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Nutritional Evaluation of *Albizia lebbeck* (L.) Pods as Source of Feeds for Livestock

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Abstract: The present study was conducted to find out the nutritional composition of *Albizia lebbeck* seeds and pods intended to be used as component in livestock feeds. The dried pods were sampled within the premises of the Usmanu Danfodiyo University, Sokoto between the periods of February to March, 2004. Seeds were separated from their pods manually and milled separately. The powdered samples were analysed for proximate and mineral contents. The results of the experiments showed seeds have the following composition: Dry matter (DM), 89.89±0.09%; ash content 4.50±0.62%; crude protein, 10.06±0.04%; crude lipid, 9.48±0.02%; crude fibre, 8.01±0.09%, Nitrogen Free Extract (NFE), 67.95±2.02%. The corresponding values for pods are: 12.00±1.85, 10.00±0.18, 5.38±0.03, 0.74±0.04, 3.25±0.05 and 80.63±1.15%, respectively. The samples generally have high calorific value 397.36±1.84 and 350.72±0.45% respectively. The crude protein, crude lipid, crude fibre contents and calorific value were significantly higher ($p<0.05$) in seeds compared to those of pods. Ash content and Nitrogen Free Extract (NFE) were however significantly higher ($p<0.05$) in pods. The dry matter content shows no significant variation ($p>0.05$) between the two samples. For mineral analysis, both samples have appreciable amounts of mineral elements such as K, Na, Ca, Mg, P, Cu, Fe and Zn with seeds sample having significant ($p<0.05$) concentration of Na, Ca and Fe; while pods contain significantly higher amount of K, Mg, P, Zn and Cu. From the results it can be concluded that *Albizia lebbeck* seeds could be an important protein supplements while pods as an important source of micronutrients for feed formulation.

Key words: Wild plants, *Albizia lebbeck*, feed, animal nutrition

INTRODUCTION

Shortage of quality animal feeds, particularly in developing countries of Africa was attributed to seasonal variation and availability of qualitative pasture (Castillo-Caamal *et al*., 2003). This has necessitated investigations of several novel alternative sources of feeding materials for possible incorporation into animal diets (Fasuya, 2005). Recent studies have shown that some novel alternative sources of feeding materials had better feeding quality. For instance, substitution of fishmeal up to 33% with processed mucuna grains in poultry ration resulted in producing heavier and less breakable eggs (Camara *et al*., 2003).

Indian Siris (*Albizia lebbeck* (L.) Benth), family, Fabaceace, is a tropical and subtropical tree native to deciduous and sub-deciduous forest of Burma, Bangladesh, India and Sri Lanka (Parrotta, 2005). The tree can grow up to 20-30 m in the humid tropics. The plant bark is flaky, pale grey (or yellowish to greenish-violable). The leaves are pipinnate with 2-4 pairs of pinnulae having 4-10 pairs of bright green leaflets rounded at both ends. *Albizia lebbeck* tree produces greenish-yellow to white

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flowers (2.5-7.5 cm in diameter) which are fragrant. The tree produces numerous light grey pods (10-30 cm long; 2-5 cm wide) ratting in the wind. The seeds are round (dark brown) and move freely in the dried pods making sound when breath blows; hence called woman's tongue.

The plant was reported to have medicinal value as it is used in the treatment of ringworms and wounds by washing the affected areas. It is also used in the treatment of gonorrhoea, leucorrhoea and other genital diseases (Hassan *et al*., 2005a).

This study was planned to carry out a preliminary investigation on some biochemical characteristics of *Albizia lebbeck* seeds and pods with the aim of using them in feed formulation.

MATERIALS AND METHODS

Collection and Processing of *Albizia lebbeck* Pods

Matured and dried pods were sampled from growing trees between the periods of February to March, 2004; within the premises of the Usmanu Danfodiyo University, Sokoto (main campus). The fruits were opened manually by peeling with hand to separate the seeds from the pods. The seeds were sorted and the spoilt ones were removed and discarded. The cleaned seeds and pods were further sun dried for five days, finely milled using mortar and pestle and then passed through 20 mesh sieve. The powdered samples were stored separately in air tight plastic containers prior to the analysis.

Proximate Analysis

The proximate analysis was done according to the standard procedures (AOAC, 1990). The Dry Matter (DM) content was determined by drying a representative 2 g sample in an oven at 105°C for 24 h repeatedly until a constant weight was obtained. The ash content was determined by the incinerating 2 g sample in a muffle furnace at 600°C until fully burnt to obtained light grey coloured ash of constant weight. Crude lipid was exhaustively soxhlet extracted from 2 g sample with n-hexane for 8 h. The nitrogen (N) content was estimated by micro-Kjeldahl method and crude protein content calculated as N% x 6.25. Crude fibre content was determined by digesting 2 g sample with 1.25% (w/v) H_2SO_4 and 1.25% (w/v) NaOH followed by ignition at 550°C for 2 h. Nitrogen Free Extract (NFE) was estimated by difference. The samples calorific values were estimated (in kcal) according to the formula: calorific value = (g protein x 4 kcal) + (g lipid x 9 kcal) + (g NFE x 4 kcal).

Mineral Analysis

The samples digests were prepared as described by Hassan and Umar (2004a). Minerals in the digests were determined using Atomic Absorption Spectrophotometer (Pye-Unicam 969) for Cu, Fe and Zn, while Na and K were determined by the use of Atomic Emission Spectrophotometer (Corning 400). A Spectrophotometer (6100, Jenway Model) was used for Phosphorus determination adapting phospho-vanadomolybdate method. Ca and Mg were analysed complexometrically with EDTA (AOAC, 1990).

Statistical Analysis of Data

This was done using Excel software. Means±standard deviations (SD) were calculated. Significant differences (using t-test) were used to separate means at $p<0.05$.

RESULTS AND DISCUSSION

Proximate Composition

The DM content of the seed (89.89±0.09%) was higher than that of pods (88.00±1.88%) (Table 1). Although there were numerical differences between the two values, no significant variation

Table1: Proximate composition of *Albizia lebbeck* (% dry weight)

Parameters	Seed	Pod
Dry matter content	89.89±0.09a	88.00±1.88a
Ash	4.50±0.62a	10.00±0.18b
Crude protein	10.06±0.04a	5.38±0.03b
Crude lipid	9.48±0.02a	0.74±0.04b
Crude fibre	8.01±0.09a	3.25±0.05b
Available carbohydrate	67.95±2.02b	80.63±1.15a
Calorific value (kcal/100 g)	397.36±1.84a	350.72±0.45b

Values are expressed, as mean±standard deviation of three replicates. Values within a row with different letter(s) are significantly ($p<0.05$) different

Table 2: Mineral composition of *Albizia lebbeck* (mg/100 g dry weight)

Element	Seed	Pod
K	900.00±18.00b	6,000.00±60.00a
Na	295.00±1.80a	270.00±2.80b
Ca	195.63±0.02a	155.00±0.08b
Mg	109.20±0.16b	183.75±1.15a
P	130.10±2.21b	240.10±2.65a
Cu	2.13±0.14b	3.79±0.22a
Fe	91.88±1.68a	59.78±0.81b
Zn	6.71±0.35b	39.61±6.78a
Ca/P	1.5	0.65

Values are expressed, as mean±standard deviation of three replicate. Values within a row with different letter(s) are significantly ($p<0.05$) different

($p>0.05$) was observed. The seeds ash content (4.50±0.62%) was significantly low ($p<0.05$) compared to that of pods (10.00±0.18%). Conversely, the crude protein content of the seeds (10.06±0.04%) was significantly higher ($p<0.05$) compared to that of pods (5.38±0.03%). Seeds crude lipid (9.48±0.02%), crude fibre (8.01±0.09%) and calorific value (397.36±1.84 kcal/100 g) were significantly higher ($p<0.05$) than their corresponding values 0.74±0.04, 3.25±0.05 and 350.72±0.45% kcal/100 g) in pods.

The nutritional components of a particular feed are the driving factor of its nutritional potential. In this study, *Albizia lebbeck* seeds and pods have high dry matter content needed for feed formulation. This also indicates low moisture content (<15%) which is desirable for feed storage as high moisture favour microbial activities (Hassan *et al*., 2005b).

The ash content of the sample indicates that pods contained greater amount of mineral elements than the seeds which was justified from the results of minerals analysis (Table 2). According to Akintayo (2004), a plant material intended for feed formulation should have ash content of<2.5%. This is an indication that these samples could not be used as selfdom feeding material, but rather mixed with other feed ingredients with low ash content.

Protein content is the most important feed component that should be taken into consideration when selecting any material for feed formulation. In this study relatively higher amount of crude protein was found in seeds when compared to pods. This amount could be even high if defatted seed cake is to be used considering significant concentration of lipid in the seeds. This value is comparable to the protein content of sorghum and maize which normally contain only 10-12% (Lambourne and Wood, 1985). The seeds crude protein content considered adequate enough for meeting the maintenance requirements of sheep and goat, which is 10% but low for poultry and rabbits (Hassan and Umar, 2004b).

The samples are rich in carbohydrate (NFE) and hence could be used as a fodder for animals as a source of energy. High amount of NFE could probably be responsible for high calorific values of the samples (Table 1). Mecha and Adegbola (1990) reported that Southern Nigeria tree forages eaten by goats have mean NFE values of 60%, which is below the values reported in this study. The differences could be attributed to geographical location and probably level of maturity (Shiawoya and Adeyemi, 2003). The samples have low crude fibre content which is an indication that most of the carbohydrates are digestible to non-ruminants animals.

Mineral Composition

The results of mineral analysis (Table 2) revealed that the samples are rich in macro-elements and iron with low concentration of zinc and copper. In most cases, pods have significantly higher ($p<0.05$) concentration of minerals (K, Mg, P, Cu and Zn) than seeds. However, seeds have significantly higher ($p<0.05$) concentration of Ca, Na and Fe.

Albizia lebbeck seeds and pods have demonstrated to be important source of minerals (Table 2). Comparing the results with the Recommended Dietary Allowances (RDA) for sheep (Church, 1977) and goat (Ramirez-Orduna *et al*., 2005) as shown in Fig. 1 and 2, the comparison indicated that Ca and P are below the recommended allowances for the animals while Mg is low for goat. This comparison was based on consuming 100 g DM. It is expected if half a kilogram of these samples were used in compounding feed and assuming proper absorption of these minerals in the animals' bodies, the RDA

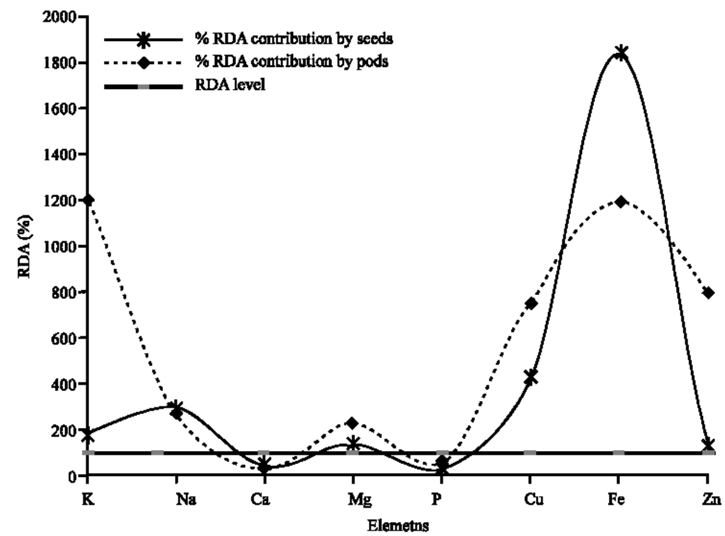

Fig. 1: Contribution of seeds and seedpods of *Albizia lebbeck* to attaining RDA values for sheep

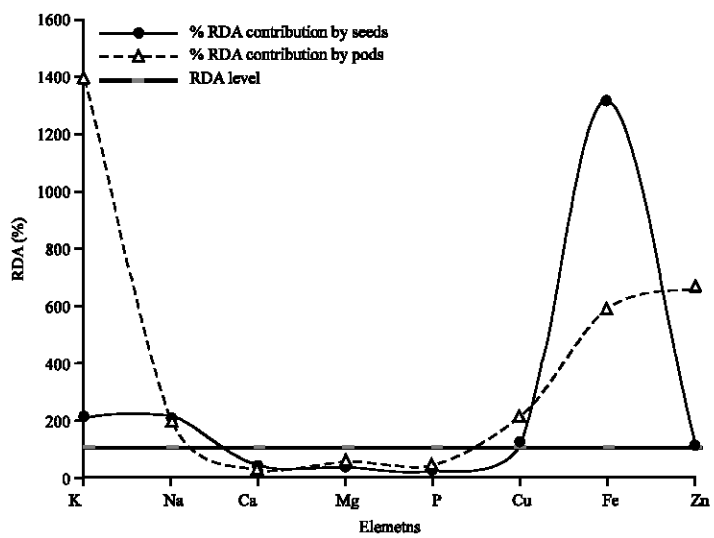

Fig. 2: Contribution of seeds and seedpods of *Albizia lebbeck* to attaining RDA values for goat

target will be met. These samples have Ca to P ratio (Ca/P) below 2:1. Feeds with Ca to P ratio beyond 2:1 are known to reduce the bioavailability of Ca and P in the gut of monogastric animals (Rama Rao *et al.*, 2003).

CONCLUSIONS

From the present study it can be seen that *Albizia lebbeck* seeds and pods are rich source of dry matter, nitrogen free extract (available carbohydrate) and mineral elements. It was also observed that the *Albizia lebbeck* seeds could be an important protein supplements while pods as an important source of micronutrients. Thus based on these it can be concluded that these samples could be used as components for feed formulation. However other parameters such as feed palatability, digestibility and toxicity should be studied before drawing a final conclusion.

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