Nig. J. Anim. Prod. 2005, 32(2):233 - 239
Nigerian Society for Animal Production

Effect of dietary inclusion levels of mechanically extracted neem seed cake on performance of young rabbits

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Abstract

A feeding trial lasting 56 days was conducted using forty (40) weaned rabbits of mixed breeds with an average initial liveweight of 669±20g to determine the effect of dietary inclusion levels of mechanically extracted neem seed cake on their performance and carcass characteristics. The animals were assigned to five treatments based on their initial live weight and sex. There were eight individually caged rabbits per treatment. The diets were formulated to be isonitrogenous (20% CP). The control diet was based on maize and soyabean meal. The neem seed cake was included at 0, 10, 20, 30 and 40% levels. Feed and water were offered ad libitum. Weekly feed intake and body weight changes were determined and feed efficiency calculated. At the end of the 56-day experiment, 5 rabbits per treatment were removed and slaughtered for carcass evaluation. The results showed that rabbits fed the 10 or 20% dietary levels of mechanically extracted neem seed cake had growth performance and carcass characteristics that were statistically comparable ($P>0.05$) to those fed soyabean meal (control) diet. Further increase in the dietary inclusion levels of the neem seed cake up to 30 or 40% resulted in significantly ($P<0.05$) depressed growth performance. The results favour the use of mechanically extracted neem seed cake in young rabbit diet up to the level of 20%.

Keywords: Young rabbits, neem seed cake, mechanical extraction, performance, carcass characteristics

Introduction

Like other monogastric animal species, commercial rabbit production is constrained by the phenomenal rise in the cost of the major conventional energy and protein feed ingredients. The competition between humans and livestock for available cereal and legume grains makes it difficult to meet up the nutrient requirement of these animals at a more economical cost (Aduku and Olukosi, 1990). There is the need therefore to focus on the use of alternative unconventional feed ingredients for the monogastrics. neem *(Azadirachta indica)* seed cake, a by-product of neem oil industry is one of such unconventional feed ingredients that the potential in livestock feeding is still being studied. It is fairly rich in crude protein (34-38%), crude fibre (25-41%) and showed a great potential for livestock feeding (Reddy *et al,* 1988; Gowda *et al.* 1998). Reports of earlier works indicated that unprocessed neem seed can be fed to rabbits in limited amount without adverse effect on their performance (Fajimi *et al.* 1989). However the

extent to which it can be included in rabbit diet without affecting their growth performance and carcass characteristics is yet to be determined. The aim of this study therefore was to determine the optimum inclusion level of mechanically extracted neem seed cake on the performance of young rabbits.

Materials and Methods

Forty (40) young rabbits with average initial weight of 669±20g obtained from the Rabbitry unit of the Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria were used for the study. They were assigned to five dietary treatments in such a way that age, sex and group weights were balanced as much as possible. The animals were allowed an adjustment period of one week before performance data were taken. There were five treatments with eight rabbits per treatment in a complete randomized design. All animals were held individually in a standard cage equipped with feeding and watering troughs. Each animal was a replicate. The five experimental diets were formulated to be isonitrogenous (20% CP) and consisted of 0, 10, 20, 30 and 40% dietary levels of neem seed cake (Table 1). The proximate analysis of the experimental diets and major ingredients are presented in Tables 2 and 3 respectively. The animals had free access to feed and water through out the 56-day trial period.

The feed intake and weight changes were monitored on weekly basis. At the end of the feeding trial, five rabbits were selected on the basis of treatment average weight and slaughtered. The warm carcass, liver, kidney and heart were weighed and expressed as percentage of carcass weight. The data generated from this study were subjected to analysis of variance (ANOVA) and where statistical significant differences were observed, the means were compared using the Duncan's Multiple Range Test according to SAS (1995).

Results and Discussion

The growth performance of weaned rabbits fed the experimental diets are presented in Table 4. The average feed intake result showed significant ($P<0.05$) differences across dietary treatments. Rabbits fed diet 4 (30 % neem seed cake inclusion) had feed intake that was significantly ($P<0.05$) different from those fed the control (0% neem seed cake inclusion), 10 and 20% inclusion level of neem seed cake but was statistically comparable to those on treatment 5 (40% neem seed cake inclusion) . The depression in feed intake of the rabbits as the levels of neem seed cake increased is in line with the report of Fajimi *et al.* (1989). These authors fed diets containing 0, 10, 20 and 30% level of neem seed cake to rabbits and observed that rabbits fed the 10 or 20% neem seed cake diets consumed similar ($P>0.05$) amount of feed with the control diet. Beyond 20% levels of neem seed cake inclusion however, a significant ($P<0.05$) depression in feed intake was observed. Other workers have also reported significantly ($P<0.05$) depressed feed intake at higher levels of neem seed cake in rabbit and broiler chick diets (Salami *et al.* 1994). neem seed cake and oil are known to have bitter taste which is thought to be related to the presence of margosine, nimbosterol and nimbin (Reddy *et al.* 1988). Fajimi *et al.* (1989) have also indicated that neem seed cake has foul smell. Perhaps the bitter taste and foul smell were the major causes of reduced feed intake associated with the neem seed cake diets at 30 and 40% level of inclusion in the present study.

Rabbits fed the 10 and 20% neem seed cake diets gained weight values that were comparable to those fed the soyabean (control) diet. Inclusion of neem seed cake at 30 to 40% levels in rabbit diet resulted in significantly ($P<0.05$) reduced weight gain. The poor growth rate of rabbits at 30 or 40% dietary levels of neem seed cake inclusion might be explained on account of significant reduction

Table 1. Composition and calculated analysis of the experimental diets

Ingredient	Graded level of neem seed cake				
	0	**10**	**20**	**30**	**40**
Maize	54.21	50.55	46.87	43.21	39.55
Soyabean meal	28.59	22.25	15.93	9.59	3.35
neem seed cake diets	-	10.00	20.00	30.00	40.00
Blood meal	4.00	4.00	4.00	4.00	4.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Vitamin premix	0.2	0.2	0.2	0.2	0.2
Total	100.00	100.00	100.00	100.00	100.00
Cost per kg of diet	34.00	32.15	26.58	23.06	19.53
Calculated analysis					
Crude protein %	20.00	20.00	20.00	20.00	20.00
Metabolizable Energy, kcal/kg	2506.90	2496.20	2481.30	2441.60	2425.90
Crude fibre %	3.95	4.94	5.92	6.91	7.81
Ether extract, %	5.26	6.44	7.67	8.90	10.14
Ash, %	2.88	3.51	4.13	4.76	5.39
Calcium, %	1.02	1.10	1.18	1.26	1.34
Phosphorus, %	0.79	0.77	0.75	0.73	0.72
Ca:P	1.29	1.43	1.57	1.73	1.86

Roche Vm contributed the following per kg of diet. Vitamin A 12,000 IU, Vitamin D_3 1,200 IU, VitaminB 3.6 mg, Vitamin K 1.8mg, Vitamin B_2 3.6mg, Nicotinates 18mg Calcium-d-Pantothenate 9.6mg Biotin 0.3mg, Vitamin B_{12} 0.12, Choline chloride 120mg Chlortetracycline 4.8mg, Manganese 124mg, Iron 48mg, Zinc 96mg, Copper 60mg, Iodine 1.8mg, Vitamin D_3 1,200IU

Table 2. Proximate composition of diets

Parameters	Graded level of neem seed cake				
	0	10	20	30	40
Dry matter	93.77	93.99	94.07	94.16	94.13
Crude Protein	20.78	20.65	20.76	20.45	20.48
Crude fibre	4.21	5.09	5.26	5.65	5.78
Ether extract	10.98	11.01	10.22	11.23	11.98
Ash	3.20	4.50	4.62	5.67	6.11
NFE	37.17	41.25	40.86	43.00	44.35

Table 3. Proximate analysis of major ingredients of the diets (%)

Ingredients	DM	CP	CF	EE	ASH	NFE
Neem seed cake	95.77	30.44	14.01	19.31	10.10	26.14
Soyabean meal	93.19	47.19	6.17	8.69	5.32	32.63
Maize	90.73	9.00	2.70	4.00	1.30	83.00
Wheat offal	96.89	15.60	10.00	5.14	6.40	62.96
Blood meal	92.78	80.15	1.64	0.88	4.40	13.36

in feed intake since depression occurred in this measurement at levels beyond 20% which was in agreement with earlier reports (Vasanthkumar, *et al.* 1995).

Feed efficiency result showed that rabbits on the control diet were most efficient compared to those on neem seed cake diets as the level of neem seed cake increased from 0 to 40%. Rabbits on 40% dietary level of neem seed cake tended to utilize feed less efficiently ($P<0.05$) as compared to the other dietary treatments. The trend of the efficiency of feed utilization of the neem seed cake diets fed to rabbits is in agreement with the reports of Vasanthkumar, *et al.* (1995) and Elangovan *et al.* (2000). This could be due to decreased feed intake as the level of neem seed cake increased in the diets. It is possible that the high concentration of the bitter taste principles (margosine, nimbestrol and nimbin) at 40% level of inclusion reduced the efficiency of feed conversion.

Table 4. Performance of rabbits fed graded levels of neem seed cake diets in a maize soyabean based diet

Ingredients	Graded Levels of neem seed cake						
	0	10	20	30	40	SEM	Level of sig
Initial weight (g)	675.00	687.50	662.20	687.20	650.00	84.16	NS
Final weight (g)	1475.00^{a}	1437.50^{b}	1440.00^{b}	1400.00^{b}	1050.00^{b}	88.33	*
Daily feed intake (g)	64.72^{a}	58.35^{a}	59.08^{a}	33.49^{b}	27.62^{b}	4.61	*
Daily weight gain (g)	14.80^{a}	12.72^{a}	12.92^{a}	6.92^{a}	4.94^{b}	1.62	*
Feed efficiency	4.35^{a}	4.75^{a}	4.69^{a}	6.64^{a}	7.45^{b}	1.39	*
Cost/kg gain (₦)	146.62	144.37	124.59	153.16	194.80	41.62	NS
Mortality (%)	0.00	0.00	0.00	0.00	12.5	-	-

^{ab}Means value on the same row with different superscript differ significantly (P<0.05)
NS Non significant
*Significant (P<0.05) SEM : Standard Error of Means.

Table 5. Carcass characteristics of rabbits fed the experimental diets

	Parameters	Graded levels of neem seed cake					Level of significance
	0	10	20	30	40	SEM	
Live weight (g)	1425.00^{a}	1375.00^{a}	1400.00^{a}	1175.00^{a}	1050.0^{b}	119.39	*
Carcass weight (g)	1064.50^{a}	1008.00^{a}	1018.00^{a}	785.00^{ab}	664.00^{b}	107.97	*
Dressing percentage %	74.60^{a}	73.30^{a}	72.70^{a}	66.80^{ab}	64.70^{b}	3.22	*
Liver (% of carcass wt)	4.25^{b}	4.49^{b}	4.61^{b}	5.56^{a}	5.92^{a}	0.64	*
Kidney (% of carcass wt)	0.74^{b}	0.87^{b}	0.99^{b}	1.98^{a}	2.13^{a}	0.28	*
Lung (% of carcass wt)	1.06^{b}	1.47^{b}	1.47^{b}	1.68^{a}	1.97^{a}	0.27	*
Heart (% of carcass wt)	0.48^{a}	0.50^{a}	0.49^{a}	0.83^{b}	0.84^{b}	0.07	*
Head (% of carcass wt)	12.90	12.74	12.29	12.23	12.90	0.71	NS
Feet (% of carcass wt)	3.97	3.72	3.80	4.02	4.56	0.52	NS
Length of intestine (cm)	492.0	480.0	482.5	486.0	503.00	39.40	NS

^{ab}Means value on the same row with different superscript differ significantly (P<0.05)
NS Non significant
*Significant (P<0.05)
SEM : Standard Error of Means.

Rabbit production enterprise is a business and the goal of every business is to make profit. It is important therefore to consider cost effectiveness along with nutritional factors in recommending a particular ingredient for incorporation into feed formula. The cost per kg diet decreased non significantly ($P>0.05$) as the level of neem seed cake increased from 0 to 40%. There was a decrease in cost per kg gain in weight up to 20% level of neem seed cake inclusion but thereafter it increased slightly. Despite the fact that diets 4 and 5 had the least cost per kg of diet compared to control, 10 and 20% levels of neem seed cake inclusion, animals on these diets had the highest cost per kg gain weight. The trend of cost analysis result could be attributed to poor tissue deposition by the animals on the 30 and 40% neem seed cake diets.

Mortality result showed that 12.5% of the rabbits on treatment 5 died during the course of the experiment. The postmortem result revealed that the lungs appeared dark in colour, the heart and liver were inflated suggesting toxicity. This could be an indication that the use of neem seed cake up to 40% levels of inclusion in diets of young rabbits on a long term feeding programme would result in high mortality. Elangovan *et al.* (2000) in a similar study with Japanese quail reported pathological changes in liver and kidney tissues as a result of long term feeding of neem seed cake in their diets.

Data on carcass characteristics are presented in Table 5. The results of carcass analysis showed that the control diet had the highest final liveweight of 1425.00g. The least value of 1050.00g was obtained from animals fed diet 5 and were significantly ($P<0.05$) different from other treatments. The carcass weight and dressing percentage followed the same pattern with that of the liveweight and were statistically comparable ($P>0.05$). Animals fed diet 1 had the highest carcass weight and dressing percentage. They were closely followed by those on treatments 3, 2 and 4. The significant ($P<0.05$) decrease in carcass weight and dressing percentage of animals on treatment 5 could be a reflection of depressed feed intake and poor efficiency of feed utilization of animals on 40% inclusion level of neem seed cake diet.

The percentage yield of liver, kidney, lung and heart showed significant ($P<0.05$) differences across the dietary treatments. Rabbits fed diet 4 had visceral organs yield that were significantly ($P<0.05$) different from those fed the control, 10 and 20% neem seed cake diets but was statistically comparable to those on treatment 5. This is in line with the findings of Nagalakishmi (1993) and Vansathkumar *et al.* (1995) where they both observed significant ($P<0.05$) differences in visceral organs yield of broilers and rabbits fed higher level of neem seed cake diets respectively. The observed trend in the liver and kidney percentage yield might have been a consequence of increase activity of these organs in detoxifying the margosine, nimbin, nimbosterol and other antinutritional factors ingested in the diets containing the neem seed cake. In addition, these organs are also actively involved in the metabolism of carbohydrate and protein in the diets. The higher percentage of heart of rabbits on diets 4 and 5 could be as a result of an indirect effect due to the increased metabolic activities of the liver.

Conclusion

The findings of the experiment suggest that mechanically extracted neem seed cake can be used to replace soyabean up to 20% level in rabbit diet without any adverse effect on the performance and

carcass characteristics.

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(Received 17 February 2003, Accepted 18 November 2004)