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PHYTOCHEMICAL AND NUTRITIONAL EVALUATION OF LOCUST BEAN FRUIT PULP

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Abstract
The study was conducted to evaluate the Phytochemical and nutritional composition of locust bean fruit pulp (LBP). Shortage of animal products to meet the adequate protein requirement needed to sustain the growing population in Africa had necessitated research into non- conventional feedstuff such as the African locust bean pulp. Result of proximate analysis showed that LBP contained 3.19% crude protein, 6.03% crude fibre, 1.84% ether extract, 6.86% ash, 88.45% dry matter and 66.39% nitrogen free extract (NFE). Mineral analysis revealed that LBP contained 221.77mg/litre of calcium and 31.4mg/litre of phosphorus. Vitamin A content in LBP was 10.46mg/litre while Vitamin C was 542mg/100g. Antinutritional factors recorded in this study were relatively lower than those reported in the literatures. The locust bean pulp had a mean value of 0.32mg/100g for tannin, 0.93 mg/100g for oxalate, 1.67mg/100g for phytate, 0.34mg/100g for saponin, 0.08mg/100g for cyanide, 0.41mg/100g for trypsin inhibitor, 19.72% for alkaloids and 40.20% for flavonoid. It was concluded that the locust bean pulp is rich in nutrients with low level of antinutritional factors, therefore it can be included in livestock feed with little or no side effects on the animals.

Keywords: phytochemical, nutritional evaluation, locust bean fruit pulp

INTRODUCTION

Provision of adequate quantity and quality feeds to meet the requirement of various classes of livestock is almost inevitable because of the high cost of conventional sources of feed. Their increasing cost has led to increase in the cost of finished feeds and animal products. Conventional feedstuffs such as maize, sorghum, soyabean e.t.c. constitutes about 45-60% of livestock diets. Generally, population density is on the increase continuously, and there is shortage supply of animal product to meet the adequate protein requirement of the populace hence, there is the need to intensify research into the nutritional compositions of some non conventional resources such as the locust bean fruit pulp so as to sustain the growing population.

The locust bean fruit is a slightly curved indehiscent pod of 30-40 cm long and 2-3 cm wide. Each pod contains up to 20 seeds, which are embedded in a sweet, yellow, floury pulp (Salim *et al*., 2002; Sacande and Clethero 2007; Olorunmaiye *et al*., 2011). The locust bean pulp is known as "Dorowa" in Hausa, igba in Yoruba. The yellow colour of the pulp may be an indication of the presence of beta carotene which is a precursor of vitamin A, which is known to improves appetite and consequently the growth performance in livestock. Vitamin A also improves laying performance and immune functions in hens (Lin *et al*. 2002; Weber 2009). The sour taste of the locust bean-pulp is an indication of high value of ascorbic acid (vitamin C) which has beneficial effects on livestock during stressful conditions. This study was therefore considered necessary because of the need to update the existing reports on the nutritional composition of the locust bean pulp. And also to encourage the preservation of the "African Locust bean tree" (*Parkia biglobosa)* which has a lot of nutritional benefits, in order to sustain the ever growing population.

MATERIALS AND METHODS

Source of Sample

The sample was procured from the grains depot in Giwa local government area of Kaduna State, Nigeria. The locust bean pulp is readily available and relatively cheap during the harvesting period usually between the month of April and June.

Sample Preparation

The matured pod was harvested with the aid of "go- to-hell", after which it was sun - dried .The dried pod in which the pulp and seeds are embedded was then pounded in a mortar to separate the seed from the pulp. Sample of the pulp was then collected and stored in air tight polythene nylon for laboratory analysis.

Phytochemical Analysis

The analysis carried out includes; proximate analysis, mineral and vitamins analysis and determination of antinutritional factors, all these were done at the Biochemical laboratory of the National Research Institute for Chemical Technology (NARICT). Bassawa, Zaria. Kaduna State – Nigeria.

Proximate Analysis

The proximate composition (Crude protein, crude fibre, moisture, ether extract, ash and NFE) of the locust bean pulp were determined using the standard methods of the Association of Official Analytical Chemist (AOAC. 1990). Results are average of two determinations respectively.

Mineral Analysis (Ca & P)

The calcium and phosphorus content of the locust bean pulp was determined using atomic absorption spectrophometry (Perkin Elmer model 403) as described by AOAC (1980.)

Vitamin Analysis (A&C)

Vitamin A and C was determined colorimetrically as described by Falade, *et al*. (2003) using a (GENESYS 10 UV spectrophotometer, Thermo Electron Corporation, England)

Antinutritional Factors

The presence of antinutritional factors such as: oxalate, phytate, saponin, tannin, trypsin inhibitor, cyanide, alkaloids and flavonoid were detected quantitatively by the standard methods. Oxalate was determined using the method described by Day and Underwood (1986). Phytate was determined as described by Reddy and Love (1999). Saponin (Obadoni and Ochuko, 2001), Tannin (AOAC,1980). Trypsin inhibitor (Kakade, *et al*., 1974), Cyanide (A.O.A.C., 1984), Alkaloid and flavonoid was determined using the gravimetric method described by Schwarz, *et al.* (2003).

RESULTS AND DISSCUSSION

Determination of Proximate Composition and Anti Nutrients in Locust Bean Pulp (LBP)

Tables 1 represent the result of the proximate analysis. Crude protein content of the LBP was 3.19% which was lower than 6.62% reported by Alabi *et al*. (2005), Sotolu and Byanyiko (2010) also reported higher value 9.51% for crude protein. However, the findings of Bot *et al*. (2013) also contradict the value recorded in this study. The author reported that the crude protein content of LBP was 11.52%. These variations may be due to differences in the varieties of pulp used. Crude fiber content of LBP recorded in this study was 6.03% which contradict the findings of Aduku (2004), the author reported that %CF level in locust bean pulp was 11%. Gernal *et al.* (2007) also reported a higher value of 11.75%, while Sotolu and Byanyiko (2010) reported 17.80% for crude fiber. The low value recorded for the crude fiber in this study when compared with the other researchers may be due to the processing method employed in separation of the pulp from the seed, or due to the differences in geographical locations.

Ether extract content of the LBP recorded in this study (1.84%) was lower than the value reported by Bot *et al.* (2013) who gave a value of 3.09% for ether extract. Ash content was 6.86% which was lower than the value of 15.40% reported by Sotolu and Byanyiko (2010), 8.05% reported by Edigwe *et al*., (2012), and higher than 4.08% reported by Bot, *et al*., (2013). NFE value of 66.39% obtained in this study is in line with 67.30% reported by Gernal *et al*., (2007), 68.75% reported by Bello, *et al*. (2008), and 68.32% reported by Bot, *et al*, (2013). However, the findings of Musa, *et al*. (2005), Edigwe *et al*. (2012) contradict the value for NFE in this study, the authors reported 46.59% and 47.63% respectively. NFE result obtained in this study is an indication that LBP could be a potential source of carbohydrate (energy) for poultry and other livestock. This observation confirms the findings of Kwari and Igwebuike (2002) who had earlier reported that the LBP is high in carbohydrates.

Table 1 Proximate Composition of Locust Bean Pulp

Parameters	
Crude protein (%)	3.19
Crude Fibre (%)	6.03
Ether Extract (%)	1.84
Total Ash (%)	6.86
Dry Matter (%)	88.45
NFE (%)	66.39

Results are average of two determinations

Table 2 represents the minerals and vitamins content of the pulp. Calcium and phosphorus were selected for analysis in this study because, they are the major minerals required by dairy cows. Also calcium is essential for bone and egg shell development in poultry. Therefore inclusion of LBP in poultry and ruminants ration may be beneficial, Calcium content of LBP recorded in this study was 221.77mg/lit. Musa *et al*. (2005) gave a value of 400mg/100g while Bello *et al*. (2008) reported that the concentration of calcium in LBP was 11650 mg/kg. The phosphorus content recorded was 31.4mg/lit.

Vitamin C content of LBP was 542.40mg/100g which is about 2.5 times higher than the value reported by Musa *et al*. (2005) and Bello *et al*. (2008) they reported that LBP contained 215mg/100g ascorbic acid. However, the findings of Bot *et al.* (2013) was lower, the author reported that the content of ascorbic acid in the pulp was 24.22mg/100g. Weber (2009) also reported that 200mg/lit of supplemental Vitamin C is required to reduce mortality in laying hens during heat stress. The content of Vitamin A in the locust bean pulp was 10.46 mg/lit, the results is an indication that the inclusion of locust bean pulp in livestock diets could be a good source of minerals and vitamins as well as other essential nutrients. This observation tallies with the report by Edigwe *et al.* (2012) who reported that the locust bean pulp is very rich in nutrients such as beta carotene (precursor of vitamin A) and calcium.

Table 2 Minerals and Vitamins Contents of the Locust Bean Pulp

Parameters	
Calcium (mg/lit)	221.77
Phosphorus (mg/lit)	31.40
Vitamin A (mg/lit)	10.463
Vitamin C (mg/100g)	542.40

Results are average of two determinations

Table 3 represents the results of the antinutritional factors in the locust bean pulp. Results showed that the values obtained for the antinutritional factors were relatively lower than those reported in the literatures. The locust bean pulp had a mean value of 0.32mg/100g for tannin, 0.93 mg/100g for oxalate, 1.67mg/100g for phytate, 0.34mg/100g for saponin, 0.08mg/100g for cyanide , 0.41mg/100g for trypsin inhibitor, 19.72% for alkaloids and 40.20% for flavonoid. Gernal *et al*. (2007) had earlier reported that LBP contained 60 mg/100g phytate, 17.8 mg/100g saponin and 17.3 mg/100g cyanide which was higher than the result obtained in this study. Furthermore, Bot *et al*. (2013) also reported higher values 150mg/100g for oxalate, 219.10mg/100g for phytate. The wide variation may be due to geographical locations or differences in method used for sample preparation before laboratory analysis.

CONCLUSION

Within the scope of this study it was concluded that, the locust bean pulp (LBP) is rich in nutrients with low level of antinutritional factors. Furthermore, there is less competition between man and animals for LBP. It is a cheaper source of nutrients when compared with the conventional feedstuff like maize, sorghum and soyabean. Therefore, for a sustainable development, propagation of the African locust bean trees should be encouraged, because of the nutritional potentials, it should not be allow to becoming extinct.

Table 3 Anti - Nutritional Factors in the Locust Bean Pulp

Parameters	
Tannin (mg/100g)	0.32
Oxalate (mg/100g)	0.93
Phytate (mg/100g)	1.67
Saponin (mg/100g)	0.34
Cyanide (mg/100g)	0.08
Trypsin inhibitor (mg/100g)	0.41
Alkaloid (%)	19.72
Flavonoid (%)	40.20

Results are average of two determinations

LIMITATIONS

Some limitations encountered during the course of this study are access to limited laboratory facilities coupled with Erratic electricity power supply during the period of the study.

REFERENCES

Aduku, A.O. (2004). Animal nutrition in the tropics: feeds and feeding, pasture management, monogastric and ruminant nutrition pg 18-19.

Alabi, D.A., Akinsulire, O.R. and Sanyaolu, M.A.(2005).Qualitative determination of chemical and nutritional composition of Parkia biglobosa (Jacq.) Benth .African Journal of Biotechnology 4(8) ;pp. 812-815.Available online at ttp://www.academicjournals.org.

AOAC (1984). Official Methods of Analysis (14th Edition). Association of Official Analytical Chemist, Washington D.C. USA.

AOAC (1990). Official Methods of Analysis (15th Edition). Association of Official Analytical Chemist, Washington D.C. USA.

AOAC. (1980). Official Methods of Analysis (13th Edition). Association of Official Analytical Chemist, Washington D.C. USA.

Bello, M.O., Falade, O.S., Adewusi, S.R.A. and Olawore, N.O.(2008) . Studies on the chemical compositions and anti nutrients of some lesser known Nigeria fruits. African Journal of Biotechnology.Vol. 7 (21), pp 3972-3979.

Bot, M.H., Bawa, G.S. and Abeke, F.O.(2013). Replacement value of maize with African locust beans (Parkia biglobosa) pulp meal on performance, haematological and carcass characteristics of broiler. Nigerian Journal of Anim. Sci. vol. 15 : 59-70

Day, R.A. and Underwood, A.L.(1986). Quatitative analysis.5th ed. Prentice- Hall publication, 701.

Edigwe, D., Euloge, S.A., Evelyne, L.L., Yehouenou, R.H., Nasif, F., Mohamed, M.S. and Dominique C.K. (2012). Nutritional and microbiological characterization of pulp powder of locust bean (Parkia biglobosa) used as a supplement in infant feeding in Northern Benin. African Journal of food Science, Vol. 6(9), pp. 232 – 238. Available online at http://www.academicjournals.org

Falade O.S., Sowunmi O.R., Oladipo A, Tunbosun A, Adewusi S.R.A.(2003).The level of organic acids in some Nigerian fruits and their effect on mineral availability in composite diets. Pakistianis Journal of Nutrition. 2: 82-88.

Gernah, D.I., Atolagbe, M.O. and Echegwo, C.C. (2007).Nutritional Composition of the African Locust Bean (Parkia biglobosa) fruit pulp.Nig food J. 25 (1): pp 190 - 196

Kakade, M.L., Rackis, J.J., Mcghee, J.E. and Puski, G. (1974). Determination of Trypsin Inhibitor activity of soy products: A collaborative analysis of an improved procedure.

Kwari, I.D. and Igwebuike, J.U. (2002) .Performance of broiler chickens fed graded levels of African Locust bean (Parkia biglobosa). Proceedings of the Nigerian Society for Animal Production (NSAP) Sept 17th – 19th University of Maiduguri.

Lin, H; Wang, L.F; Song, F.L; Xie, Y.M and Yang, Q.M. (2002). Effect of dietary supplemental levels of vitamin A on the egg production and immune responses of heat-stressed laying hens. Poultry Science 81: pp 458-465.

Musa, S., Yusuf, Y.A., Koleola,A.A. and Akoma, O.(2005). Chemical and nutritional characteristics of ‘Kirbwang’: (A traditional fermented locust bean pulp – snack). Nigerian Food Journal, vol. 23, 2005.

Obadoni, B.O. and Ochuko, P.O.(2001). Phytochemical studies and comparative efficacy of the crude extracts of some homeostatic plants in Edo and Delta States of Nigeria.Global Journal of pure and Applied Sciences. 8b: 203-208.

Olorunmaiye, K.S., Fatoba, P.O., Adeyemi, Oreoluwa, C. and Olorunmaiye, P.M. (2011).Fruit and seed characteristics among selected Parkia biglobosa (Jacq) G.Don, population. In: Agriculture and Biology journal of North America.

Reddy, M.B. and Love, M. (1999).The impacts of food processing on the nutritional quality of vitamins and minerals. Adv. Exp. Med. Bio., 459: 99 – 106.

Sacande, M.andClethero, C. (2007). Parkia biglobosa (Jacq) G.Don.seed leaflet no. 124

Salim, A.S., Simeon, A.J., Waruhiu, A. Orwa, C. and Anyanjo, C. (2002). Agroforest tree database : A tree species reference and selection guide. Online at http:// www.icraf.org

Schwarz, M., Hillebrand, S., Habben, S., Degenhardt, A. and Winterhalten,P. (2003).Application of high-speed counter current chromatography to the large - scale isolation of anthocyanins. Biochemical Engineering Journal, 14, 179–189.

Sotolu, A.O. and Byanyiko, S.Y. (2010). Nutritive potentials of parkia biglobosa pulp meal in partial replacement for maize in the diets of African catfish (Clariasgariepinus) Juveniles. Electronic Journal of Environmental, Agriculture and food chemistry.pp 1197 – 1202.

Weber, G.M. (2009). Improvement of flock productivity through supply of vitamins for higher laying performance and better egg quality. World Poultry Science Journal, Vol. 65, (3) pp 443 – 457. Doi: 10. 1017/S004393909000312