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Nutrients and Antinutrients Analysis of *Albizia lebbeck* Seed

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Abstract

Background: The nutritional and antinutritional contents of *Albizia lebbeck* seed were investigated. Levels of nutrients like the crude protein, ether extract, crude fibre, ash, mineral and antinutrients like phytate, cyanide, oxalate, saponin, and tannins were determined.
Results: The results indicated a high protein level of 27.30 ± 0.001, ether extract of 7.50 ± 0.10, crude fibre of 38.50 ± 0.01, ash content of 4.20 ± 0.10 and NFE (carbohydrate bydifference) content of 19.40 ± 0.00. Minerals like magnesium, 7.47 ± 0.07ppm, Fe, 2.80 ± 0.002 ppm, Cu, 1.83 ± 0.001 ppm and Se, 4.886 ± 1.03 ppm. The antinutrients discovered include phytate,2.91 mol/kg, cyanide, 0.338 mg/kg, oxalate, 0.0012mg/100g and saponin, 90.00mg/100g. However, the presence of tannins was not detected.
Conclusion: It is considered that *Albizia lebbeck* could be a very good source of protein and minerals in animal feeds, if well processed, to reduce or eliminate the antinutritional factors. The high saponin content also shows that it could be a potent aphrodisiac.

Key words: Nutrients, Antinutrients, *Albizia lebbeck*.

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INTRODUCTION

The search for protein-rich seed is an ongoing process. This is because protein is limiting in the world nutrients today, especially in Africa where people can really afford the animal protein, which of course is superior to plant protein. Even the plant proteins are becoming more expensive because of the competition between man and his animals for these protein sources. Therefore, there is the need to continually search for protein, especially among the lesser known plants, among which is *Albizia lebbeck*.

Albizia lebbeck is (L) Benth (Minosaceae) belongs to the family Fabaceae. It is a medium to large tree, of multistemmed widely spreading habit (about 30 m in diameter) when grown in the open but capable of good log form in plantation. The seeds are brown, flattened, 7x 1.5mm and are 3 – 12 seeds per pod. The seeds are freely produced and are relatively large (7,000 – 8,000 seeds/kg) (Everist, 1986). It is indigenous to the Indian subcontinent and those areas of Southeast Asia with a marked dry season, and to the monsoon areas of Southern Australia (Parrota, 1988).

Although, geographically widespread, it appears to have potential for increasing pastoral production in extensive systems in the wet-dry tropics where the major problem is low feed quality of the basal diet It has various names in various regions, for instance it is called 'siris', 'koko', 'vagai' (India), 'tekik' (Japanese), 'kikote', 'tarisi' (Sudanese), 'khago', 'kase' (Thai) and East Indian walnut (Gupta, 1981). The nutritive values of the leaf, flower and pod of *A. lebbeck* in rabbit and sheep have been reported (Gupta, 1981; Pradhan and Dayal, 1981; Lowry, 1987; Schlink *et al*., 1991; Dwatmadji*et al*., 1992). However, information on the nutritional values and the antinutritional content of the *A. lebbeck* seed is still very scanty in literature.

MATERIALS AND METHODS

Materials

Sources of Materials

Dry pods of *Albizia lebbeck* were picked from the premises of the main campus of the University of Ilorin, Nigeria and authenticated at the Department of Plant Biology, University of Ilorin, Nigeria. The sodium hydroxide, sodium sulphate used were products of East Anglia Chemicals, Hadleigh Ipswich Suffolk; the petroleum ether (60 – 80^{o}C) used was a product of Eagle Scientific Limited, Unit 5, Eldson Rd., Beeston, Nottingham; the chloroform, methanol, ethanol used were products of BDH Chemicals Ltd., Poole, England. Cupric sulphate, 5-hydrate was a product of J.T. Baker Chemicals Co., Phillipsmore, N.Z. All other reagents used were of analytical grade and prepared in the Biochemistry laboratory, University of Ilorin, Nigeria, with all-glass apparatus.

Methods

Processing of Materials

The seeds were removed from their pods, winnowed and ground to powder form using electric grinding machine. The milled seed was subsequently used for analyses.

Proximate Analysis

The crude protein, ether extract, crude fibre and ash contents of the *A. lebbeck* seed were determined as described by AOAC (1990).

Antinutrient Determination

The determination of the phytate, tannin, cyanide and oxalate contents of the milled *A. lebbeck* seed were carried out using the methods of Wheeler and Ferrel (1971), Josyln (1970), AOAC (1990) and Iwuoha and Kalu (1995) respectively.

Mineral Determination

The determination of the levels of inorganic minerals of the milled *A. lebbeck* seed was carried out using the perchloric acid digestion (wet oxidation) procedure. P and Fe were determined using the colorimetry method while determination of the Zn, Ca, Mn and Mg contents of the seed were carried out using the atomic absorption spectrophotometer (Gomori, 1942; Piper, 1944; Perkin-Elmer Corp., 1968; AOAC, 1990).

RESULTS

The results of the proximate analysis of the *A. lebbeck* seed is shown in **Table 1.** The seed has a high protein and crude fibre contents of 27.3 and

Table 1: Proximate Composition (% dry matter) of *Albizialebbeck* Seed

Nutrient	Percentage Composition
Moisture	3.10 ± 0.001
Crude Protein	27.30 ± 0.001
Ether extract	7.50 ± 0.10
Crude Fibre	38.50 ± 0.01
Carbohydrate (by difference)	19.40 ± 0.00

Values are means of 4 determinations ± SEM.

38.5% respectively. **Table 2** shows the results of the mineral analysis of *A. lebbeck* seed. The seed is rich in Mg, Fe and Se, however, a little amount of Cd, a heavy metal, was observed. The antinutrient composition of the *A. lebbeck* seed is shown in **Table 3.** The seed was found to contain a high level of saponin and considerable amount of phytate and cyanide.

DISCUSSION

Animal feed, today, is becoming costly due to the limitation posed by protein source. This is because the conventional soybeans and groundnut are over-competed for man and his animals. Therefore, the present result showing a high level of protein in the *A. lebbeck* seed indicates that it could be harnessed as a source of protein in animal feed. The level of protein in the seed compare favourably well with that of cowpeas (25%) (Gallup and Reder, 1943), pigeon pea (20.4%), (Jambunathan *et al*., 1984) jack bean (30%) (Udebibie,1990), limabean, bambaragroundnut (23 – 26%) (Aletor and Aladetimi, 1989; Ene-Obong and Carnovale, 1992; Olaofe *et al*., 1993). The crude lipid of (7.5%) in the seed is higher than those of the cowpeas (2.2%) (Gallup and Reder, 1943), pigeon pea(1.6%) (Jambunathan *et al*., 1984), jack bean (3.4%) (Udebibie,1990), limabean (29.3%), bambara groundnut (Oyenuga, 1968; Aletor and Aladetimi, 1989; Ene-Obong and Carnovale, 1992; Olaofe *et al*., 1993).

Seeds that are very high in fat content have been reported to retard digestion and normal metabolism, therefore, the seed may have long shelf -life with no tendency for rancidity (Ewing, 1951; Atteh, 2002). The seed could also be a good source of magnesium, iron and selenium in animal diets. The significance of these elements cannot be over emphasized. For instance, magnesium is important in virtually all the steps involved in protein and cholesterol synthesis; iron in the formation of the haem component of the haemoglobin of the red blood cells; while selenium is known to be required by the enzyme glutathione peroxidase that protects the cell membrane againstlipid peroxidation.

However, the existence of the antinutrients, which are known to have various deleterious effects, ranging from reduction in feed intake, reduction in bioavailability of minerals to causing death of animals (Butler, 1989, 1992; Giner-Chavez, 1996; Reed, 1995; Osagie, 1998), is an indication of the limitation of the use of the seed as protein source in animal feed. The toxic compounds may occur in all parts of the plant, but the seed is normally the most concentrated source, especially, the seed coat (Gill, 1992; Osagie, 1998).The seed coat would equally account for the high crude fibre observed in the seed. For *A. lebbeck* to be harnessed as a source of protein and minerals in animal feeds, it may therefore be necessary that the *A. lebbeck* seed be subjected to processing techniques. This will either reduce or eliminate its antinutritional factors. Meanwhile, the high saponin content of the seed may potentiates it as an aphrodisiac.

Table 2: Mineral Composition (ppm) of *Albizialebbeck* Seed

Mineral	Concentration (ppm)
Mg	7.47 ± 0.07
Mn	0.31 ± 0.001
Cu	1.83 ± 0.001
Fe	2.80 ± 0.002
Zn	-
Se	4.87 ± 1.03
Cd	0.15 ± 0.001

Values are means of 4 determinations ± SEM.

Table 3: Antinutrient Content of *Albizialebbeck* Seed

Antinutrient	Concentration
Phytate (mol/kg)	2.91 ± 0.003
Cyanide (mg/kg)	0.34 ± 0.001
Oxalate (mg/100g)	0.0012 ± 0.003
Saponin (mg/100g)	90.00 ± 0.40
Tannin	-

Values are means of 4 determinations ± SEM.

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