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- ☞ Profile Distribution of Some Physico-Chemical Properties in Upland Soils in Katagum Local Government Area of Bauchi State, Nigeria.
- ☞ Effect of Season and Variety on Flowering and Fruit Set in Tomato (*Solanum Lycopersicum* L. Mill) in North Eastern Nigeria.
- ☞ Nutritional Evaluation of Locust Bean Seeds (*Parkia Specie*)
- ☞ Trace Elements Evaluation for some Mine Ponds in the Tin Mining Areas of Jos and Environments, Plateau State.
- ☞ Economic Analysis of Broiler Production in Jos North Local Government Area, Plateau State, Nigeria.



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NUTRITIONAL EVALUATION OF LOCUST BEAN SEEDS (*PARKIA SPECIE*)

AKANDE, K.E.; ABUBAKAR, M.M.; ADEGBOLA, T.A.; BOGORO, S.E. AND DOMA, U.D.

*Animal Production Programme, School of Agriculture,
Abubakar Tafawa Balewa University, Bauchi, P.M.B 0248, Bauchi State, Nigeria
E-mail: fkakande225@yahoo.com*

ABSTRACT

Raw and roasted locust bean seeds were subjected to proximate and amino acid analyses as measures for assessing its nutritive quality. Results obtained revealed the following range of values; dry matter (96.22 - 97.09%), crude protein (25.41-26.45%), crude fat (16.68 - 18.54%), crude fibre (15.91 - 17.88%), ash (4.69 - 5.38%) and nitrogen free extract (30.81 - 31.56%). The crude fibre of locust bean was observed to be relatively high. Generally, heat processing reduced the concentrations of most of the amino acids with the exception of aspartic acid, serine, glutamic acid, proline, glycine, alanine, leucine and tyrosine which had their values increased due to heat processing. Locust bean was observed to be high in lysine (5.78g/16gN and 4.74/16gN in the raw and roasted locust bean seeds respectively). It was however found to be low in the sulphur containing amino acids, methionine and cystine. The concentrations of these amino acids in the seeds were greatly affected by heat processing. The most limiting amino acid in locust bean was found to be cystine with 1.32g/16gN in the raw seeds and 0.69g/16gN in the roasted seeds. Among the essential amino acids, leucine was observed to have the highest concentration in locust bean with the value of 8.42g/16gN in the roasted seeds. Glutamic acid had the highest amino acid concentration of 13.59g/16gN in the raw and 14.06/16gN in the roasted seeds.

KEY WORDS: Locust bean, proximate, amino acid, evaluation

INTRODUCTION

Parkia specie belongs to the family Leguminosae and sub-family Mimosoideae (Hopkins, 1983). Currently the described species within the genus *Parkia* number twenty-four, ten species occur in tropical South America, ten species in tropical Asia, and four species in Africa (Hall *et al.*, 1997).

The crude protein content of locust bean seed varies between 25 and 35%. The average fat content is 20% (Olomu, 1995). Hassan and Umar (2005) reported that the protein content of locust bean seed (in percentage dry matter) of seeds with and without hull was found to be 28.20% and 32.40% respectively while that of the pulp was 1.84%. The crude protein of 32.40% for locust bean seeds obtained by these workers is comparable with those obtained by other researchers, (Okpala, 1990; 31.60% CP), (Alabi, 1993; 35.00% CP) and (Obizoba, 1998; 34.30%). Results obtained by Hassan and Umar (2005) revealed that the dehulled seeds of locust bean contain higher amount of amino acids than whole seeds except in glycine, phenylalanine, proline and threonine.

However, with the exception of cystine and threonine, all other amino acids found in the pulp are lower than those in the seeds. The whole seed of locust bean is high in lysine with the value of 6.56g/100g protein but lower in methionine 1.62g/100g protein and cystine 1.23g/100g protein (Hassan and Umar, 2005).

Locust bean has a wide distribution ranging across the Sudan and Guinea Savannah ecological zones. The range extends from the Western coast of Africa in Senegal across of Sudan. Locust bean is found in nineteen Africa countries; Senegal, Gambia, Guinea Bissau, Guinea, Sierra Leone, Mali, Cote d' Ivoire, Burkina Faso, Ghana, Togo, Benin, Niger, Nigeria, Cameroon, Chad, Central African Republic, Zaire, Sudan and Uganda (Hall *et al.*, 1997).

MATERIALS AND METHODS

Processing of locust bean seeds:

The locust bean used in this study was obtained from Bayara market, Bauchi State, Nigeria. The locust bean seeds were sand-roasted. This involved the use of clean fine

alluvial sand in a wide aluminum frying pan and heating the sand to the temperature of about 80°C. Sufficient quantity of each batch of the raw seeds to cover about two-third of the area of sand was placed on the sand. The seeds and sand were mixed together by constant stirring to prevent the burning of the seed coat and enhance even distribution of heat. The sand roasting of locust bean took 4 - 5 minutes. The sand was then sieved from the seeds and allowed to cool and then milled in hammer mill.

Proximate analysis:

Proximate analysis of locust bean (both raw and processed seeds) were carried out using the methods outlined by the Association of Official Analytical Chemists (AOAC, 1990). The proximate compositions of the locust bean seeds are presented in Table 1.

Table 1: Proximate composition (%) of raw and roasted locust bean seeds

Content	Raw Seed	Roasted Seed
Dry matter	96.22	97.09
Crude protein	25.41	26.45
Crude fat	16.68	18.54
Crude fibre	17.88	15.91
Ash	4.69	5.38
Nitrogen free extract	31.56	30.81

Amino acid analysis:

The amino acid compositions of the samples were determined using the method described by Spackman *et al.* (1958). The samples were dried to constant weight and defatted. A known weight of the defatted sample was hydrolysed under vacuum with 7ml of 6N Hcl in a sealed pyrex tube at 105°C for 22 hours. Immediately after cooling, it was filtered through non-absorbent cotton wool. The filtrate was dried at 40°C using rotary evaporator. The amino acids in the flask were diluted with 5ml of acetate buffer (pH 2.0) and 5 to 10 microlitre was loaded into the cartridge of Technicon Sequential Multisample amino acid analyzer (TSM). The steam carrying the amino acid reagent mixture went through a heating bath where development of the coloured reaction product occurred. The

absorbance was proportional to the concentration of each amino acid and was measured by colorimeter.

Table 2: Amino acid profiles of raw and roasted locust bean seeds (g/16gN)

Amino acids	Raw locust bean	Roasted locust bean
Lysine	5.78	4.74
Histidine	2.55	2.01
Arginine	5.66	5.43
Aspartic acid	9.09	9.43
Threonine	3.38	2.01
Serine	3.37	4.04
Glutamic acid	13.59	14.06
Proline	3.15	3.16
Glycine	3.48	3.52
Alanine	3.25	3.53
Cystine	1.32	0.69
Valine	4.41	3.48
Methionine	1.49	0.89
Isoleucine	4.78	3.45
Leucine	8.42	7.69
Tyrosine	3.32	3.98
Phenylalanine	4.49	4.35
Tryptophan	ND	ND

ND = Not determined

RESULTS AND DISCUSSION

The proximate compositions of the locust bean seeds are shown in Table 1. Results obtained revealed the following range of values; dry matter (96.22 - 97.09%), crude protein (25.41 - 26.45%), crude fat (16.68 - 18.54%), crude fibre (15.91 - 17.88%), ash (4.69 - 5.38%) and nitrogen free extract (30.81 - 31.56%). The crude protein content of locust bean seed obtained in this study falls within the range of 25 and 35% reported by Olomu, 1995. Alabi *et al.* (2005) reported that the lipid content of locust bean was 16.86%, which is within the range of 16.68 - 18.54% reported in the present study. The crude fibre of locust bean is relatively high. Locust bean is a fair source of oil.

The amino acid compositions of raw and roasted locust bean are presented in Table 2. Results obtained in this study showed that heat processing slightly decreased the concentrations of most of the amino acids with

the exception of aspartic acid, serine, glutamic acid, proline, glycine, alanine, leucine and tyrosine. These amino acids were generally heat-stable and some of them increased in value upon heat processing. Glutamic acid had the highest amino acid concentration of 13.59g/16gN in the raw seeds and 14.06g/16gN in the roasted seeds. Locust bean seeds were found to be low in the sulphur-containing amino acids (methionine and cystine). The most limiting amino acid was found to be cystine with 1.32g/16gN in the raw seeds and 0.69g/16gN in the roasted seeds. These results are in agreement with the reports of Hassan and Umar (2005). Leucine was the most concentrated essential amino acid found in locust bean with values of 7.69g/16gN for the roasted locust bean and 8.42g/16gN for the raw locust bean. Similar values were reported by Hassan and Umar (2005).

CONCLUSION

The results obtained from the proximate and amino acid analyses in this study clearly shows the potential value of locust bean as a promising unconventional protein source for livestock feeding. It is recommended that diets containing locust bean should be adequately fortified with the sulphur-containing amino acids (methionine and cystine) in order to safeguard against deficiencies of these essential amino acids in the diets. This study as indeed contributed additional and useful nutritional information to the existing scanty nutritional information available on locust bean seed. Further experiments should be carried out to determine the mineral and vitamin content of locust bean seed.

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