aJava

Asian Journal of Animal and Veterinary Advances

Academic
Journals Inc.

www.academicjournals.com

Asian Journal of Animal and Veterinary Advances 3 (3): 169-173, 2008
ISSN 1683-9919
© 2008 Academic Journals Inc.

The Effect of Partial Replacement of Soybean Meal with Gliricidia Leaf Meal on the Performance and Organ Weights of Weaner Rabbits in the Tropics

I.A. Amata and L. Bratte
Department of Animal Science and Fisheries, Delta State University,
Asaba Campus, Asaba, Nigeria

Abstract: In an experiment to determine the effect of feeding graded levels of *Gliricidia sepium* Leaf Meal (GLM) on the performance and organ weights of rabbits, 25 weaner rabbits, 5-6 weeks old, were randomly allotted to 5 dietary treatments containing 0% (control), 5, 10, 15 and 20% GLM with 5 rabbits per treatment in a completely randomised design. Each rabbit constituted a replicate. The rabbits were housed individually in wire hutches in a spacious house and were given weighed quantities of feed daily and unlimited access to clean drinking water for eight weeks. The inclusion of GLM in the diets of the rabbits had no significant effect on body weight gain, feed intake nor on feed conversion ratio of the rabbits. However, significant reductions were observed in cost of feed kg^{-1} and in cost of producing a kg of meat as the level of GLM in the diets was increased. Heart and lung weights were unaffected by dietary treatments while kidney and liver weights were significantly higher in the 15 and 20% GLM groups than in the control 0, 5 and 10% GLM groups. It was concluded that although incorporation of GLM even up to 20% level in the diets of weaner rabbits does not significantly reduce tissue synthesis in the rabbits, however, there is significant reduction in the cost of feeding weaner rabbits in the tropics. This probably increases detoxification activities in the liver and kidneys of rabbits when used at levels beyond 10%.

Key words: *Gliricidia sepium*, organ weights, kidney fat, liver, performance, soybean meal

INTRODUCTION

Most of the meat currently consumed in Nigeria, especially in the urban and peri-urban regions, comes from the ruminant species (cattle, sheep and goats), pigs and poultry, especially chickens. Together with fish, they furnish the average Nigerian with only about 7.4 g of animal protein per day (FAOSTAT, 2005), which is still far below the recommended animal protein level of 35 g per required by an average adult human for proper health. Efforts by governments, government agencies and scientists in Nigeria at developing the livestock sub-sector to meet the country's animal protein needs have tended to concentrate on the traditional livestock species - the ruminants, pigs and chickens and paid little attention to the rabbit. With a population, in Nigeria, of only about 1.7 million (FAOSTAT, 2005), the rabbit is still a relatively unexplored livestock species in Nigeria. Perhaps one of the reasons for the low level of rabbit production in Nigeria is the high cost of commercial pellets (Odeyinka and Ijiyemi, 1997) which may constitute as much as 70% of the total cost of production (Oruseibio, 2002; with the energy and protein-providing components of finished feeds in Nigeria being the costliest. Although the rabbit is known to have the ability to thrive on forages, which grow abundantly in Nigeria

Corresponding Author: Dr. I.A. Amata, Department of Animal Science and Fisheries, Delta State University, Asaba Campus Asaba, Delta State, Nigeria
Tel: +2348037225861/+2348052034681

especially in the high rainfall areas (Asuquo, 1997; Odeyinka and Ijiyemi, 1997) its ability to digest dietary fibre is believed to be less than one half as efficient as cattle (Slade and Hintz, 1969). Nevertheless, rabbits can thrive on diets containing 14-25% crude fibre (Adegbola *et al*., 1985; Asuquo, 1997). This ability, coupled with its short generation interval, makes the rabbit a very useful animal in meeting Nigeria's animal protein needs in the short run.

Gliricidia sepium is a tropical tree legume, which grows abundantly in the southern part of Nigeria. Previous records (Gohl, 1981; Adejumo and Ademosun, 1985) have shown that the leaves contain as much as 20-30% crude proteins and 15% crude fibre. The plant grows vigorously, is drought-resistant and persistent, has good re-growth potentials and so can be used to provide feed all year round (Atta-Krah and Sumberg, 1986) to rabbits thereby drastically reducing the cost of production. However, cost considerations alone may not be beneficial if performance indices such as growth, feed intake, weight gains and livability are adversely affected.

This study was therefore carried out to ascertain the effect on body weight, feed intake, feed conversion, feed costs and organ weights, resulting from feeding diets in which soybean meal was replaced at varying levels with Gliricidia Leaf Meal (GLM) to rabbits.

MATERIALS AND METHODS

Location

This study was carried out from April to July, 2006 at the Delta State University Teaching and Research Farm, Asaba Campus, Asaba in Nigeria (6°14'N and 6° 49'E).

Test Ingredient and Experimental Diets

Fresh, young *Gliricidia sepium* leaves were harvested, dried under shade for several days, milled to obtain Gliricidia Leaf Meal (GLM) and incorporated into five rabbit diets in which soybean meal was replaced with GLM at 0% (control), 5, 10, 15 and 20%. The diets (Table 1) were formulated to contain approximately 17% crude protein and 2340 kcal kg^{-1} Metabolizable Energy (ME). Dry samples of GLM and the experimental diets were analysed for their proximate composition using standard procedures by AOAC (1990).

Animals and Their Management

Twenty-five Dutch rabbits of mixed sexes, aged 5-6 weeks, were weighed individually and randomly assigned to the five dietary treatments with 5 rabbits per treatment. Each rabbit was regarded as a replicate. The rabbits were housed singly in cages in two rows of hutches. Each of the cages measured approximately 70×60×54 cm. The hutches were raised approximately 80 cm from the floor in a house with 1 m high dwarf walls, which permitted sufficient ventilation. The experimental diets and clean drinking water were provided the rabbits *ad libitum* for 8 weeks.

Table 1: Composition of the experimental diets (g kg^{-1} DM)

	Levels of GLM inclusion (%)				
Ingredients	0	5	10	15	20
Maize	57.33	57.33	57.33	57.33	57.33
Soybean meal	21.27	18.57	15.77	13.02	10.27
GLM	-	2.75	5.50	8.25	11.27
Fishmeal	3.00	3.00	3.00	3.00	3.00
Wheat offal	15.00	15.00	15.00	15.00	15.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Oyster shell	0.80	0.80	0.80	0.80	0.80
Salt	0.40	0.40	0.40	0.40	0.40
Premix	0.20	0.20	0.20	0.20	0.20

GLM = Gliricidia Leaf Meal

Data Collected

At the end of eight weeks, two rabbits chosen at random from each treatment group were starved overnight, stunned, sacrificed by cervical dislocation and dissected in accordance with guidelines of the World Rabbit Science Association (WRSA). The carcasses were then eviscerated and the vital internal organs carefully removed and weighed and expressed as percentages of the dressed weight.

Data on body weight, feed intake, feed conversion and costs and the weights of the major internal organs of the rabbits were taken.

Data Analyses

Data collected were analysed by the one-way analysis of variance procedure using the IRRISTAT for Windows (Version 5.0.) computer software. Significantly different means were separated by the Duncan's Multiple Range Test procedure (Duncan, 1955).

RESULTS AND DISCUSSION

The proximate composition of *Gliricidia* Leaf Meal (GLM) is presented in Table 2. The values obtained fell within the range of nutrients earlier reported for *Gliricidia sepium* in the tropics by Göhl (1981), Chadhokar (1982) and Adejumo and Ademosun (1983). Its protein content was, however, lower than those reported for the forage by Herbert (1998) and Ifut and Inyang (2007) (19.30 and 25.63%, respectively) while its crude fibre and ash contents were higher than those reported by Herbert (1998) (19.00%) due, perhaps, to differences in edaphic characteristics to which the plants were exposed and to possible variations in plant age, processing procedures and climate.

Table 3 shows the energy and proximate composition of the experimental diets, while the performance characteristics and feed costs of the rabbits fed the experimental diets are presented in Table 4. The energy and proximate values of the diets fell within recommended ranges of nutrients required by rabbits in the tropics for optimum growth and performance (Aduku and Olukosi, 1990) (12-17% Crude Protein; 20-25% fat; 10-20% Crude Fibre; 2.39-2.50 kcal g^{-1} Digestible Energy).

Although body weight gains and feed intake tended to decline as the level of GLM in the diets was increased, which is a reflection of the increasing levels of fibre in the diets, the differences were non-significant. The body weight gains observed in this study are in agreement with the reports of studies on rabbits in Nigeria by Omole (1982) and Aduku *et al*. (1988) and are an indication that the use of up to 20% GLM in rabbit diets does not adversely reduce tissue synthesis.

Table 2: Energy and proximate composition of gliricidia leaf meal (GLM)

Composition	(%)
Dry matter	89.65
Crude protein	15.60
Crude fibre	13.77
Ether extract	1.41
Ash	11.58
Nitrogen-free extract	47.29
Gross energy (kcal g^{-1})	3.46

Table 3: Energy and proximate composition of the experimental diets

	Levels of GLM inclusion (%)				
Ingredients	0	5	10	15	20
Dry matter	92.65	90.60	89.76	91.80	93.88
Crude protein	17.29	17.38	17.40	17.36	17.24
Crude fibre	10.48	11.38	12.68	13.96	14.25
Ether extract	3.35	3.60	3.38	3.12	3.08
Ash	3.49	3.52	3.64	3.96	4.25
Nitrogen-free extract	58.04	54.72	52.66	53.40	55.06
Gross energy (kcal g^{-1})	4.26	4.21	4.08	3.97	4.15

Table 4: Performance and feed costs of rabbits fed the experimental diets (Mean±SEM)

Performance parameters	Levels of GLM inclusion (%)				
	0	5	10	15	20
Initial body weight (g)	571.00±32.27^{b}	725.19±10.41^{ab}	712.50±35.35^{ab}	727.50±34.25^{ab}	757.47±26.88^{a}
Final body weight (g)	1533.25±11.78^{b}	1612.50±5.25^{ab}	1703.40±32.33^{a}	1700.00±20.41^{a}	1676.04±27.79^{a}
Weight gain (g)	958.25±40.02^{a}	887.31±59.13^{a}	991.90±23.93^{a}	972.50±33.01^{a}	919.37±44.13^{a}
Feed intake (kg rabbit^{-1})	7.16±0.96^{a}	6.83±3.14^{a}	7.12±0.21^{a}	6.78±0.42^{a}	6.59±0.39^{a}
Feed conversion ratio	0.13±0.01^{a}	0.13±0.01^{a}	0.14±0.00^{a}	0.15±0.01^{a}	0.14±0.01^{a}
Cost of feed (₦ kg^{-1})	41.18±0.86^{a}	39.61±0.41^{ab}	38.04±0.41^{bc}	36.48±0.82^{c}	34.91±0.87^{c}
Cost of feed kg^{-1} gain (₦)	309.38±26.86^{b}	324.41±32.51^{a}	270.77±31.07^{bc}	280.46±22.36^{abc}	243.15±27.54^{c}

Within each row, means with the same superscripts are not significantly different

Table 5: Organ weights of rabbits fed the experimental diets (Mean±SEM)

Organ weights (g)	Levels of GLM inclusion (%)				
	0	5	10	15	20
Heart	4.75±0.15^{a}	4.87±0.15^{a}	5.64±0.50^{a}	5.99±0.12^{a}	5.02±1.13^{a}
Kidney	6.52±0.51^{b}	7.65±0.45^{b}	10.54±0.47^{a}	10.95±4.00^{a}	10.25±4.50^{a}
Kidney fat	0.86±05.0^{a}	0.71±0.05^{b}	0.64±0.35^{c}	0.53±0.25^{c}	0.55±0.04^{c}
Liver	32.24±2.99^{b}	30.36±0.88^{b}	32.69±1.15^{b}	40.62±0.50^{a}	42.84±2.00^{a}
Lungs	5.24±0.10^{a}	5.48±0.15^{a}	5.18±0.50^{a}	5.44±0.50^{a}	6.36±0.95^{a}
Spleen	0.43±1.00^{a}	0.23±2.00^{b}	0.45±1.50^{a}	0.45±0.90^{a}	0.27±2.10^{b}

Within each row, means with the same superscripts are not significantly different

Feed conversion ratio, though numerically higher for the 10, 15 and 20% GLM diets when compared to the control treatment (Table 4), was not significantly affected by dietary treatments.

The economic indices showed significant reductions in cost kg^{-1} of feed and in cost kg^{-1} body weight gain. This implies that inclusion of GLM at moderate levels of up to 20% can substantially reduce feed costs without significantly reducing feed intake, feed conversion and growth in rabbits.

Changes in the organ weights of the rabbits with variations in the level of dietary GLM are shown in Table 5. Variations in the heart and lung weights with dietary treatments were not significant whereas the kidney and liver weights tended to increase as the proportion of GLM in the diets increased. The weights of some internal organs like the liver and kidney are commonly used in animal feeding experiments as evidences of toxicity (Ahamefule *et al*., 2006). Bone (1979) reported that increased metabolic rate of the organs in attempt to reduce toxic or anti-nutritional factors in livestock feeds to non-toxic metabolites may cause abnormalities in their weights. *Gliricidia* leaves contain some anti-nutrient factors such as condensed tannins and cyanide (Chadhokar, 1982; Ahn *et al*., 1989; Herbert, 1998). This may have accounted for the significantly higher weights of the kidneys and liver of rabbits fed the 15 and 20% GLM diets. Kidney fat weight decreased gradually but significantly as the level of dietary GLM increased thus reflecting the effect of increasing proportions of dietary fiber.

The findings of this study indicate that incorporation of GLM up to 20% level in the diets of weaner rabbits does not significantly reduce tissue synthesis in the rabbits. However, there is significant reduction in the cost of feeding weaner rabbits in the tropics. This probably increases detoxification activities in the liver and kidneys of rabbits when used at levels beyond 10% in rabbit diets (Table 5).

REFERENCES

Adegbola, T.A., E.U. Tibi and D.C. Adogwa, 1985. Feed intake and digestibility in rabbits on all forage plus concentrate and all concentrate diet. J. Anim. Prod. Res., 5: 15-16.

Adejumo, J.O. and A.A. Ademosun, 1985. Effect of plant age at harvest and of cutting time, frequency and height on the dry matter yield and nutritive value of *Gliricidia sepium* and *Cajanus cajan*. J. Anim. Prod. Res., 5: 1-2.

Aduku, A.O., P.N. Okon, P.C. Njoku, A.A. Akanga and M.I. Dim, 1988. Evaluation of cowpea (*Vigna unguiculata*) and peanut (*Arachis hypogea*) haulms as feedstuffs for weaned rabbits in tropical environment (Nigeria). J. Applied Rabbit Res., 9: 178-180.

Aduku, A.O. and J.O. Olukosi, 1990. Rabbit management in the tropics: Production, processing, utilization, marketing, economics, practical training research and future prospects. Nig. J. Anim. Prod., 25: 34-40.

Ahamefule, F.O., G.O. Eduok, A. Usman, K.U. Amaefule, B.E. Obua and S.A. Oguike, 2006. Blood biochemistry and haematology of weaner rabbits fed sundried, ensiled and fermented cassava peel based diets. Pak. J. Nutr., 5: 248-253.

Ahn, J.H., B.M. Robertson, R. Elliot, R.C. Gutteridge and C.W. Ford, 1989. Quality assessment of tropical browse legumes: Tannin content and protein degradation. Anim. Food Sci. Technol., 27: 147-156.

AOAC, 1990. Official Methods of Analyses. Association of Official Analytical Chemists. 15th Edn. Washington DC.

Asuquo, B.O., 1997. Nutritional potentials of Ipomea, Centrosema, Puereria, Emilia and Tridax forages in mixed feeds for weaner rabbits. Nig. J. Anim. Prod., 24: 46-50.

Atta-Krah, A.A. and J.E. Sumberg, 1986. Studies with *Gliricidia sepium* for crop/livestock systems in West Africa. Agro-forestry Syst., 6: 167-178.

Bone, F.J., 1979. Anatomy and Physiology of Farm Animals. Reston, USA.

Chadhokar, P.A., 1982. *Gliricidia maculate*: A promising legume fodder plant. Wild. Anim. Rev., 44: 36-43.

Duncan, D.B., 1955. Multiple range and F-tests. Biometrics, 11: 25-40.

FAOSTAT, 2005. FAO statistics database. Food and Agriculture Organization, Rome, Italy.

Göhl, B., 1981. Tropical feeds; Feed information summaries and nutritive values. FAO Animal Production and Health Series, No. 12. FAO, Rome, Italy.

Herbert, U., 1998. Reproductive performance of rabbit does fed diets containing *Gliricidia* leaf meal from conception through weaning of kits. Nig. J. Anim. Prod., 25: 163-168.

Ifut, O.J. and U.A. Inyang, 2007. Effect of Brewers' Spent Grains Supplementation on the Utilization of Guinea Grass (*Panicum maximum*) and Gliricidia (*Gliricidia sepium*) Foliages by West African Dwarf Goats. In: Sustainability of the Livestock Industry in an Oil Economy, Agiang, E.A., L.N. Agwunobi and O.O. Olawoyin (Eds.). Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod., pp: 204-206.

Odeyinka, S.M. and O.C. Ijiyemi, 1997. Performance of rabbits fed *Luecaena leucocephala* and concentrate between 9th and 25th week of age. Nig. J. Anim. Prod., 24: 51-53.

Omole, T.A., 1982. The effect of level of dietary protein on growth and reproductive performance of rabbits. J. Applied Rabbit Res., 5: 83-88.

Oruseibio, S.M., 2002. A Textbook of Rabbit Production. F and F Publishers, Port Harcourt, Nigeria.

Slade, L.M. and H.F. Hintz, 1969. Comparison of digestion in horses, ponies, rabbits and guinea pigs. J. Anim. Sci., 28: 643-842.