PROXIMATE AND PHYTOCHEMICAL COMPOSITIONS OF PARBOILED AFRICAN LOCUST BEAN (*PARKIA BIGLOBOSA*) SEED COAT AND POD

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ABSTRACT
This study was conducted to evaluate the nutritional and phytochemical composition of parboiled seed coat and pod of African locust beans (*Parkia biglobosa)*. Samples were gathered within the local environs and subjected to laboratory analysis, proximate analysis shows that the dry matter, moisture content, crude protein, ether extract, crude fibre, carbohydrate, and ash content of the seed coat had values of 86.58%, 13.43%, 26.02%, 15.57%, 20.24%, 17.03%, and 7.73% respectively, which were all higher than those obtained from the pod except for the moisture content and carbohydrate. Phytate was found to be present in higher concentrations than other antinutrients where the pod had (98.87 mg/g) and the coat (30.72 mg/g) while the pod had oxalate as 12.41 mg/g, tannin 0.36 mg/g and saponin 29.63 mg/g, while the seed coat had 3.68 mg/g, 0.15mg/100g, and 2.10 mg/g respectively.
Keywords: *Parkia biglobosa*, seed pod, seed coat, nutrients, phytochemicals

INTRODUCTION
African locust is a multipurpose tree, the seed, pod, coat, fruit pulp and leaves are edible materials either to humans or livestock. The seeds are usually fermented and processed into condiment known by the Yorubas as Iru, the Hausas as Dawadawa, and Sikomu among the Igbo peoples (Omolara and Ibrahim, 2014). The perennial deciduous tree belongs to the family *Leguminosae* and subfamily *Mimosoideae* with over thirty-one species (Adjanohoun *et al*., 1989). The tree is usually found in a wide range of environments all around Africa but is domiciled in the Southern part of Nigeria. It grows its seeds in a pod with a sweet pulp around the seed. The pod of *P. biglobosa* is usually dark brown at maturity of about 30-40 centimetres and each pod contains about 30 seeds which are embedded in a sweet powdery yellow pulp, the seeds are usually collected and stored due to the seasonality of the fruit maturation (Omolara and Ibrahim, 2014). The raw seed which is covered with a black coat is cooked, fermented and processed into a protein-inexpensive rich condiment, with high essential amino acids, fatty acids, vitamins and minerals constituting important medical purposes and economic activities (Alberts *et al*., 2014; Vinceti *et al*., 2018). However, the black parboiled seed coat is usually discarded and regarded as wastes, thrown into open fields believing it is of no economic or nutrient value. Interestingly it was observed that goats on free range usually feast on these discarded seed coats which becomes a pointer to the fact that it may contain nutrients useful to the animal (Obizoba, 1998) and thus possibly incorporated into their diets instead of regarding it as waste causing a nuisance to the environment and on the long run, helping to reduce the high demand placed on conventional feed materials like wheat offal, rice brain or brewers dry grain and help in reducing the cost of feeding which usually account for over 70% cost of production under the intensive system of production (Alqaisi, 2011).
Thus, this study aimed at investigating the nutrient and phytochemical compositions of *P. biglobosa* parboiled seed coat and raw pod to provide relevant information on its utilization and possible incorporation into ruminant or other livestock diets.

MATERIALS AND METHODS
Collection and preparation of parboiled seed coat and raw pod
Samples of seed pods were gathered from farms where it was left as waste after the seeds inside were collected. Parboiled seed coats were collected from locust bean processing centres within the Ikole Local Government area of Ekiti State and air-dried for three days at room temperature. All dirt were removed by

sorting and the samples were ground into powder to facilitate easy quantification during laboratory analysis.

Laboratory analysis

Laboratory analysis of the samples was carried out at the Central Laboratory of the Federal University of Technology, Akure. Ondo state.

Proximate analysis was determined using (AOAC, 2002) method, and the phytochemicals; oxalate, tannin, and saponin determined using the method of (Mathams and Sutherland, 1992) while Phytate was analyzed according to (Makkar and Goodchild, 1996).

Data analysis

Data from laboratory analysis were subjected to one-way analysis of variance (ANOVA) using the general linear model procedure of Statistical Package for Social Sciences (SPSS) version 25.

RESULTS AND DISCUSSION

Proximate composition of *P. biglobosa* seed coat and pod

Proximate composition is an important criterion to determine the nutritional values and quality of feed materials (Qayyum *et al.,* 2012). Presented in Table 1.0 below are the nutrient composition of *Parkia biglobosa* parboiled seed coat and raw pod. The Dry Matter (DM) was highest in the seed coat with a value of 86.58% and 84.75% in the seed pod, this variation could be attributed to the nature and texture of these two materials. The DM of feedstuff is one of the significant parameters that influence voluntary feed intake in animals (Perry *et al.,* 2003). The moisture contents were below 20% which is desirable as high moisture content supports the growth of bacteria and mould, reducing the stability, quality of flavor, and shelf life (Ogunyinka *et al*., 2016).

The Crude Protein (CP) in the seed coat (26.02%) was thrice that of the pod (8.69%), this was in agreement with the study of Olawuni *et al.* (2012). The high content of CP could be attributed to the fact that *P. biglobosa* like all other leguminous seeds and their coats contains a high portion of Nitrogen, Nitrogen been a precursor of crude protein. Moreover, the application of heat during cooking is believed to have helped in breaking down the protein structure, hence increasing its composition and availability, this observation was similar to the report of Ogunyinka *et al*., (2016). Hence incorporating the seed coat into livestock diet will play a significant role in the production and maintenance of body cells, tissues, enzymes, and hormones as well as some fluid required for body functioning (Hayat *et al*., 2014).

Ether extract, a fraction of the fat in the samples, was higher in the coat (15.57%) than in the pod (12.13%). High content of fat may prone the seed coat to rancidity if not properly stored or exposed to air (Ogunyinka *et al.,* 2016). It is generally known that leguminous seeds contain oil in them, the proximity of the seed coat to the seed suggests that a reasonable amount of oil is embedded in the coat.

The crude fibre (20.24%) obtained from the seed coat was similar to the 22.73% reported by Dahouenon – Ahoussi *et al* (2012). Though crude fibre does not contribute nutrients or energy unless acted upon by microbes, it is significant during digestion, encouraging microbial growth and activities, and colon health. Ash content was also higher in the seed coats (7.73%) more than double that in the pod (2.49%), this points to the fact that the coat contains abundant mineral content over the pod, this submission is in line with the observation of (Iqbal *et al.,* 2012, Ogunyinka *et al.,* 2016).

However, the carbohydrate content was higher in the seed pod (42.65%) than 17.03% recorded for the seed coat, this report supports the findings of (Dwiani *et al.,* 2014) that *P. biglobosa* fruit pulp and pod contain more carbohydrates than the seeds and seed coat. The lower portion of carbohydrates in the coat could be attributed to the heat it was exposed to during processing, as excess heat tends to denature many soluble carbohydrates as they are heat-sensitive compounds (Dwiani *et al.,* 2014). Though proteins and fats also provide energy, carbohydrates are much cheaper and more easily digested and absorbed as a source of energy.

Table 1: Proximate composition of *P. biglobosa* seed coat and pod

Nutrition (%)	SEED COAT	SEED POD
Dry matter	86.58 ± 3.02	84.75 ± 3.04
Moisture content	13.43 ± 1.02	15.25 ± 1.04
Crude Protein	26.02 ± 1.40	8.69 ± 0.30

Ether extract	15.57 ± 0.03	12.13 ±0.01
Crude fibre	20.24 ± 0.20	18.80 ± 0.03
Ash	7.73 ± 0.07	2.49 ± 0.02
Carbohydrate	37.03 ± 1.02	42.65 ± 1.05

Mean ± S.D

Phytochemical composition of *P. biglobosa* seed coat and pod

According to Vikram *et al.* (2020), anti-nutritional compounds also called Anti-nutritional factors (ANF) are secondary chemical compounds produced during a metabolic process in plant materials that exert a specific effect on the digestive, circulatory or nervous system of the host organism when ingested in excess. Interestingly, they elicit both harmful and beneficial effects on animals depending on dosage (Greathead, 2003). The result from the phytochemical composition is presented in Table 2.0 below.

The results revealed the presence of low antinutrients in the seed coat when compared to the seed pod, oxalate, phytate, tannin, and saponin were 3.68 mg/g, 30.72 mg/g, 0.15 mg/100g, and 2.10% respectively while the seed pod contains 12.41 mg/g, 98.87 mg/g, 0.36 mg/100g and 29.63%. It is believed that significant portion of the antinutrients must have been removed, reduce, or denatured during the cooking process, this account for the results obtained, this was similar to the submission of (Ijarotimi and Keshinro (2012). However, the values obtained from the coat were within safe range, may not pose danger on health except for phytate which may interfere with the bioavailability of nutrients due to its high content. Research has established that phytate interferes with some mineral components such as calcium, iron, zinc, and magnesium, forming insoluble complexes with them (Ijarotimi and Keshinro 2012).

The high portion of antinutrients in the pod may necessitate further processing before it can be introduced to livestock.

Table 2: Phytochemical composition of *P. biglobosa* seed coat and pod

	SEED COAT	**SEED POD**
Oxalate (mg/g)	3.68 ± 0.01	12.41 ± 0.08
Phytate (mg/g)	30.72 ± 0.00	98.87 ± 018
Tannin (mg/100g)	0.15 ± 0.00	0.36 ± 0.02
Saponin (%)	2.10 ± 0.00	29.63 ± 0.13

Mean ± S.D

CONCLUSION AND RECOMMENDATIONS

The seed coat and pod from *P. biglogbosa* seeds can be considered an alternative feed material instead of leaving them to waste away. The coat could serve as a good source of protein supplements in livestock diets, especially the ruminants.

From the study conducted, the following recommendations are made:

a. further (in-vivo and in-vitro) studies should be conducted to evaluate the digestibility and growth response of livestock to these materials

b. large quantity of antinutrients in the pod may pose a threat to health if incorporated without treatment, hence methods like fermentation and chemical treatment can be deployed to reduce the presence of the antinutrients in the pod.

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