Utilization of whole pods of *Albizia saman* in diets of growing rabbits

O.O. Oduguwa

Department of Animal Nutrition, University of Agriculture, P.M.B. 2240, Abeokuta, Nigeria

Abstract

The effect of graded levels of whole pods of *Albizia saman* (Rain tree) on the performance nutrient utilization and haematology of growing rabbits were studied. Four experimental diets were formulated which contained 100, 200 and 300g whole pods of *A. saman* per kg of diet. Forty-eight growing hybrid rabbits with average initial weight of 828.2g were used for the experiment. They were allotted on weight equalization basis to four dietary treatments that is 12 animals per treatment. The animals were housed individually and fed *ad libitum* with the respective diets throughout the eight weeks experimental period. Data on body weight, feed intake, feed to gain ratio and protein efficiency ratio were monitored. Metabolic trials were also carried out in the course of the experiment and the digestibility of dry matter and the proximate components of the feed were determined. Some haematological indices of the experimental animals were also assayed, these include: packed cell volume, haemoglobin, red blood cell, white blood cell, serum total protein, serum albumin and serum creatinine. Results showed that the dietary treatments had significant effect ($P < 0.05$) on body weight, feed intake, feed to gain ratio and protein efficiency ratio. Rabbits fed 100g kg⁻¹ *A. saman* diet had similar performance with those on the control diet (0g kg⁻¹ *A. saman*) and performed better ($P < 0.05$) than those fed 200g kg⁻¹ and 300g kg⁻¹ *A. saman* diets. The digestibility values of dry matter and other proximate fractions of the dietary treatments were not significantly different ($P > 0.05$). However, when only the *A. saman* diets were considered, rabbits fed 100g kg⁻¹ had the highest but non-significant digestibility values for all the measurement taken. The mean values for packed cell volume, haemoglobin, serum total protein and serum albumin decreased with increasing level of inclusion of *A. saman*. There was no significant difference ($P > 0.05$) in the values of red blood cells and serum creatinine. It was concluded that inclusion of whole pods of *A. saman* up to 100g kg⁻¹ level in the diets of growing rabbits gave best results with no adverse effect on performance and nutrient digestibility.

Keywords: whole pods of *Albizia saman*, growing rabbits

Introduction

Albizia saman, also known as Rain tree is a multipurpose leguminous tree which has huge spreading branches with short stem, producing massive domed crown and black fleshy pods. The pods of *Albizia saman* are between 15 – 23cm long and 2cm wide with up to 25 seeds. The fruits are highly relished by ruminant which pick them up during grazing (NFTA, 1987). It is valued on

pasture farms where it shades livestock and encourages the growth of green lush grass apart from shedding nutritious pods. *Albizia saman* contains 139.4, 102, 101, 87.4, 661.1, 8.7, 0.75g kg⁻¹ of crude protein, crude fibre, ether extract, ash, nitrogen free extract calcium and phosphorus in that order (Oduguwa *et al.* 2000)

The potentials of Rain tree for livestock feed have not been properly harnessed. Its growth in

Nigeria and other countries in West African sub-region have been limited to use as an ornamental shade (Oduguwa *et al.* 2000). The problems associated with livestock feed availability and quality posed by seasonal changes can be reduced by the use of leguminous tree crops like rain tree. Moreover, rain tree is known to produce and shed its pods at peak of dry season (Aribido, 1988). Adebiyi and Adeneye, (2001) fed levels of whole pods of *Albizia saman* to weaned calves, they concluded that performance of White Fulani calves fed Guinea grass could be enhanced with the inclusion of milled whole pods of *Albizia saman* in their diets up to 30%. Although, *A. saman* and its products are known to contain some antinutritional factors like tannin and protease inhibitors, (NFTA, 1987; Oyekoya 2003) there is still a need to further investigate its usefulness as a feed stuff.

With the advent of hikes in the price of convectional feedstuffs especially protein and energy sources, there is need to increase the range of possible feed resources for livestock and especially rabbit because rabbit production represents one of the most economic methods of generating high quality animal protein within the shortest possible time due to their rapid growth rate. Studies on the potentials of using *A. saman* whole pods as inputs into rabbit feed are very scanty in literature. This present study therefore sought to evaluate the utilization of graded levels of whole pods of *A. saman* in diets of growing rabbits.

Materials and Methods

Location: The experiment was carried out at the Teaching and Research farm of the University of Agriculture, Abeokuta, Nigeria, where the prevailing climate is tropical humid.

Test ingredients: Ripe and dry whole pods of *A. saman* were collected during the dry season (December 2001 to February 2002). They were oven dried for about a week at 65°C, milled to pass through 2mm sieve in a hammer mill, bagged and stored for further use.

Feeding trial: Four experimental diets were formulated to contain dried whole pods of *A. saman* at 0, 100, 200 and 300g kg⁻¹ levels. The diets were formulated to be isoenergetic and isonitrogenous (Table 1). Forty-eight hybrid fryer rabbits with average weight of 828.2g were allotted on weight equalization basis to the four dietary treatments that is 12 animals per treatment. The animals were housed individually in hutches equipped with separate feeders and drinkers. A period of 5 days was allowed for the animals to get acclimatized in the cage environment before the commencement of the experiment. Feed, offered in mash form and water were given *ad libitum* throughout the period of the experiment which lasted eight weeks. The records taken include weekly body weight, feed intake, feed to gain ratio and protein efficiency ratio.

Digestibility Trials

During the last seven days of the feeding trial, the faeces voided by each animal daily were collected and weighed. These were placed in aluminum foil and dried in an oven at 65°C for 72 hours. The samples were later ground to pass through a 0.1mm screen and then stored for analysis. Digestibility of dry matter and the proximate fractions of the diets by the rabbits were then calculated.

Chemical analysis

Experimental diets and the faecal samples were analysed by the A.O.A.C (1990) methods for their proximate fractions viz; crude protein, crude fibre, ether extract and ash. Tannin was determined using the method of Price *et al.* (1978).

Blood analysis

Eight rabbits from each experimental diet were selected and blood samples were collected from the jugular vein of each animal using a syringe. Two sets of blood samples were collected from each animal. Samples for serum analyses were decanted after centrifugation while ethylene diamine tetracetic acid (EDTA) was added to samples for whole pod analysis. Parameters

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determined included serum total protein, serum albumin and serum creatinine. Measurements taken from whole blood were packed cell volume, haemoglobin, red blood cell and white blood cell.

Statistical analysis

The data collected were subjected to one way analysis of variance and Duncan's Multiple Range Test was used to separate the mean variables that were significantly different (Steel and Torrie, 1980)

Table 1: Gross and proximate composition of experimental diets (g kg^{-1})

	Diet 1	Diet 2	Diet 3	Diet 4
	0 g kg^{-1}	100 g kg^{-1}	200 g kg^{-1}	300 g kg^{-1}
	<i>A. Saman</i> pod	<i>A. Saman</i> pod	<i>A. Saman</i> pod	<i>A. Saman</i> pod
Maize	300.0	200.0	100.0	0.00
<i>Albizia samana</i>	0.0	100.0	200.0	300.0
Groundnut cake	15.0	150.0	150.0	150.0
Blood meal	30.0	30.0	30.0	30.0
Palm Kernel meal	150.0	115.0	70.0	50.0
Rice bran	320.0	355.0	400.0	420.0
Oyster Shell	10.0	10.0	10.0	10.0
Bone meal	27.0	27.0	27.0	27.0
Methionine	3.0	3.0	3.0	3.0
Lysine	3.0	3.0	3.0	3.0
Salt	3.0	3.0	3.0	3.0
Vit/Mineral premix	4.0	4.0	4.0	4.0
	1000	1000	1000	1000
Determined analysis				
Crude protein	182.7	184.6	185.9	188.7
Crude fibre	130.0	130.4	140.3	145.6
Ash	76.8	77.7	77.9	80.4
NFE	526.9	523.4	509.5	524.2
Digestible Energy MJ/kg	11.89	11.56	10.59	10.64

Table 2: Composition of whole pods of *A. saman* (g kg^{-1})

Component	
Dry matter	869.1
Crude protein	137.6
Crude fibre	92.2
Ether extract	12.1
Ash	91.7
Nitrogen free extract	535.5
Tannin	31.2

Results and Discussion

The crude protein content of the experimental diets ranged from 182.7 to 188.7 g kg^{-1} . These values are slightly higher than the 160 g kg^{-1} requirement for growing rabbits as recommended by FAO (1986). These values however fall within the recommended crude protein values for this class of animal by NRC (1994).

The crude fibre levels of the diets ranged from 130.0 to 145.6g kg⁻¹ which are close to 13 – 14% recommended by Ekpeyong and Biobaku (1986) and Lebas *et al.*, (1986). The crude fibre was highest in diet 4 (300g kg⁻¹ *A. saman* inclusion). The high level could be as a result of the high levels of some feed ingredients like rice bran as well as *A. saman* included in the diet. The energy contents of the diets had slightly lower values than the first two diets.

The crude protein content of the whole pods of *A. saman* pods obtained in this study (137.6g kg⁻¹) falls within the range of 120 – 180g kg⁻¹ of ripe pods reported by NFTA (1987). The values for crude fibre, ether extract and nitrogen free extract are 92.2, 12.1 and 535.5g kg⁻¹ in that order. These values are lower compared to those reported for autoclaved whole pod, by Oduguwa *et al.*, (2000). The performance characteristics of rabbits fed the experimental diets are shown

in Table 3. The rabbits on the different diets were started with average initial body weights that ranged from 827.3g to 829.0g. the final body weights were 1082, 1063, 979.6 and 932.2g for diets 1, 2, 3 and 4 respectively. The final body weights varied significantly ($P < 0.05$) between the groups but rabbits fed the control diet (diet 1) and diet 2 (100g kg⁻¹ *A. saman*) had weights that were not significantly different from each other. The rabbits fed 300g kg⁻¹ *A. saman* diet had the least final body weight. The significant reduction in body weights of rabbits in this category may not be unconnected with the presence of some antinutritional factors in *A. saman* and its products these include tannin and protease inhibitors (Oyekoya, 2003). In fact, the body weights decreased as the level of *A. saman* increased. The values obtained for daily weight gain followed the same trend as the of body weight and the same reasons adduced above are also applicable.

Table 3: Performance characteristics of rabbits and digestibility coefficients (g kg⁻¹) of proximate constituents of experimental diets

	Diet 1	Diet 2	Diet 3	Diet 4	
	0 g kg ⁻¹	100 g kg ⁻¹	200 g kg ⁻¹	300g kg ⁻¹	
Measurements	<i>A. Saman</i> pod	<i>A. Saman</i> pod	<i>A. Saman</i> pod	<i>A. Saman</i> pod	SEM
Initial weight rabbit ⁻¹ (g)	827.8	828.5	829.0	827.3	34.2
Final weight rabbit ⁻¹ (g)	1081.9 ^a	1063.1 ^a	979.6 ^b	932.2 ^c	18.9
Daily feed intake rabbit ⁻¹ (g)	69.4 ^a	69.5 ^a	64.0 ^{ab}	60.8 ^b	0.97
Daily weight gain rabbit ⁻¹ (g)	9.2 ^a	9.6 ^a	6.0 ^b	4.0 ^c	0.69
Feed: Gain ratio	7.5 ^c	7.2 ^c	10.5 ^{bc}	15.2 ^a	2.1
Protein efficiency ratio	0.72 ^{ab}	0.78 ^a	0.47 ^{ab}	0.11 ^c	0.06
Dry matter digestibility	769.8	756.4	742.3	724.0	21.4
Crude protein digestibility	850.8	840.5	830.8	828.9	14.5
Crude fibre digestibility	853.4	849.1	827.0	812.9	10.1
Ether extract digestibility	916.4	924.7	901.1	912.0	6.0
Ash digestibility	864.4	849.1	832.3	819.1	17.1
Nitrogen free extract digestibility	718.1	700.6	698.5	698.5	14.9

Means on the same row with different superscripts are significantly different ($P < 0.05$)

There was a gradual reduction in feed intake by rabbits from 100g kg⁻¹ *A. saman* diet to 300 g kg⁻¹. The lowered feed intake may be

corresponded with high presence of chaff and the presence of tannin. Tannin is known to cause a reduction in feed intake (Vilalba and Provenza, 2001; Smith *et al.* 2001).

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The feed to gain ratios of rabbits fed the experimental diets were significantly different ($P<0.05$) among the groups with best efficiency observed for rabbits fed 100 g kg^{-1} although this value was not significantly better than the group fed control diet (diet 1) and the diet that contained 200 g kg^{-1} (diet 3) *A. saman*. (diet 3) The rabbits fed 300 g kg^{-1} *A. saman* pods did not efficiently utilize the feed. This may be due to the presence of antinutritional factors in the raw pod like saponins and tannins (NFTA, 1987; Oyekoya, 2003).

The protein efficiency ratio of rabbits fed 100 g kg^{-1} *A. saman* pods was quite high although it was not significantly higher than those fed 0 g kg^{-1} and 200 g kg^{-1} *A. saman*. The group fed 300 g kg^{-1} *A. saman* however had the lowest ($P<0.05$) protein efficiency ratio.

The digestibility values of dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract were not significantly different ($P<0.05$) but a trend was observable in which rabbits fed the control diet had a slight edge in all these measurement (Table 3). When

only the *A. saman* diets were considered, rabbits fed 100 g kg^{-1} *A. saman* diets had the highest but non significant digestibility values in all the measurements.

Table 4 shows the haematological indices of rabbits fed the experimental diets.

The packed cell volume (PCV) is an indicator of blood dilution (Wilson and Brigstoke, 1981). The values of this measurement for the group of rabbits fed the control diet was highest ($P<0.05$), while those fed 300 g kg^{-1} *A. saman* diet had lowest values. In fact, the values decreased with increasing level of inclusion of *A. saman*. Haemoglobin measures the ability of an animal to withstand some levels of respiratory stress (Sainsbury, 1983). The values ranged from $7.8 - 12.4\text{ g dl}^{-1}$ for rabbits fed 300 and 0 g kg^{-1} of *A. saman* diets respectively.

Serum total protein and serum albumin also reduced as the levels of *A. saman* increased in the diets This trend points to a slight loss of condition on the part of the animals with increasing *A. saman* inclusion.

Table 4: Haematological parameters of rabbits fed the experimental diets

Measurements	Diet 1 0 g kg^{-1} <i>A. Saman</i> pod	Diet 2 100 g kg^{-1} <i>A. Saman</i> pod	Diet 3 200 g kg^{-1} <i>A. Saman</i> pod	Diet 4 300 g kg^{-1} <i>A. Saman</i> pod	SEM
Packed cell volume (%)	37.0 ^a	29.5 ^b	29.0 ^b	23.5 ^c	2.4
Haemoglobin (gdl ⁻¹)	12.4 ^a	10.9 ^{ab}	10.5 ^b	7.8 ^c	0.81
Red blood cell (Cell million ⁻¹)	4.2	3.3	3.6	2.7	0.27
White blood cell (cell MM ⁻¹)	6500 ^b	6500 ^b	6500 ^b	6700 ^a	73.2
Serum Total Protein (mgdl ⁻¹)	59.5 ^a	50.5 ^b	47.0 ^b	37.5 ^c	3.9
Serum Albumin (mgdl ⁻¹)	36.0 ^a	30.0 ^b	28.0 ^b	22.5 ^c	2.3
Serum Creatinine (mgdl ⁻¹)	1.2	1.1	1.1	1.0	0.01

Means on the same row with different superscripts are significantly different ($P<0.05$)

White blood cells (WBC) play prominent role in disease resistance especially with respect to the generation of antibodies and the process of phagocytosis (Wintrobe, 1983) The mean values of white blood cells showed that rabbits that

received diet 4 (300 g kg^{-1} *A. saman* diet) had the highest ($P<0.05$) values while those on the other diets had the same values. The elevated values of WBC is an indication that the rabbits were reacting to one or more factors in the feed. There

was no significant difference in the values of red blood cells and serum creatinine.

It was concluded that inclusion of whole pods of *A. saman* pods up to 100 g kg⁻¹ level in diets of growing rabbits gave the best results with no adverse effect on performance and nutrient digestibility.

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