. Andres and L. Wessel-Beaver, 2002. Phylogenetics relationships among domesticated and wild species of cucurbita (cucurbitaceae) inferred from a mitochondrial gene: Implications for crop plant evolution and areas of origin. Natl. Acad. Sci., 99: 535-540.

Turner, N.A., 1980. Micro determination of oxalate in crude extracts of plant tissues. J. Sci. Food Agric., 31: 171-176.

Ziniye, A., 1991. The implication of toxicants in food. J. Food Digest., 1: 30-34.