EFFECT OF DIFFERENT PROCESSING METHODS ON NUTRIENTS AND ANTI-NUTRIENT COMPOSITION OF LEBBECK (*Albizia lebbeck*) SEEDS

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ABSTRACT

Effect of different processing methods on proximate and anti-nutrient composition of *Albizia lebbeck*seeds was carried out. Raw *Albizia lebbeck*seeds used for this study were harvested from the Federal University of Technology, Minna Gida Kwano campus. Three different processing methods (boiling, sprouting and roasting) were carried out. All the processed seeds were milled, labelled and taken to the laboratory for proximate and phyto-chemical analysis. Results of the study show that processing significantly influenced (P<0.05) all the proximate and anti-nutritional contents determined. Raw *Albizia lebbeck*seed contains 92.44 % dry matter, 26.30% crude protein, 5.19 % crude fibre, 9.22 % ether extract, 5.57 % ash and 46.17 % nitrogen free extract. Sprouted seed contained the highest (P<0.05) Crude protein (33.26 %). Roasted seed had the highest (p<0.05) crude fibre (8.68 %). While the raw contained the highest (P<0.05) Nitrogen free extract and energy. Raw seeds were found to contain high anti-nutritional factors such as phytate (4.74 mg/100 g), saponin (6.39 mg/100 g), tannin (6.89 mg/100 g) and oxalate (6.51 mg/ 100 g). Anti-nutritional factors were significantly reduced (P<0.05) by the processing methods, however, boiling gave the highest percentage reduction of anti-nutritional factors (phytate, 1.87 %, saponin, 2.58 %, tannin, 2.21 % and oxalate, 3.63 %). It was concluded that *Albizia lebbeck* seeds should be improved by processing before being used as livestock feed.

INTRODUCTION

Nigeria has many natural endowments that are sufficient to produce animal feed. However, there is serious insufficiency of animal protein production in Nigeria, this is because of high cost of feed occasioned by use of conventional feed stuff. Over a period of time, commercial poultry farmers have increased universally; however, the demand for animal protein is still far higher than the supply, hence, animal protein is expensive especially in developing countries. The high cost of animal protein has made it unaffordable for the average Nigerian man (Ani and Adiegwu, 2005). Feed and feeding represents 70 to 80 % of the total variable cost of monogastric feed. This is due to the usage of conventional feed stuffs (maize, groundnut cake and soya beans) which are in demand by man for food and industries. This has led to prolonged competition for feed ingredients between the poultry industry and the human population. Therefore, to reduce this problem, several researchers have recommended the use of nonconventional feedstuffs in poultry nutrition.There are many nonconventional feeds or agricultural by-products with substantial nutritional value and are inexpensively available in large quantities. Presently, only a small number are in use either due to lack of adequate nutritional information, for otherpurposes, orpresence of some deleterious

constituents like alkaloids, toxic amino acids, phenolic compounds, tannins, trypsin inhibitors, carcinogens and glucosinolates. Various sources of agricultural by products and their nutritional characteristics have been reviewed (Nuha*et al.*,2010). However, there are limited information on the effect of different processing methods on proximate and ant-nutritional contents of *Albizia lebbeck*. Therefore, this study was aimed at determining the effect of different processing methods on proximate and ant-nutritional contents of *Albizia lebbeck.*

MATERIALS AND METHODS

Experimental site

The research work was conducted at the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Bosso Campus, Minna, Niger State, Nigeria. Minna lies between latitude 9^0 28′ to 9^0 37′ N and longitude 6^0 23′ to 6^0 33′ E with annual rainfall of 1000 – 1500 mm and a temperature range of 28^{0-} 30 ^{0}C.The mean annual rain fall varies from 1102.6 to 1361.7 mm. The vegetation is Southern Guinea Savannah agro climatological vegetation. It has an altitude of 147 m above sea level (FUTMIN, 2018).

Sample collection and methods of processing

*Albizia lebbeck*pods, were harvested were harvested from the Federal University of Technology, Minna Gida Kwano campus. The pods were opened and the seeds were gathered and sorted to remove dirt and stones. The seeds were divided into batches and processed through the following methods: roasting, boiling and sprouting:

Sprouting

The methodofprocessing by Echendu*et al.* (2009) was used. Five kg of *Albizia lebbeck* seeds was soaked for24 hours and covered in a moist jute bag. They will be moistened daily until they shoot out. The sprouted seeds will be packed and sun-dried to a moisture level of about 10 – 15 %.The sun-dried seeds were milled and labelled Sprouted Albizia seed meal (SALSM). They were stored in a plastic air-tight container or leather to prevent it from getting spoilt from air and moisture until when required.

Roasting or Toasting

Five kg of *Albizia* seed was roasted at 100^0 C for 30 minutes using stove with iron pot mixed with sand as described by Sola-ojo*et al*. (2013). During roasting, the seeds were stirred continuously to ensure uniform roasting and to prevent burning until they turn brown. The roasted seeds were then spread out to cool after which they were milled using a hammer mill with sieve size of 3 mm and labelled Roasted Albizia seed meal (RALSM). They were stored in a plastic air-tight container or leather to prevent it from getting spoilt from air and moisture until when required.

Boiling

Another five kg of *Albizia* seed was subjected to boiling at 100^0 C for 15- 30 minutes as described by Jimoh*et al*. (2014) after which water was drained off using a 10 mm sieve and the boiled seeds were sun -dried. The seeds were then milled using hammer mill and then sieved with a 3mm sieve size and labeled Boiled Albizia seed meal (BALSM). They were stored in a plastic air-tight container or leather to prevent it from getting spoilt from air and moisture until when required.

All the processed samples were subjected to laboratory analysis to determine the proximate, energy and anti-nutrient contents according to the method of AOAC (2006), at the Animal Science Laboratory, Federal University of Technology, Minna. The gross energy was determined using Gallenkamp Ballistic Bomb Calorimeter (Model 1266, Parr Instrument Co., Moline, IL.) with benzoic acid as an internal standard.

Data Analysis

Data generated were subjected to Analysis of variance (ANOVA)using the general linear model of statistical analysis system, Version 9.3 (SAS). Significance was accepted at P <0.05.

RESULTS AND DISCUSSION

Results of proximate composition of raw and differently processed*Albizia lebbeck* seeds are presented on Table 1.The results showed that all the parameters measured were influenced (P<0.05)by processing. Dry matter (92.44 %), ash (5.57 %) and nitrogen free extract (46.17 %) contents were highest (P>0.05) in raw seeds. Sprouted seed contained the highest (P<0.05) Crude protein (33.26 %). Roasted seed had the highest (p<0.05) crude fibre (8.68 %). While the raw contained the highest (P<0.05) Nitrogen free extract and energy The dry matter value of 92.44 % observed in this study was lower than 93.50 % dry matter as reported by Michael *et al.,* (2019) in their study on *Jatropha curcas* seed meals. They were, however, significantly different (P<0.05). The crude protein value of33.26 %in sprouted seeds observed in this study was higher than 31.46 % crude protein reported by Michael *et al.,* (2019) in raw *Jatropha curcas* seed meals, the crude protein value of 28.05 % boiled seeds in this study was lower than 28.33 % as reported by Michael et al., (2019) in boiled*Jatropha curcas* seed meals and the crude protein value of 26.30 % in raw seeds observed in this study was higher than 25.50 % as reported by Obun*et al.*,(2012) on raw *Daniella oliveri* (Rolfe) and Michael *et al.,* (2019) raw *Jatropha curcas* seed meals.The crude protein value of 31.52 % in roasted seeds observed in this study was higher than 30.46 % as reported by Michael *et al.,* (2019) in roasted *Jatropha curcas* seed meals.The ether extract value of 6.92 % in roasted seeds observed in this study was similar to 6.75 % as reported by Michael *et al.,* (2019) in roasted *Jatropha curcas* seed meals.They were, however, all significantly different (P<0.05) from one another.

Results on the effects of processing on the Anti nutritional factors of *Albizia lebbeck* seeds are presented on Table 2.The results revealed that all the parameters measured were influenced (P<0.05) by processing. Phytate, tannin and oxalate contents were highest

(P>0.05) in the raw *Albizialebbeck* seeds, followed by roasted, the sprouted then boiled *Albizia lebbeck* seeds, with the least (P<0.05) contents. The percentage reduction of phytate, saponin, tannin and oxalate were significantly (P<0.05) higher in boiled seeds, though this reduction varies in degree with different processing methods. The highest percent reductions in phytate (1.87 %), saponin (2.58 %), tannin (2.21 %) and oxalate (3.64 %). The higher percentage reduction of all the parameters observed in boiling confirms with the reports of, Saulawa*et al*. (2014) and Makinde*et al*. (2019) who discovered that boiling method was very effective in reducing anti-nutrients in *Adansonia digitata* and African star apple, respectively. Raw and roasted seeds had similar (P>0.05) Saponin contents and their contents were significantly higher (P<0.05) than all the others, this is an indication that roasting as a processing method might not be effective in tannin reduction.

CONCLUSION

Results from this study revealed that the proximate and phytochemical compositions of raw and differently processed *Albizia lebbeck*seeds differ significantly (P<0.05). The processed seeds were found to contain higher contents of crude protein (sprouted), crude fibre (roasted). The ani-nutrients were significantly reduced with processing and the boiling method had the highest anti-nutrition reduction.

Table 1: Proximate Analysis of *Albizia lebbeck*

Nutrients (%)	RAWALSM	BALSM	SALSM	RALSM	SEM	P-Value
Drymatter	92.44^{a}	88.72^{b}	86.69^{d}	86.89^{c}	0.873	0.001
Ash	5.57^{a}	3.34^{d}	4.99^{b}	4.74^{c}	0.31	0.001
CrudeProtein	26.30^{d}	28.05^{c}	33.26^{a}	31.52^{b}	1.04	0.001
CrudeFibre	5.19^{d}	8.45^{b}	6.63^{c}	8.68^{a}	0.539	0.001
EtherExtract	9.22^{b}	9.68^{a}	7.24^{c}	6.92^{d}	0.454	0.001
NitroFreeExtract	46.38^{a}	39.20^{b}	34.57^{d}	35.07^{c}	1.758	0.001

*All values are means of triplicate determinations expressed in dry weight basis, a,b,c,d=means with different superscripts on the same row are significantly different (P<0.05),RAWALSM – Raw *Albizia lebbeck* seed meal, BALSM – Boiled *Albizia lebbeck* seed meal, SALSM- Sprouted *Albizia lebbeck* seed meal, RALSM- Roasted *Albizia lebbeck* seed meal.SEM=Standard error mean, P=Probability value.

Table 2: Antinutritional Analysis of *Albizia lebbeck*

Parameters (mg/100 g)	RAWALSM	BALSM	SALSM	RALSM	SEM	P-Value
Phytate	4.74[a]	1.87[d]	2.82[c]	3.15[b]	0.396	0.001
Saponin	6.39[a]	2.58[c]	4.19[b]	6.34[a]	0.603	0.001
Tannin	6.89[a]	2.21[d]	3.25[c]	5.43[b]	0.691	0.001
Oxalate	6.51[a]	3.64[d]	5.19[c]	5.76[b]	0.398	0.001

*All values are means of triplicate determinations expressed in dry weight basis, a,b,c,d=means with different superscripts on the same row are significantly different (P<0.05), RAWALSM – Raw *Albizia lebbeck* seed meal, BALSM – Boiled *Albizia lebbeck* seed meal, SALSM- Sprouted *Albizia lebbeck* seed meal, RALSM- Roasted *Albizia lebbeck* seed meal. SEM=Standard error mean, P=Probability value.

REFERENCES

Ani, A. O &Adiegwu, L. I (2005).The Feeding value of velvet beans(Mucuna pruriens) to weaner rabbit.*Proceedings of the 30th Annual Conference of NigerianSocietyfor Animal Production.* University of Nigeria Nsukka, Nigeria. pp.186-189.

AOAC(2006).Official Methods of Annalyses. (18thed.) National Research Council, Washington D. C. National Academy Press.

Echendu, C. A., Obizoba, I.C &Anyika, J.U (2009). Effect of Germination on chemical composition of Ground bean (*Kerstingiellageocarpa harm)* seeds. *Pakistan Journal of Nutrition.* 8(12): 1849- 1854. Doi: 10. 3923.

FUTMIN,(2018).Postgraduate School. prospectus. Federal University of Technology Minna ,Niger

State.pp1

Jimoh, W.A., Ajasin, F.O., Adebayo, M.D., Banjo, O.T., Rifhat, A.O.&Olawepo, K.D (2014).

Haematological changes in the blood of *clariasgariepinus* fed *chrysophyllum albidum* seed meal replacing maize. *Journal of Fishries and Aquatic Science*.9,407-412.

Makinde, O.J., Aremu,A., Alabi, O.J., Jiya, E. Z &Ajide, S.O(2019). Effects of Different processing

Methods on Nutrient and Anti-nutrient compositions of African Star Apple (*Chrysollum*

albidum) kernels. *AfricanJournal of Food, Agriculture, Nutrition and Development.* 19(4): 14

848- 14862. Doi:10.18697/*ajfand.87.16980.* ISSN:1684 5374.

Michael, K. G., Sogbesan, O. A., Onyia, L.U&Shallangwa, S.M (2019).Nutritional Evaluation of proc-

essed*Jatropha carcus* seed meals.*Direct Research Journals of Agriculture and Food Science*

(DRJAFS). 7 (6): 131-136. ISSN: 2354-4147. Doi: https// doi.org/ 10.5281/ Zenodo.3242756.

Article number DRJAFS:3264119358.

Nuha, M. O., Isa, A. M. A &Elfadil (2010).Chemical Composition, anti- nutrients and extractable min-

erals of sickle pod (*Cassia obtusifolia)* leaves as influenced by fermentation and cooking.

International Food Research Journal. 17: 775-785.

Obun,C.O& Adeyemi, O.A (2012).Effects of raw and toasted *Daniella oliveri* (Rolfe) seed meal as

replacementfor groundnut meal on the performance of broiler chickens.*RevistaCientifica*

UDO Agricola. 12(4): 947-954.

Saulawa, L. A., Yaradua, A.I&Shuaibu, L (2014).Effect of different processing methods on proximate,

Mineral and anti nutritional factors content of baobab (*Adansonia digitata*) seeds. *Pakistan*

Journal of Nutrition. 13(6):314-318.

Sola-ojo, F.E., Adeyemi, K.D., Toye, A.A., Bolu, S.A., Fayeye, T.R., Annogu, A.A., Garba,S.O& Karim, R.O (2013). Performance, carcass profile and oxidative stability of broiler chickens fed baobab seed meal. *Bulletin of Environment, Pharmacology and Life* Sciences.2(11):94-99.