MON -11

Performance of Grower Rabbits Fed Graded Levels of *Moringa oleifera* Leaf Meal

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Abstract
Twenty-seven (27) crossbred male rabbits aged 4-5 weeks were used in an experiment to investigate the growth performance of rabbits fed graded levels of *Moringa oleifera* leaf meal (MOLM). The composition of the diets revealed diets 1 (control) had 18.17%CP, 3000.06 Kcal/kg ME and 11.2%CF, diet 2 had 15.66% CP, 2914.59 Kcal ME and 19.30% CF and diet 3 with 13.15% CP 2814.74 Kcal (ME) and 39.00 CF. Treatments 1, 2 and 3, received 0, 25, and 50% MOLM respectively. The result of the experiment showed that rabbits fed diets 1 and 2 had significantly ($p<0.05$) high final body weight (1732.82 and1726.66 g) and daily average weight gain (11.40 and 11.31g) respectively. The result of total feed intake and average daily feed intake followed the same trend with treatment 1 and 2 with values of 4030.00, 3937.36g respectively; while diet 3 gave, lower values 3720.15 g. The feed conversion ratio was numerically lower at the inclusion level of 25% MOLM (6.22) compared to the control (6.35) and diet 3 (8.99). The cost per kg diet declined as inclusion levels of MOLM increased with values of N89. 62, 70.05 and 62.20 for diets 1, 2 and 3 respectively. The rabbit performed better on the control (diet1) and test diet 2, with diet 2being more economically efficient. 25% MOLM is therefore recommended as the optimum inclusion level in place of full fat soya beans in grower rabbit diets for optimum performance and profitability.

Keywords: Performance, grower rabbits, Moringa, soyabean meal

Introduction

Protein supplementation is very important in improving livestock performance. The provision of protein needs to be done with respect to the requirement of the animal in addition to the balance of other nutrients available. Soya bean meal and fish meal have been widely and successfully used as conventional protein sources for livestock (Sarwatt *et al.,* 2002). However, the prices of these protein sources have been increasing continuously in recent times. Hence, any similar high protein ingredient which is readily available and cheaper that could partially or completely be used as a substitute for soybean meal or fishmeal is desirable (Odetola, 2012). One possible source of cheap protein is the leaf meal of some tropical leguminous browse plants. Leaf meal does not only serve as protein source but also provide some essential Vitamins such as Vitamin A and C, minerals and oxycarotenoids. The constraints to enhanced utilization of leaf meals reside chiefly on factor such as fibre content, the presence of anti-nutritional factors and deficiencies of certain amino acids. Moringa leaves have quality attributes that make it a potential replacement for soya bean meal or fishmeal in the diets of non-ruminant animals. Despite the high crude protein content of moringa leaf meal, there is little information available on the use of this unconventional feed resource, especially as an alternative protein supplement for rabbit production.

This study was aimed at assessing the growth performance and economic analysis of grower rabbits fed graded levels of *Moringa oleifera* leaf meal in place of full fat soya bean meal.

Materials and Methods

The research was conducted at the Rabbitry Unit of the Teaching and Research Farm, Department of Animal Production and Health, Federal University Wukari, Taraba state. Fresh *Moringa oleifera* leaves were purchased from a market in Wukari town. The Moringa leaves were allowed to dry under room temperature (27 ^{O}C) for two days to a constant weight. The dried *Moringa oleifera* were grounded to pass through 0.5mm sieve using a hammer mill. Three diets were formulated with *Monringa oleifera* Leaf Meal (MOLM) replacing full fat soya bean as shown in Table 1. Diet 1 serves as control with 0% MOLM, while diet 2 and 3 contained MOLM at 25% and 50%replacement levels respectively.

Twenty-seven, (27) 4-5 weeks old male rabbits of mixed breeds were used in 8 weeks feeding trial. The animals were randomly assigned on the basis of equal mean live weight to three treatment groups each with nine rabbits in a Completely Randomized Design (CRD). Each treatment group had three replicates with three rabbits per replicate. The rabbits were housed three in a cell of wood-wire hutches equipped with feeders and drinkers. The experimental diets, fresh forage (*Tridax procubens*) and water were provided *ad libitum.* They were acclimatized to their various hutches for one week during which medication was administered to them. The study lasted for 56 days. Data collected were body weight, feed intake and mortality. Feed cost per Kg gain, cost per kg diet were calculated. Feed intake and weight gain recorded were used to calculate feed conversion ratio. Feed cost per Kg gain was obtained by multiplying feed cost per Kg diet by feed conversion ratio.

Data collected were subjected to Analysis of Variance (ANOVA) using Statistical Package for Social Sciences (SPSS) computer package version 20.00 and significant means were separated using Fisher's Least Significant Difference (LSD).

Table 1: Percentage Composition of Experimental Diets

Ingredients	T_1 0% MOLM	$T_2$25% MOLM	$T_3$50% MOLM
Maize	36.40	36.40	36.40
FFSBM	31.60	23.70	15.80
MOLM	-	7.90	15.80
Maize offal	27.70	27.70	27.70
Bone meal	3.00	3.00	3.00
Premix	0.50	0.50	0.50
DL- methionine	0.25	0.25	0.25
L- lysine	0.25	0.25	0.25
Salt	0.30	0,03	0.03
Total	100.00	100.00	100.00
ME (Kcal/Kg)	3000.06	2914.59	2814.74
Crude Protein (%)	18.17	15.66	13.15
Crude Fibre (%)	11.3	19.30	39.00
Feed cost/kg diets(N)	89.62	76.05	62.47

MOLM= *Moringaoleifera* leaf meal, FFSBM= Full Fat Soya Bean Meal, ME = Metabolizable Energy

Results and Discussion

The results for the performance of grower rabbits fed graded levels of MOLM based diets are indicated in Table 2 below. The results of the Final weights of the rabbit showed that treatment 1 and 2 are similar with values of 1732.82 and 1726.66g for T_1 (0%MOLM)and T_2 (25% MOLM) respectively, While treatment 3 is significantly ($p<0.05$) lower with values 1510.00g for T_3(50% MOLM). The final body weight falls within the range of 1001.15-1823.11g observed by Warfa *et al*. (2017) when Kapok seed meal was fed to weaner rabbits. It agrees with the value range of 1400.00-1169.00g when weaner rabbit were fed *Alchornea cordifolia.* Leaf meal diets as reported by Ebegbulem *et al.* (2016).

Table 2: Performance of rabbit fed graded level of MOLM based diet

Parameters	T_1	T_2	T_3	SEM±
Initial weight (g)	1093.33	1093.24	1089.54	2.20
Final body weight (g)	1732.82^a	1726.66^a	1510.00^b	30.03
Average body weight gain (g)	638.43^a	633.42^a	420.45^b	29.30
Average daily weight gain (g)	11.40^a	11.31^a	7.51^b	0.52
Total feed intake (g)	4030.00^a	3937.36^a	3720.15^b	35.61
Average daily Feed intake (g)	71.96^a	70.31^a	66.43^b	0.64
Feed Conversion Ratio	6.35^b	6.22^b	8.99^a	0.54
Feed cost/Kg diet (N)	89.62^a	76.05^b	62.20	0.28
Feed cost/Kg weight gain (N)	568.90	560.78	560.78	30.75
Mortality	0.00	0.00	0.00	0.00

^{abc}Rows with superscripts are significantly different ($p<0.05$), a= highly significant, followed by b and c respectively.

The significant higher body weight observed in treatment 1 and 2 could be as a result of the higher crude protein levels in the diets (18.17 and 15.66%) as against the values of 13. 36% for treatment 3. Aduku and Olukosi, (1990) recommended crude protein-level range to be 15-19% for optimum performance in rabbits. A significant difference ($p<0.05$) was observed in the average weight gain of the rabbits across the test diets. Rabbit fed test diet 1 (control) and diet 2 (25% MOLM) had similar average weight gain of 638.43g and 633.42g respectively. Rabbit fed test diet 3 (50% MOLM) on the other hand were noticed to have significantly ($P<0.05$) lower average weight gain of 420.45g. The increased average weight gain notice in treatments 1 and 2 with values of 638.43 and 633.42g could be due to the higher feed quality which translated better intake of nutrients in the feed and were converted to body weight as reported by Makinde *et al.* (2016).

The result of the average daily weight gain follows the same trend as in the final weight and average weight gain. The range of 7.51-11.40g observed as average daily weigh gain is in consonance with the values of 9.02g/day (Omoikhoje *et al.,* 2016). The significantly ($p<0.05$) lower average daily weight gain noticed in treatment 3 (420.43) with 50% MOLM on the other hand could be as result of low quality of feed with 13.15 crude protein that is lower than the recommended level of 15 – 19%

(Aduku and Olukosi, 1990) and high crude fiber level of 39.00% which is above the recommended fiber level 200-250 g/Kg dry matter as safe for the rabbits. (Aduku and Olukosi, 1990). Leng (2008), reported that high amount of fiber in the diet can interfere with nutrients availability to rabbits. The treatment 3 also has lower crude protein 13.15%, which may not be adequate to support optimum growth in the animals. There was significant difference ($p<0.05$) among the treatment diets for total feed intake of rabbit in this experiments. Treatment diets 1 and 2 were similar with the values of 4030.00g and 3937.36g for test diets 1 and 2.

The values obtained in this study (3720-4030g) falls within that of 2955.50-4509.80grecorded by Yashim*et al.*(2016) for weaner rabbits fed differently processed *Crotalaria retusa* leaves. The values for average daily feed intake followed the same trend with feed intake. The value range of 66.43-71.96g/day agrees with that of 63.90-87g/day reported by Ndalwise (2013). The feed conversion ratio from this study ranged from6.22 to 8.99. These values are in line with the range of 7.58-9.84 reported by Olukun *et al.* (2015) from grower female rabbits fed varying levels of melon seed husks meal supplemented with maxigrain. The decreased feed cost per Kg diet in the test diets could be attributed to the lower cost of *Moringa oleifera* (N100.00/kg) compared to soya beans (N171.82/kg)as at the time of this study.

Conclusion and Recommendations

From the result of this study, It is recommended that MOLM should be used in rabbit grower diet up to 25% level in place of full fat soya bean to reduce the cost of production. Rabbit farmers should establish their Moringa orchards to further reduce its cost and further research should be carried out to look at the rabbit growth performance at levels of25% to 45% of MOLM.

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