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Changes in Amino Acid Composition of African Yam Beans (*Sphenostylis stenocarpas*) and African Locust Beans (*Parkia filicoida*) on Cooking

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Abstract: Amino acid composition of raw and cooked African yam beans and African locust beans have been determined. The results showed that cooked or raw beans contained all the amino acid commonly found in protein food materials. Cooking has significant effect on some essential amino acid contents of the two seeds (P>0.05). When the samples were cooked, the essential amino acid content of African yam beans and African locust beans were observed to change from 1.12 to 0.97g per 16g N and from 1.69 to 1.79g/16g N respectively. African locust beans showed isoleucine and threonine to be its limiting amino acids. Their values increased slightly on cooking from 2.27 to 2.31(African yam beans) and from 2.91 to 3.33g per 16g N(African locust beans). The advanced amino acid profile of the two cooked seed samples compares favourably with whole hen's egg and most of them meet the daily requirement of FAO and WHO. The amounts of lysine, proline and glutamic acids amounts reduces cooking any of the two studied beans, while the remaining amino acids showed slight but varied percentage changes on cooking. Results are also compared with literature values for other contemporary plant seeds and legumes. The two seeds are projected as alternative sources of cheap food protein.

Key words: African yam beans, African locust beans, amino acid

Introduction

The nutritional potential of sphenostylis stenocarpa and parkia flicoidea have been intensively research upon (Oyenuga *et al*., 1974; Edem *et al*., 1990; Balogun and Fetuga, 1986; Okigbo, 1973). This trend is rightly asserted by Pant and Tulsiram (1969) to be so as a result of insufficient protein of good quality, which poses a serious problem in many developing countries, including Nigeria, where the increasing populations can no longer meet their nutritional requirements. Protein from plant sources still remains a major alternatives source for the common man, since animal protein is scarce and expensive beyond their demand.

African yam beans and African locust beans are popular food items in all parts of Nigeria. African yam beans, is cultivated extensively as a crop plant in both savanna and the forest zones of Nigeria (Okigbo, 1973). The pharmacological basis for the traditional uses of this plant has been documented by Asuzu (1986).

On the other hand, the African locust beans is also widely cultivated in the natural grassland of the Northern parts of Nigeria as well as in the derived savanna zones of the western and south eastern states of Nigeria (Oyenuga *et al*., 1974). The seeds and pulp of this plant have been successfully use as food for pigs in the Northern part of Nigeria and as condiments in many African diets (Oyenuga *et al*., 1974; Ekop, 2006).

Adequate knowledge and awareness of the amino acid profile of protein contained in edible plant products is necessary. Numerous research findings (Oyenuga *et al*., 1974; Pant and Tulsiram, 1969; Finar, 1975; Williams, 1960) have recognized that the value of food and animal feed for protein nutrition is determined primarily by it's amino acid content. Most work, so far carried out in this direction on African yam beans.. The present study is aimed at determining the amino acid content of African locust beans and African yam beans.

Materials and Methods

Matured, infected samples of African locust beans and African yam beans were procured from a local market in Abak metropolis, Akwa Ibom State. The samples were sun dried. Half of each seeds sample was separately cooked in water until they were soft. The cooked samples were dried to constant weight after cooling. The dried samples were grounded and sieved through a 60mm-mesh screen and preserved for analysis.

In the determination of the amino acid profile of the sample, the method described by Speakman *et al*. (Speckman *et al*., 1958) was adopted.

Results and Discussion

The result of the amino acid composition of raw and cooked samples of African yam beans and African locust beans is presented in Table 1. The amino acid profile of a whole egg and FAO/WHO recommended daily requirements are also included in the Table.

The result shows that the raw and cooked samples of the two seeds contained all the amino acids which are found naturally in plant protein. The values for the African yam beans were generally higher than the corresponding values for the African locust beans.

Table 1: Amino acids composition of raw and cooked samples of the African yam beans and African locust beans

	Raw S	Cooked S	Raw P	Cooked P	Whole hen egg's	FAO/ WHO
Morlencine	6.63	6.86	5.68	6.19	ND	ND
Glutamic acid	10.64	10.44	15.92	15.72	10.11	ND
Aspartic acid	7.87	9.89	7.21	8.58	8.12	ND
Serine	3.51	4.48	4.18	2.81	6.72	4.01
Threonine	4.27	5.09	2.91	3.33	4.01	ND
Proline	2.44	1.96	3.03	2.29	4.41	ND
Alanine	5.35	5.53	4.45	4.45	4.41	ND
Glycine	6.31	6.65	8.52	9.56	2.22	ND
Valine	4.04	4.92	4.51	5.34	5.32	5.01
Cystine	1.69	1.79	5.01	5.02	ND	3.52
Methionine	1.12	0.97	5.29	4.86	2.13	3.52
Isoleucine	2.28	2.81	2.27	2.31	4.08	4.01
Leucine	4.34	5.07	5.21	4.17	6.91	7.01
Tyrosine	2.88	2.19	3.03	2.49	2.66	6.02
Phenylalanine	2.72	1.78	3.58	2.73	3.78	6.02
Histidine	3.58	3.41	3.19	3.21	3.02	2.41
Lysine	7.09	6.95	6.33	5.86	8.16	5.52
Arginine	3.49	3.41	5.47	6.12	4.42	2.01

Mba, 1980

Table 2: Percentage changes in the amino acid composition of the seeds of the African yam beans and African locust beans after cooking

Morlencine	3.47b	8.68
Glutamic acid	1.88	1.25
Aspartic acid	25.67[b]	23.31[b]
Serine	28.01[b]	32.78[b]
Threonine	19.21[b]	14.78[b]
Proline	19.67	24.42
Alanine	3.36[b]	0.01
Glycine	5.39[b]	12.38[b]
Valine	21.78[b]	18.40[b]
Cystine	6.51[b]	0.41
Methionine	13.39	8.3
Isoleucine	22.17[b]	1.76
Leucine	16.82[b]	19.96[b]
Tyrosine	24.11	17.49
Phenylalanine	24.01	23.31
Histidine	4.75	0.63
Lysine	1.98	7.42
Arginine	2.58	11.88[b]

b – Decrease in percentage

Except for glutamic acids, methionine and morleucine. A unit mass, 1kg, of each sample is seen to satisfy the daily allowance stipulated by FAO and WHO. The values of almost all the amino acids present in the two seed samples compares favourably with a whole hen's egg. Both plant seeds have higher non-essential and essential amino acids, with the exception of serine, methionine, leucine abd arginine. The values for African locust beans were comparable to values reported by Oyenuga *et al*., 1974; Pant and Tulsiram 1969 and Anonymous (1950). Values obtained for lysine in the two seeds samples were also comparable to value reported by Williams (1960) for soy beans.

The observed value of 5.3g per 16g of N for the methionine content of African locust beans is high when compare with the range of values (0.24 – 1.27g N per 16g N) reported for most legumes (Oyenuga *et al*., 1974). The values for the leucine and isoleucine in the two seeds are low when compare to the range of values (3.07-9.50g per 16g N) reported by Black and associates (Block and Diona, 1961) for corn and soybeans.

The values observed for the two seeds also compares favourably with recommended daily intake (Natural Research Council, 1974)., which implies that these seeds are rich in amino acid.

The limiting amino acids in African yam beans are methionine and cystine while isoleucine and threonine are the limiting amino acids in African locust beans. These observation agrees with earlier investigation (Oyenuga *et al*., 1974; Nwokolo, 1987; Apata and Ologhbo, 1994). The observes high content of lysine observed in the raw samples of the two seeds confirms the work of Nwokolo (1987) and Oyenuga *et al*. (1974).

Table 2 shows the percentage changes in the concentration of amino acids in the two seed samples as result of cooking. The result indicates that the limiting amino acids of the two seeds are slightly reduced when the seeds are cooked. The concentration of glycine in the seed African yam beans remains fairly constant in the cooked and raw samples but increases by 46.35% in African locust beans seed. This observation may be due to the aromatic amino acids content (phenylanine and tyrosine) of African locust beans seed as compared

to the seed of the African yam beans which shows a strong resistant to change in temperature. Glycine combine easily with aromatic compounds such as benzene to form benzyl glycine or hippuric acid (Finar, 1975). The reaction may leads to the reduction in the amount of glycine in the seed of African locust beans after cooking (Mba, 1980; Anonymous, 1950).

The increase in amino acid content after cooking observed in some cases might be due to the effect of antienzyme on trypsin inhibition (Anonymous, 1950).

Conclusion: The seeds of African yam beans and African locust beans contain most of the essential and non-essential amino acids in relatively higher concentrations when compares with other seeds. The reduction in some of the amino acid content of the seeds after cooking does not have a significant effect on the nutritional role of this seeds. This shows that cooking does not have a significant effect on the amino acid content of these seeds.

In conclusion the seeds of African locust beans and African yam beans are projected by the findings of this work to be a promising cheap source of the amino acids that are lacking in most food materials.

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