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Performance of grower rabbits fed *Gmelina arborea* leaf meal

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Abstract

Forty five weaner rabbits, aged four weeks of mixed sexes were used to investigate the performance of rabbits fed Gmelina arborea leaf meal (GALM) at 0,10,20,30 and 40% inclusion level. Increasing the level of GALM had no significant effect (P>0.05) on feed intake, weight gain and feed to gain ratio. There was also no treatment effect on nitrogen intake (P>0.05). Furthermore, increasing the dietary level of GALM in the diet also had no significant effect (P>0.05) on faecal nitrogen, nitrogen retained and nitrogen digestibility. However, the cost of feed declined with the corresponding increase in the GALM dietary level. The result shows that Gmelina arborea leaf meal could be fed to grower rabbits up to 40% inclusion level without any adverse effect.

Keywords: *Gmelina arborea*, rabbits, leaf meal, dietary level.

Introduction

The cost of livestock feeds alone account for about 70% of the total cost of production of monogastric animals and this has led to unprofitable livestock production (Hamzat *et al*., 2007). There is the need to use unconventional and agro industrial by-products that are cheaper, affordable and easily obtainable in order to reduce the cost of feed production for mongastric animals. One of such feedstuff is *Gmelina arborea* leaf, an agro-forest waste (also known as Beachwood, Gmelina, Goomar teak, Kashmir tree, malay beechwood, white teak and vemane) also known, locally as Gambhari, Roxy (Family *verbenaceas)* is a fast growing tree frequently planted in plantations to produce wood for light construction, crafts, decorative veneers, pulp, fuel and charcoal. The wood is pale yellow to cream coloured or pinkish – buff when fresh, turning yellowish brown on exposure and is soft to moderately hard, light to moderately heavy lustrous, when fresh, usually straight to irregular or rarely grained and medium course textured. Flowering takes place during February to April. (James, 1998)

Gmelina arborea leaves when dry, fall in the forest and are wasted. But, this dried forest leaves can be collected for rabbit feeding rather than being allowed to waste away. The rabbit is a non ruminant herbivore and can consume high fibre diets and are regarded as hind gut digesters (Ehrelent *et al*., 1983). Fermentation of cellulose and other fibrous components is post gastric and this occurs in the caecum and colon which are well developed in rabbit and harbor a considerable amount of microbial population which are involved in digestion of starch and cellulose. (Adeniji and Omonijo, 2004). This study was aimed at determining the amount of *Gmelina arborea* leaf meal (GALM) that grower rabbits can tolerate in their diet and to assess the effect of this forest waste in reducing the cost of rabbit's feeds.

Materials and Methods

A total of forty five (45), 4-week-old grower rabbits were used for this study, which lasted for a period of 8 weeks. The rabbits were randomly allocated to five dietary treatments. Each treatment had

Table 1: Composition of grower diet (kg/100kg)

Ingredients	0	10	20	30	40
Gmelina leaf meal	0	10	20	30	40
Maize	40	40	40	40	40
Corn bran	23.2	20.2	10	40	0
Palm kernel cake	20.2	13.2	13.2	9.2	2.9
Groundnut cake	4.7	4.7	5.0	5.0	5.5
Soya bean meal	5.0	5.0	5.0	5.0	5.0
Fish meal	0.5	0.5	0.5	0.5	0.5
Bone meal	2.5	2.5	2.5	2.5	2.5
Limestone	3.0	3.0	3.0	3.0	3.0
Salt	0.35	0.35	0.35	0.35	0.35
*Vitamin premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1	0.1
Lysine	0.1	0.1	0.1	0.1	0.1
Total	**100**	**100**	**100**	**100**	**100**
Proximate Composition (Analyzed Values)					
Dry matter (%)	89.80	88.28	87.14	88.10	87.92
Crude protein (%)	15.60	15.35	15.28	15.15	15.08
Crude fibre (%)	5.70	7.20	8.80	10.40	11.70
Ether extract (%)	4.10	3.90	3.80	3.70	3.50
Ash (%)	8.58	7.77	8.77	10.53	8.57
M.E Kcal/Kg (Calculated)	2798	2788	2683	2664	2641

*Vitamin A: 10000000.00lu; Vitamin B3: 2000000,00lu; Vitamin E: 20000.00mg; vitamin K3: 2000.00mg; Calcium Pantothenate: 1000.00mg; Vitamin B: 6,4000.00mg; Vitamin B12: 20.00mg; Chlorine Chloride: 300.00000mg; Folic Acid: 1000.00mg; Zinc: 80,000.00mg; Copper: 8500.00mg; Iodine: 1500.00mg; Cobalt: 300.00mg; Selenium: 12000mg; Antioxidant: 120,000.00mg.

three replicates and there were three rabbits per replicate. The five experimental diets (Table1) had varied inclusion levels of *Gmelina arborea* leaf meal (GALM) at 0,10,20,30 and 40%. The GALM fed had a crude protein content of 11.9%, ether extract of 3%, crude fibre 25.10%, ash 10%, N.F.E 38.62%, moisture 10%. The rabbits were allowed a week adaptation period so as to adjust to the feed and cage prior to the 8 weeks data collection. All rabbits were dewormed and placed on antibiotics before the commencement of the experiment. Feed and water were supplied *ad libitum* throughout the study period and the rabbits were housed individually in metabolic cages for ease of urine and faecal collection.

A digestibility trial was conducted over three days during the last week of the experiment. Collected faeces were dried, measured and stored, while the urine was collected in plastic bottles and tetraoxosulphate (VI) acid (H_2SO_4) added as preservative. All proximate analysis was conducted using the methods of A. O. A. C., (1990). Records of initial, weekly live – weight and daily feed intake were taken and the feed conversion ratio calculated. All data were subjected to analysis of variance using the completely randomized design and where significant treatment means were separated by the Duncan's multiple range tests (Steel and Torrie, 1980)

Results

The growth performance of Rabbits fed *Gmelina arborea* leaf meal is presented in Table 2. There was no significant difference ($P>0.05$) in the weight gain values obtained for the different treatments, though there

Table 2: Performance of rabbits fed G*melina arborea* leaf meal (GALM)

Parameters	Levels of *Gmelina arborea* (%) 0	10	20	30	40	SEM	
Final body weight gain (g/rabbit/day)	1249.76	1336.52	1225.88	217.28	1196.88		
Initial body weight (g/rabbit/day)	650	655	653	650	625		
Body weight gain (g/rabbit/day)	10.71	12.17	10.23	10.13	9.73	1.50	NS
Feed intake (g/rabbit/day)	40.62	46.10	44.67	45.88	40.50	2.60	NS
Feed to gain ratio	3.79	3.79	4.37	4.53	4.66	2.12	NS

NS = means in the same row are not significantly different (P>0.05)

S.E.M = Standard error mean

tended to be a "slight decline" in weight gain as the GALM level increased in the diet. The weight gain values dropped from 12.17g to 9.73g as GALM levels increased from 10% to 40%. The feed intake values for the growers rabbits were also not significantly affected (P>0.05) across treatments; though rabbits on the 10% GALM had the highest feed intake value of 46.10g while the 40% GALM fed rabbits had the least value of 40.50g. The feed to gain ratio was not significantly (P>0.05) affected by the treatment, although rabbits on both the 0 and 10% inclusion levels of GALM tended to have the best feed efficiency of 3.79, while the poorest feed efficiency was obtained from the rabbits fed on 40% inclusion level with 4.66.

The economic implication of feeding *Gmelina arborea* leaf meal (GALM) is presented in Table 3. There was no significant effect (P>0.05) of treatment on the feed cost. The feed cost declined from N50.72 to N45.05 with increasing levels GALM in the diets. The least cost of feed consumed of N1.82 was observed with the 40% inclusion, while the highest cost of feed consumed was by the rabbits on 10% GALM diet which was N2.26. Both 20% and 30% inclusion levels had highly comparable cost of feed consumed values of N2.14 and N2.13 respectively. 40% inclusion level of GALM tended to give the highest (P>0.05) profit margin (N/rabbit) of N548.08, while 10% inclusion level had the least profit margin of N523.44. This is also a reflection of the gross profitability obtained. The best feed cost efficiency was

Table 3: Economic Analysis of feeding *Gmelina arborea* leaf meal to rabbits

Parameters	Levels of GALM inclusion (%) 0	10	20	30	40	SEM	
Cost of feed (₦/kg)	50.72	49.07	47.92	46.42	45.05		NS
Cost of feed consumed (₦/kg)	2.06	2.26	2.14	2.13	1.82		
Selling price (₦/kg)	1400	1400	1400	1400	1400		
Cost of rearing (₦/Rabbit)	865.36	876.56	869.84	869.28	851.92	1.25	NS
Profit (₦/Rabbit)	534.64	523.44	530.16	530.72	548.08	0.5	NS
Gross profitability (%)	61.78	59.72	60.95	61.05	64.33	0.8	NS
Feed cost efficiency	1.218	1.217	1.272	1.315	1.315		

NS = Means in the same row are not significantly different

S.E.M = Standard error mean

Determined based on market price at the time experiment was conducted (Jan. 2010) ₦135 = 1$

Table 4: Nitrogen digestibility of G*melina arborea* leaf meal fed to rabbits

	LEVELS OF GALM inclusion (%)						
Parameters	0	10	20	30	40	SEM	
Nitrogen intake (g)	15.60	16.03	16.67	16.25	16.37	0.1	NS
Nitrogen in faeces (g)	4.37	4.38	3.50	2.63	4.38		
Nitrogen retained (g)	11.22	11.66	13.17	13.62	11.99	0.2	NS
Nitrogen digestibility (g)	71.96	72.71	79.00	83.87	73.28	0.7	NS

NS – means in the same row are not significantly different (P>0.05).

from 10%, having 1.217, followed by 0% having 1.218. Both 30 and 40% inclusion level had similar values of 1.315 each, which were the highest.

The result of the nitrogen digestibility of rabbits fed diets of *Gmelina arborea* is presented in Table 4. The treatment level had no significant effect (P>0.05) on the nitrogen intake. The nitrogen intake increased from 15.60g in the control diet to 16.67g in the 20% GALM fed rabbits. Results for nitrogen in faeces showed that both 10 and 40% inclusion level had the highest of 4.38(g); followed by 0%, which had 4.37(g). 30% inclusion level had the least of 2.63(g) while 20% inclusion level had 3.5(g). Values for nitrogen retained showed that the least retention obtained was from 0% inclusion level with 11.22g, while 30% inclusion level of 13.62g seemed to have retained more nitrogen. Meaning that as the inclusion level of GALM was increased from 0 to 40%, there was also a corresponding increase in the nitrogen retained. Nitrogen digestibility showed that as GALM level increased in the feed, there was also an increase in the digestibility values obtained, however 30% inclusion had the highest digestibility of 83.37%, while the 0% had the least of 71.96%

Discussion

The values obtained for weight gain in this study had no significant effects (P>0.05), which is similar to the findings of Harris *et al.,* (1983), they observed that the influence of crude fibre, whether high or low cannot alter the weight gain by rabbits: this is important because GALM is very high in fibre hence can be classified as a fibrous feedstuff (forage). Shaahu, *et al* (2008) similarly reported an insignificant effect of feed intake, weight gain and feed conversion when rabbits were fed cassava leaf meal.

The feed to gain ratio obtained, however was at variance with the findings of Oyawoye and Nelson (1993), who reported a decrease in growth and efficiency as the inclusion level of fibre increased in their test feed. In terms of the economic implication, the 40% inclusion level of GALM produced the lowest feed cost and highest profitability; impling that GALM can help rabbit farmers make saving on cost of feed even with the cost of feed consumed very low at higher levels of GALM inclusion. Farmer's profitability would be increased and this should stimulate more farmers to rabbit rearing. This cost savings also agrees with the findings of Adeniji (2006) who used nutrase xyla supplementation of palm kernel cake for maize in the diets of weaned rabbits. Therefore the more the increase in the inclusion level, there tends to be a corresponding decrease in the cost obtained. Similarly, Ekwe*, et al* (2008) reported that cost per kilogramme of feed and cost per unit weight gain decreased when whole cassava meal inclusion was increased in rabbit feed resulting in an increase in gross margin.

With respect to Nitrogen digestibility of

GALM, for grower rabbits it was observed that as the inclusion level increased, there was also an increase in the value of Nitrogen digestibility obtained. This however disagree with the finding of Adeniji and Omonijo (2004), who studied the replacement value of palm kernel cake for groundnut cake in the diet of weaned rabbits. Nitrogen digestibility was observed to be increasing with higher inclusion level of GALM. This implies that this fibrous feedstuff (GALM) aids nitrogen digestion in the diet of rabbits. Results obtained from this experiment reveal that GALM has a high potential as feedstuff in rabbit nutrition. The growth performance characteristics for the test rabbits were not affected as a result of feeding *Gmelina arborea leaf meal* to grower rabbits. However, for economic performance and high nitrogen digestibility the 40% inclusion level of *Gmelina arborea* is hereby recommended for grower rabbits. GALM is not competed for by humans, it is a forest waste that dries up making the forest environment un-neat.

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