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Fatty Acid and Amino Acid Profiles of *Irvigna gabonesis* and *Citrullus colocynthis* Seeds Used for Soup Preparation in South Eastern Parts of Nigeria

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Abstract: Analysis of fatty acid composition and amino acid profile of two indigenous seeds *Irvigna gabonesis* and *Citrullus colocynthis* used as both soup condiments and thickeners in soup preparation were carried out using standard methods. The fatty acid profile of *Irvigna gabonesis* showed it is composed of saturated fatty acids while fatty acids of *Citrullus colocynthis* were mostly unsaturated with the occurrence of some essential fatty acids. There were rich in amino acids, especially, the essential amino acids. The concentration of arginine in *Irvigna gabonesis* and *Citrullus colocynthis* were 5.01 and 9.32g/100g protein respectively. There was no variation with the concentration of arginine in an egg. The concentration of histidine was 2.40 and 4.77g/100g for *Irvigna gabonesis* and *Citrullus colocynthis* respectively while a comparative analysis showed no difference from 2.4g/100g of protein in an egg. The fatty acid profile revealed the predominance of saturated fatty acids in *Irvigna gabonesis,* while *Citrullus colocynthis* was about 63% unsaturated. Saturated fatty acids in *Irvigna gabonesis* contributed about 97%. However, *Citrullus colocynthis* contained some essential fatty acids. It was observed that the limiting amino acids in *Irvigna gabonesis* were lysine, methionine, isoleucine, valine and phenylalanine while the limiting amino acids in *Citrullus colocynthis* were isoleucine, leucine and valine. A comparative analysis revealed that the two seeds will compensate for the limiting amino acids in each seed and can provide a secured nitrogen balance of the body.

Key words: Soup · Thickeners · Condiments · Fatty Acids · Amino Acids

INTRODUCTION

Information on the nutrient composition of locally available foods is very scanty and where available, these data are related to only the most popular foods [1]. The food use of these thickeners calls for more investigative data on the nature of their compositions and properties. Some of these seeds have been neglected and not given a pride of place in the diets of the world people, which might be as a result of ignorance of their nutritive value and other possible benefits of the seeds.

Irvigna gabonesis has the ability to form gels at lower concentration than many oil seed flours and this is why they are applied in food industry that require a thickening agent [2]. *Irvigna gabonesis* (ogbono) is a wild plant bearing many fruits [3]. *Citrullus colocynthis* is a seed crop and the commonest soup condiment enjoyed in the south-east region of Nigeria [4]. These two food materials are often taken in combination. *Irvigna gabonesis* is mainly used as thickener while *Citrullus colocynthis* is mainly used as condiment.

Food safety is a primary concern for everyone and most people are ignorant of the fact that some of these seeds can provide cheap sources of very useful nutrients needed for healthy growth and maintenance of the system [5]. The nutritional value of any food material can be achieved through biochemical analysis which has proven very useful because it analyses the major nutritional factors such as fatty acid composition and amino acid profile of the food material.

Some seeds are used in Nigeria for soup preparation, especially in the rural areas due to their availability and cheap cost. These seeds contain an appreciable amount of essential nutrient which the body needs but may unable to synthesize them. These essential nutrients must therefore be provided exogenously by ingestion

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in food materials which liberated upon hydrolysis. The investigation into the amino acid profile will make way for the prediction of the extent to satisfy the demand for essential amino acids and stabilize nitrogen balance in the system. The fatty acid profile will also help to unveil the possible content of essential fatty acids and other fatty acids which are also needed for membrane synthesis and energy storage [6].

Essential amino acids are those that must come from the diet. These include: isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. However, arginine, cysteine, glycine, glutamine, histidine, praline, serine and tyrosine are considered conditionally essential, meaning that they are not normally required in the diet, but must be supplied exogenously to specific populations that do not synthesize it in adequate amounts [7, 8].

Essential fatty acids are very important in maintaining cell membrane structure and in capillary wall integrity as well as staring materials for the synthesis of other unsaturated fatty acid derivatives such as prostaglandins [9].

MATERIAL AND METHODS

The seeds of *Irvigna gabonsis* and *Citrullus colocynthis* used for this analysis were fresh indigenous seeds picked from Mebi Owa in Okposi autonomous community of Ohaozara Local Government Area, Ebonyi State, Nigeria. They were dried in an oven at 60°C for 48 hours and milled with blender to reduce the particle size and increase the surface area and used for the analyses.

Determination of Amino Acid Profile: The amino acid profile in the samples was determined using methods described by Spackman *et al*., [10]. The samples were dried to constant weight, defatted, hydrolyzed, the solvent evaporated in a rotary evaporator and loaded into the Technicon sequential Multi-sample Amino Acid Analyzer (TSM), model DNA 0209 for analysis. The concentration was expressed in g/100g protein.

Determination of Fatty Acid Profile: The fatty acid methyl esters of lipids were prepared according to the AOAC 1980 methods [11]. The analyses of fatty acid methyl esters were carried out with a Hewlett Packard Gas Chromatograph equipped with a hydrogen flame ionization detector and a capillary column; CP-Sil-88 Wcott fused silica 50mx0.25mm id., (of 0.20mm film thickness).

Table 1: Summary of percentage (% area) fatty acid profile of *Irvigna gabonesis* and *Citrullus colocynthis* seeds

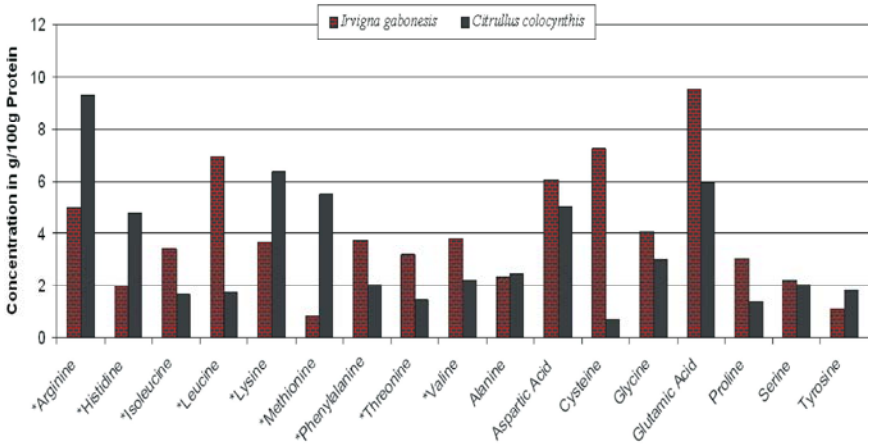
Parameters (% area)	*Irvigna gabonesis*	*Citrullus colocynthis*
Capric acid C10	1.4202	-
Lauric acid C12	36.848	0.2109
Myristic acid (C14-0)	42.0961	0.4042
Myristoleic acid (C14:1)	-	-
Palmitic acid (C16:0)	13.0503	30.8341
Palmitoleic acid (C16:1)	-	-
Stearic acid (C18:0)	3.6885	5.5387
Oleic acid (C18:1)	-	22.1971
Linoleic acid (C18:2)	-	40.815

RESULTS AND DISCUSSION

The results showed that the seeds contained fatty acids and amino acids in good amounts that can be better compensated for each other when taken in combination. The fatty acid distribution in the seeds of *Irvigna gabonesis* and *Citrullus colocynthis* used soup preparation as shown in Table 1 is revealed as percentage area of fatty acid methyl esters composition. *Irvigna gabonesis* contained myristic acid 42.0961%, lauric acid 36.8480%, palmitic acid 13.0503%, stearic acid 3.6885% and capric acid 1.4202%. There were no presence of oleic and linoleic acids. The results of investigation on *Citrullus colocynthis* revealed high percentage content of linoleic acid 40.8150%, oleic acid 22.1971, palmitic acid 30.8341% and trace amounts of capric and lauric acids. These values are comparable to 26.50 oleic acid and 45.10g/100g linoleic acid reported for *Xylopia aethiopica* by Barminas *et al*., (2004) and 15.10 -24.80% palmitic acid, 29.90 – 41.80% oleic acid and 35.90 – 51.30% linoleic acid reported by Damian *et al*., (1999) sorghum cultivars from Argentina.

The values were similar to the result on the fatty acid profile of some selected seeds used as soup thickeners in the South East parts of Nigeria [4]. The high level of saturated fatty acids also confirms their state at room temperature because they were semi liquid. The nutritional advantage of *Citrulluis colocynthis* seeds was that they contained a good level of the essential fatty acid linoleic acid. The body requires essential fatty acids for the synthesis of useful substances. The body can however synthesize linolenic caid and arachidonic acid if provided with linoleic acid [9].

The amino acid profile of *Irvigna gabonesis* showed that it contained glutamic acid 9.54, cysteine 7.28, leucine 6.94, aspartic acid 6.08, arginine 5.01, glycine 4.06, phenylalanine 3.77, lysine 3.67 and threonine 3.20g/100g protein. The rest had values less than 3.00g/100g protein. The investigation into the amino acid composition of *Citrullus colocynthis* showed arginine 9.32, lysine 6.35,



* = *Essential amino acid*

Fig. 1: Amino acid profile of *irvigna ganonesis* and *citrullus colocynthis* using amino acid analyzer, technicon tsm-1, (model: dna 0209), (concentration in g/100g protein).

glutamic acid 5.95, methionine 5.51, aspartic acid 5.02, histidine 4.79, glycine 2.98 and alanine 2.47g/100g protein. The primary function of dietary protein is to supply building materials for growth and maintenance of body tissues. It does this by furnishing amino acids in appropriate amounts and types for efficient synthesis of specific cellular tissues proteins. Nitrogen, with its key position in amino acids and hence in building body tissue, is a vital element in our body. All amino acids supplied by dietary protein participate in growth and tissue maintenance. Others perform some physiologic roles [5].

CONCLUSION

The result showed that *Irvigna gabonesis* has predominance of myrystic and lauric acids while linoleic acid, plamitic acid and oleic acid were higher in *Citrullus colocynthis* than in *Irvigna gabonesis.* There was presence of essential amino acids in both. However, none can supply all the essential amino acid in a balanced proportion but when taken in combination, each can complement for deficiencies or limiting amino acids in the other. This may explain the reason why the people of the South Eastern Nigeria like mixing soups made of *Irvigna gabonesis* (Igbo: *Ogbono*) and *Citrullus colocynthis.*

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