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Short Note [Nota Corta]

PROTEIN AND AMINO ACIDS COMPOSITION OF AFRICAN LOCUST BEAN (*Parkia biglobosa*)

[CONTENIDO DE PROTEÍNA Y AMINO ÁCIDOS DE *Parkia biglobosa*]

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SUMMARY

The protein and amino acids composition of seeds and pulp of African locust beans (*Parkia biglobosa*) were analysed. The protein content (in % dry matter) of seeds with and without hull was found to be 28.20% and 32.40% respectively while that of pulp is 1.84%. The results for amino acids analysis indicate that the seeds are good source of most essential amino acids in which both whole and dehulled seeds have chemical score of 5/8 including the sulphur-containing amino acids. Pulp has chemical score of 1/8. Threonine and lysine are the most limiting essential amino acid in seeds and pulp respectively. These results should serve as a database for encouraging the general population particularly the masses in developing nations to harness the nutritional potential of wildly occurring plant foods for narrowing nutritional deficiencies.

Key words: Protein, amino acids, locust bean, legumes.

RESUMEN

Se analizaron las semillas y pulpa de *Parkia biglobosa*. El contenido de proteína (% Base Seca) de las semillas con y sin pericarpio fue de 28.20% y 32.40% respectivamente, mientras que la pulpa tuvo 1.84%. El análisis de las semillas mostró que son una buena fuente de la mayoría de los amino ácidos esenciales, incluyendo los aminoácidos azufrados. Treonina y lisina fueron los amino ácidos limitantes en la semilla y la pulpa respectivamente. These results should serve as a database for encouraging the general population particularly the masses in developing nations to harness the nutritional potential of wildly occurring plant foods for narrowing nutritional deficiencies.

Palabras clave: Proteína, amino ácidos, leguminosas, frijoles.

INTRODUCTION

Protein–Energy–Malnutrition (PEM), is a serious problem facing most developing nations as a result of inadequate intake of good quality protein source such as meat, fish and poultry product, which are out of reach to many populaces due to poor economy, increase in population pressure and others natural calamities such as drought and flood Ladeji *et al.,* 1995; Nordeide *et al.,* 1996). In these nations about 60% of the population suffer PEM, which results to high rate of mortality, permanent brain damage and decrease in learning capability of children (Abdullahi, 2000). In order to arrest this situation, much attention has been focus on the exploitation and utilization of plants. Even though more than 250,000 plant species have been described worldwide as a source of food to man, less than 30 species provide 90% of the world's food requirement and mostly cereals, to which rice, wheat and corn are the major sources and collectively supply nearly 60% of the world's food supply (Parvathin and Kumar, 2002; Oliveira *et al.,* 2000). Ordinarily, plants provided nearly two thirds of the world supply of food protein for human and animals in with 10 – 15% comes from legumes (Baudoin and Maquet, 1999; Pirman *et al.,* 2001). Despite the presence of antinutritional factor, legumes owning to their high proportion of protein even though unbalance are still regarded as potential source of protein (Baudoin and Maquet, 1999; Pirman *et al.,* 2001). Apart from protein, legumes provide a high proportion of complex carbohydrates, starch, edible oil and fibre (Pirman *et al.,* 2001; *Chau et al., 1998*).

Among the leguminous plants used by man particularly in some African countries, is the African Locust bean tree (*Parkia biglobosa*). The seeds are well known for their uses in the production of local condiment commonly known as *Daddawa* (Hausa) or *Iru* (Yoruba). Furthermore, *Parkia biglobosa* is such plant legumes with an outstanding protein quality and its protein and amino acid composition has been reported (Nordeide *et al.,* 1996; Ega *et al.,* 1988; Glew *et al.,* 1997; Cook *et al.,* 2000; Lockeett *et al.,* 2000).

To add to the database of nutritional composition of this plant, protein and amino acid composition of *P. biglobosa* from this region was evaluated since environmental factors under which food legumes are grown could influence their amino acid composition (Oshodi *et al.,* 1995; Bhatty, N., Gilani, A.H. and Nagra, S.A. (2000). The aim of this study is to determine the protein and amino acid composition of seeds and pulp of *P. biglobosa* grown in Gindi village of Jega Local Government Area of Kebbi State; and compare the results with those obtained elsewhere and to that of WHO standard.

MATERIALS AND METHODS

Sampling and samples treatment

The matured and dried fruit pods were randomly sampled (Ayaz *et al.,* 2002; Asaolu and Asaolu, 2002) from different branches of ten locust bean trees at farmlands of Gindi Village, south of Jega town in Kebbi state. The samples were transported to the laboratory in airtight polyethylene bag where the pods were opened manually. The pulp and seeds were separated with aid of mortar and pestle. The seed samples were divided into two portions. One portion was washed (made free of pulp) and air–dried for two days (Ega *et al.,* 1988) and labelled whole seeds. The other portion was dehulled mechanically and the cotyledons labelled dehulled seeds. The whole seeds, dehulled seeds and pulp were oven dried at 70^{o}C for 24h (Nordeide *et al.,* 1996), cooled, ground to fine powder using ceramic mortar and pestle, sieve to pass through 20 mesh sieve, and stored in air tight polyethylene bags inside dessicator until they were analysed. The dried powdered samples were used for the protein and amino acid analysis.

Chemical analysis

The crude protein content (N x 6.25) and amino acids content in the samples were determined using the methods of AOAC (1990) and Spackman *et al.* (1958) respectively. Results are average of three and two determinations respectively.

RESULTS AND DISCUSSION

The crude protein content of whole seeds, dehulled seeds and pulp was found to be 28.54%, 41.84% and 4.81% (Table 1). The crude protein in the seeds (whole and dehulled) compared favourably with findings of others researchers (Ega *et al.,* 1988; Lockeett *et al.,* 2000; Enujiugha and Ayodele-Oni, 2003; Akintayo, 2004). In case of pulp, the protein content is higher than 3.3% obtained by Nordeide *et al*., 1996).

Table 1: Amino acid composition of seeds (whole and dehulled) and pulp of African locust bean (g/100g protein)*.

Amino acid	Whole Seeds	Dehulled Seeds	Pulp	FAO/WHO/UNU** Reference pattern
Crude protein***	28.54	41.84	4.81	
Isoleucine	2.40	2.55	2.11	2.8
Leucine	7.35	8.03	4.07	6.6
Lysine	6.56	7.56	2.64	5.8
Cystine	1.23	2.17	1.31	-
Methionine	1.62	1.83	0.82	-
Total sulphur AAs	2.85	4.00	3.13	2.5
Phenylalanine	4.88	4.56	3.05	-
Tyrosine	3.28	3.28	1.80	-
Total aromatic	8.16	7.84	4.85	6.3
Threonine	2.81	1.46	3.15	3.4
Valine	4.05	4.07	1.64	3.5
Alanine	3.66	4.28	2.14	
Arginine	6.80	7.86	4.33	
Aspartic acid	6.87	7.60	4.13	
Glutamic acid	14.12	14.89	7.51	
Glycine	4.71	4.19	2.45	
Histidine	2.65	2.84	2.39	
Proline	2.63	2.07	2.03	
Serine	4.84	5.29	2.96	
Score	⅝	⅝	⅛	

*Average of two determinations. ** FAO/WHO/UNU (1991). AAs: Amino Acids
*** Values express as % dry weight sample.

The amino acids composition of seeds (whole and dehulled) and pulp are shown in Table 1. From the results, dehulled seeds contain higher amount of amino acids than whole seeds except in glycine, phenylalanine, proline and threonine. Furthermore, with exception of cystine and threonine, all others amino acids found in pulp are lower than those in seeds. When the results are compared with those reported elsewhere as shown in figure 1 to 3, the whole seeds arginine and leucine contents are comparable, while cystine is comparable to values of Cook *et al.* (2000) and Leung *et al.* (1980) but much lower than values reported by Ega *et al.* (1988). Glycine, phenylalanine, serine, threonine and tyrosine content are within the reported values and with the exception of methionine all the rest are lower than those reported. All the amino acids analysed in dehulled seeds with exception of leucine (which is comparable), arginine and methionine (which are higher), their concentrations are lower than those reported Ega *et al.* (1988). The pulp amino acids are below the values reported by other researchers (figure 3) except cystine histidine and phenylalanine content which are comparable. Also threonine concentration was within the reported values.

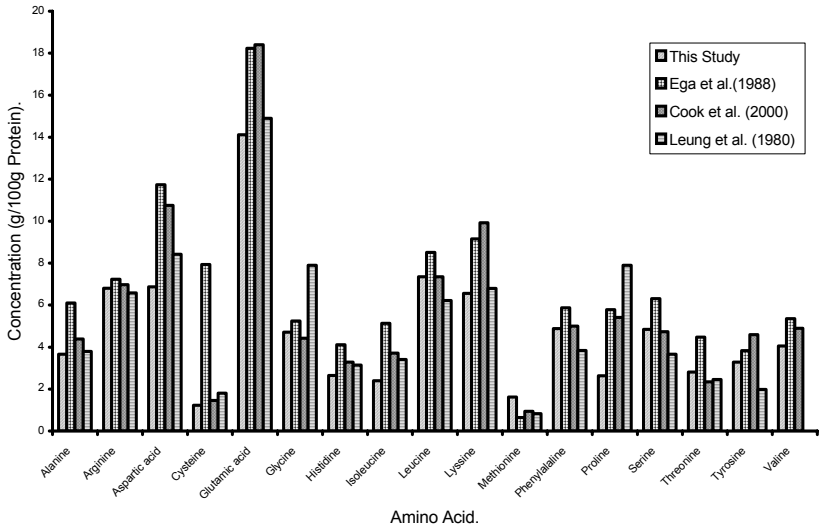

Figure 1: Comparative Amino Acid Content of Whole Seeds.

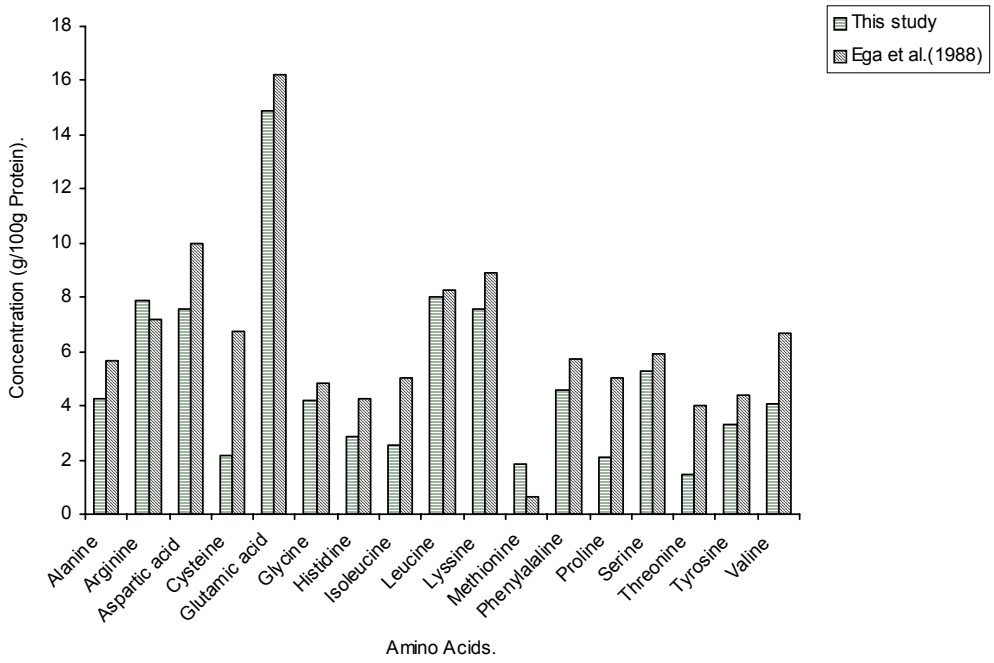

Figure 2: Comparative Amino Acid Content of Dehulled Seeds

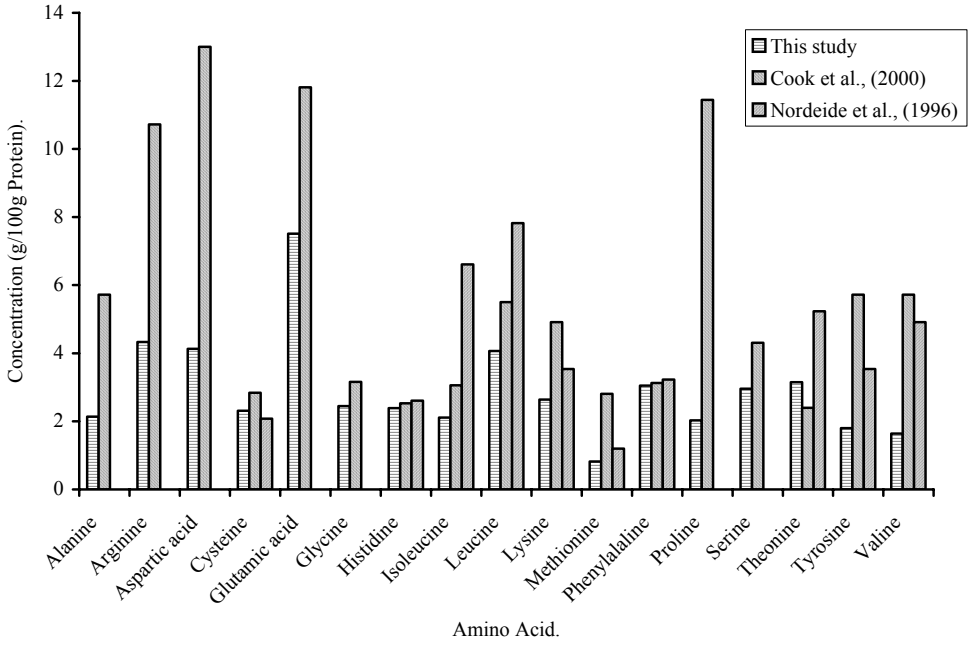

Figure 3: Comparative Amino Acid Content of Pulp.

The variations in amino acid composition between this report herein and those reported elsewhere suggests that geographical location has a considerable effect over content of amino acids in plant protein as also reported (Bhatty *et al.*, 2000; Oshodi, 1993). Also similar observation was reported when amino acid content of South African *Plectrathus esculentus* was analysed and compared with that of Nigerian types in which significant variation was noted (Allemam and Hammes, 2003). Apart from geographical location, the acid digestion method used in preparation of samples for amino acids could also have destroyed a significant amount (Wathelet, 1999).

The nutritive value of plant protein is usually assessed by comparing its essential amino acid content with reference standard "ideal" protein set by the World Health Organisation (FAO/WHO/UWU 1991), which is based on the amino acid needs of the children aged 2 – 5 years. As showed in Table 1, both whole and dehulled seeds have essential amino acids score of 5/8, with threonine as the most limiting amino acids. Pulp has poor essential amino acid content with score of 1/8. Furthermore, pulp contributes about 93% of the total body requirement for threonine. Although sulphur-containing amino acids had been reported to be the limiting essential amino acids in legumes (Baudoin and Maquet, 1999; Laurena *et al.,* 1991), these samples contained methionine and cystine that were above the reference standard (FAO/WHO/UWU 1991). This observation is in agreement with finding of Chau *et al.* (1998) when they analysed some underutilized legumes seeds grown in China.

Apart from the essential amino acids, other non-essential amino acids found to play a vital role in human nutrition and metabolisms are arginine and histidine, which are found in reasonable quantity in all the samples. Arginine was known to become conditionally essential in adults at times of trauma or disease (Glew *et al.*, 2004). Histidine is required for growth and is essential in infants and young children (Ihekoronye and Ngoddy, 1985); this amino acid was found to be higher than 1.9g/100g protein set as reference standard (FAO/WHO/UWU 1991).

CONCLUSION

In conclusion, the above analytical data reveled that *P. biglobosa* seeds seemed to be a potential source of protein and essential amino acids than pulp. The result also gives useful information about the use of *P. biglobosa* for further exploration to cope with increasing demand of protein. The seeds in particular has attractive amino acid profiles, indicates their potential for use as a future food supplements and/ or formulation of baby foods. However, further research on their functional properties is required.

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