

FOREST TREE SEEDS AS ALTERNATIVE FEED SOURCE FOR LIVESTOCK

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ABSTRACT

An experiment was conducted to investigate the potential of forest tree seeds as alternative feed source for ruminant livestock. The experimental design was a 5x5 Latin Square Design. The treatments consisted of *Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium conophorum* and *Jacaranda mimosfolia*, respectively. *Panicum maximum* hay was used as a control. Fifteen West African Dwarf goats of 4 – 7 months of age were used in the digestion studies of the seed cakes. Results indicated that the seeds had high calorific value. Crude Protein content ranged between 37.4% - 24.4%. Results of the research showed that *Jacaranda mimosfolia* and *Anacardium occidentale* could be fed solely or in supplementary rations to goats. Further research should be done to investigate the use of these tree seeds in combination with other feeding stuffs in complete diets.

INTRODUCTION

Trees found in forest reserves in Nigeria produce substantial quantities of seeds, which waste away annually (Ogundun *et al.*, 2009). Many of these forest tree seeds have been evaluated in terms of nutrients composition and were found to contain reasonable amount that can meet the nutrient requirement of farm animals (Kamatali *et al.*, 1992; Adeloye and Ogundun, 2000; Ogundun *et al.*, 2009). The observation shows that indigenous goats raised by villagers in settlements around the forest reserves often feed on the seeds of trees in the plantations which constitute the "grazing" arena to the goats. The common plant seeds which are relished by the goats in the locality of this study area are *Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium conophorum* and *Jacaranda mimosfolia*. The study reports the nutrient compositions and digestibility of these seeds.

MATERIALS AND METHOD

Seed collection and processing: The seeds of *Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium conophorum* and *Jacaranda mimosfolia* were harvested in Omo forest reserves of the rain forest of Oyo-State, Nigeria. The seeds were sun-dried and toasted, milled and pressed mechanically to remove the oil. The resulting seed meals were used in this study. *Panicum maximum* hay was fed as the basal diet. This was harvested at the pre-flowering stage, allowed to dry on the field and stacked in jute bags.

Animals and their Management: Fifteen West African dwarf goats, 4 – 7 months old with average Weight of 7kg (5.1 – 9.2kg) were used in the study. The animals were dipped against

ectoparasites and dewormed of endoparasites as routine treatments. They were allowed two weeks reconditioning to the treatment, containment and diets offered. The animals were fed rations of the seed meals at 3% of body weight of 08.00h. *Panicum maximum* hay was offered *ad libitum* as basal diet at 16.00h. They had free access to clean water.

Experimental Design: A replicated 5 x 5 Latin Square design (Steel and Torrie, 1980) was used.

Sampling of Feedstuffs: Samples of the feed offered and refusals were taken daily. Such samples were oven-dried at 5°C to constant weight, bulked and milled to pass through a 2mm screen and kept in air-tight plastic containers for chemical analyses.

Faecal collection: Following the adjustment period of 14 days, was the seven days collection period. The faeces voided by individual animals were collected, weighed and 10% of these faeces were dried at 65°C to constant weight. The dried samples were weighed, bulked and milled to pass through 2mm sieve in the milling machine. Urine from each goat was collected in a plastic bucket which previously contained 5ml of (5% v/v) Sulphuric acid. The total volume of urine was estimated, 10% saved in sample bottle and stored at – 5°C for chemical analyses.

Chemical Analyses: The saved samples of the feed and faeces were analyzed for the dry matter, crude protein, crude fibre, ether extract, nitrogen free extract, energy and total ash (AOAC, 1990). The neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined following the procedure of Van Soest and Goering (1970). Hemicellulose was estimated as the difference between NDF and ADF. The gross energy

contents of the seed meals, *Panicum maximum* hay, faeces and urine were determined by ballistic bomb calorimeter.

Apparent digestibility and statistical analyses

Apparent digestibility coefficient was calculated for the basal ration using the formula.

$$B = \frac{(a - b)}{a} \times 100$$

Where: B= digestibility coefficient of the nutrient

a= Amount of nutrient in the feed

b= Amount of nutrient in the faeces

The nutrient digestibility of the seed meals was calculated following the method of Crampton and Lloyd (1959) as:

$$D = \frac{100(T - B)}{S} + B$$

Where; D=Percentage apparent digestibility of the nutrient in seed meal.

T= Coefficient of digestibility to total ration

B= Coefficient of Digestibility of basal ration

S= Percentage of concentrate feed in the total ration. All data were subjected to analysis of variance using the general linear model (SAS, 1987).

RESULTS AND DISCUSSION

Nutrient Digestibility: The crude protein digestibility was in the decreasing order of *Jacaranda mimosfolia* seed meal (72.4g/100g), *Anacardium occidentale* (54.2g/100g), *Tetracarpidium conophorum* (50.4g/100g) seed meals (Table 2). The digestibility of the crude fat in the seed meals and the hay was in order of *Jacaranda mimosfolia* (56.7g/100g) > *Anacardium occidentale* (55.8g/100g) > *Tetracarpidium conophorum* (54.6g/100g) > *Parkia biglobosa* (28.6g/100g). The crude fat in the hay was 29.6g/100g. Crude fibre was highly digested to the value of 70.0g/100g in *Panicum maximum*. The animals on the seed meals have crude fibre digestibility in the order of (14.6g/100g) *Jacaranda mimosfolia* > (13.1g/100g) *Anacardium occidentale* > (11.4g/100g) *Parkia biglobosa* > (11.2g/100g) *Tetracarpidium conophorum*.

The chemical composition of the seed meal.

The chemical composition of the seed meals (*Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium Conophorum*, *Jacaranda mimosfolia* and *Panicum maximum*) are presented in Table 1. The dry matter contents of the seed meals and the hay exceeded 90%. The *Parkia biglobosa*, seed meal had the highest crude protein

of 37.4%, followed by *Anacardium occidentale* (25.7%), *Tetracarpidium conophorum* (25.6%) and *Jacaranda mimosfolia* (24.4%). The hay had 7.7% crude protein. *Jacaranda mimosfolia* had the highest (19.7%) crude fibre among the seed, *Tetracarpidium conophorum* and *Anacardium occidentale* had 18.3% and 12.5%, respectively while the *Panicum maximum* hay had 37.3% crude fibre. Among the seeds, *Anacardium occidentale* was richest in ether extract (31.0%) followed by *Jacaranda mimosfolia* (19.6%), *Tetracarpidium conophorum* (16.0%) and *Parkia biglobosa* had 14.0%. The energy values were averagely high among the seeds with little significant difference. *Jacaranda mimosfolia* and *Panicum maximum* had 412.2 (Kcal/g) and 437.0 (kcal/g), respectively. *Parkia biglobosa* had the highest NDF, ADF and lowest hemicelluloses value. There were no significant differences ($P > 0.05$) in Pepsin Digestible protein among the seed meals. The pepsin digestible indexes were high in both the seeds and *Panicum maximum*. The plant seeds were milled in order to reduce the particle size of the whole seeds. The moisture content (>10%) of the resulting seed meals made preservation easy as the meals did not undergo any noticeable deteriorative changes. All the seed meals had low crude fibre while high crude fibre reflected in *Panicum maximum* is expected. The legume *Parkia biglobosa* seems to protect the seeds with toxic anti-nutritional compounds (Tanner *et al.*, 1990), so the low fibre content of the *Parkia biglobosa* seed meal is consistent with the rather thin testa (Femi-Ola *et al.*, 2008). *Anacardium occidentale* seed meal is rich in oil and calorie while *Jacaranda mimosfolia* meal was rich in soluble carbohydrates. The non toxic anti-nutritional compounds in the seed meals of *Jacaranda mimosfolia* and *Tetracarpidium conophorum* make the digestibility of the nutrients to be highest. Feeding *Parkia biglobosa* may require the supply of a degradable protein source to ensure an efficient rumen environment / function.

CONCLUSION

Conclusion from this study shows that *Jacaranda mimosfolia* and *Anacardium occidentale* can be fed solely or as supplementary diet. Other seeds could be in combination with other feeding stuff in complete diets.

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Table 1. Chemical composition of *Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium consphorum*, *Jecaranda mimosfolia* seed and *Panicum maximum*.

Parameters	<i>Parkia biglobosa</i>	<i>Anacardium occidentale</i>	<i>Tetracarpidium consphorum</i>	<i>Jacaranda mimosfolia</i>	<i>Panicum maximum</i>
Dry matter (%)	93	96.7	91.8	94.9	93.5
On dry matter basis (%)					
Crude protein	37.4	25.7	25.6	24.4	7.7
Ether extract	14.0	31.0	16.0	19.6	1.7
Crude fibre	11.0	12.5	18.3	19.7	37.3
Total Ash	4.5	3.5	3.6	6.4	12.0
NFE	20.5	24.0	18.6	12.5	39.4
Energy (kcal/g)	378.4	394.1	388.7	412.2	437.0
NDF	46.3	26.9	24.5	20.4	63.2
ADF	36.0	7.8	9.2	6.4	51.7
Hemicellulose	10.3	19.1	17.3	10.6	11.5
Pepsin Digestible protein (%)	3.5	18.3	17.3	15.7	16.7
Pepsin Digestible index (%)	70.0	72.0	69.2	69.0	70.0

Table 2: Digestibility of nutrients in *Parkia biglobosa*, *Anacardium occidentale*, *Tetracarpidium conophorum*, *Jacaranda mimosfolia* seeds and *Panicum maximum* (hay) fed to West Africa dwarf goats (g/100g DM + s.d).

Parameters	<i>Parkia biglobosa</i>	<i>Anacardium occidentale</i>	<i>Tetracarpidium conophorum</i>	<i>Jacaranda mimosfolia</i>	<i>Panicum maximum</i>
Crude protein	38.2+1.2	54.2+1.1	50.4+1.6	72.4+2.0	43.3+1.7
Ether extract	28.6+1.4	55.8+1.4	54.6+1.3	56.7+1.1	29.6+1.3
Crude fibre	11.4+0.9	13.1+1.1	11.2+0.2	14.6+1.6	70.0+2.0
NDF	69.5+1.5	20.5+0.8	35.0+1.4	65.5+1.3	62.9+1.0
ADF	19.8+0.9	46.0+1.2	18.9+1.5	22.3+0.9	78.0+1.7
Cellulose	13.3+0.9	10.3+0.9	13.8+1.8	9.0+1.1	10.0+0.9

Digestion estimates of neutral detergent fibre in goats were fairly high for *Parkia biglobosa* (69.5g/100g), *Jacaranda mimosfolia* (65.5g/100g) and *Panicum maximum* (62.9g/100g) and considerably low in *Tetracarpidium conophorum* (35.0g/100g) and *Anacardium occidentale* (20.5g/100g). The digestibility of the acid detergent fibre was fair in goats fed on *Anacardium occidentale* (46g/100g) but low in goats fed *Jacaranda* (22.3g/100g), *Parkia biglobosa* (19.8g/100g) and *Tetracarpidium conophorum* (18.9g/100g).