

DETERMINATION OF OPTIMUM CONCENTRATE AND FORAGE COMBINATION FOR SMALL HOLDER FEEDING OF RABBITS

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Target Audience: Rabbit farmers, feed producers

ABSTRACT

A total of sixty weaner rabbits were used to evaluate the optimum concentrate: forage ratio suitable for raising rabbits under small holder operations. Three forage legumes; mucuna, lablab and groundnut haulms ('harawa') were used in combination with 75, 50 and 25% concentrate meal. The control consisted of 100% (150g) concentrate meal and *Digitaria* grass. The concentrate meal was formulated to contain 23% crude protein and 2653 kcal ME/kg. Lablab and mucuna were cut at flowering stage while groundnut haulms were collected at harvest. The forages were dried and chopped before feeding.

Average daily feed intake, feed:gain ratio and feed cost per kilogram gain were significantly ($P < 0.05$) influenced by dietary treatments imposed. Irrespective of forage fed, feed cost per kg gain decreased significantly with decrease in the level of concentrate fed. The reverse was the case for feed:gain ratio. Feed utilisation appeared better at lower levels of concentrate offered. Average daily gain was not statistically affected by the treatments. Any of these concentrate:forage combinations could be used for feeding rabbits without detrimental effect on growth performance. Cost of concentrate feed per kilogram gain decreased with decrease in level of concentrate with higher saving on feed observed for treatments fed the lower concentrate levels. Rabbits fed mucuna and groundnut haulms had higher savings on feed than lablab groups. However, mucuna and groundnut haulms were more promising forages while the 25% concentrate to forage combinations were more cost effective.

Keywords: Concentrate, forage, small holder, rabbits

DESCRIPTION OF PROBLEM

As more people become involved in rabbit production and in view of the high feed cost, which has hampered large scale commercial production, it becomes imperative to develop appropriate cost effective feeding systems for small scale rabbit raisers. The increasing scarcity of animal feeds in developing countries could be solved by incorporating forages in the diet of rabbits (12, 3, 7).

Forages are cheap and abundantly available in Nigeria and are produced all year round in high rainfall areas of the country. Studies on their chemical composition show considerable potential on the major sources of nutrients for herbivorous animals (16, 18). The potential of forages are particularly significant for rabbits since they are capable of digesting leaf proteins effectively (4). It was hypothetically computed by (5) that rabbits could produce five times more meat than cattle from the same amount of an alfalfa-based diet. High fibre materials, which are usually a constraint in poultry diets, are beneficial to rabbits for preventing enteritis (5). Furthermore, (10) noted that although rabbits are not able to obtain as much energy from the fibre as ruminants, they could consume a large quantity of feed sufficient to meet their energy requirement.

It was noted by (13) that when greens were given to rabbits free choice, the amount of pelleted diet could be reduced to about 50% with no reduction in growth rate. Though providing fresh greens could be labour intensive, forages may be fed in the dried form as hay. This is of significance to backyard raisers in the Savanna, who find feeding difficult during the long dry seasons. Supplementing a concentrate diet with forage will reduce the consumption of the more expensive concentrate diet and consequently reduce feed costs.

The purpose of this study was to feed rabbits various levels of concentrate diets supplemented with either of three forage legumes (mucuna, lablab and groundnut haulms) to determine if consumption of concentrate diet could be reduced without detrimental effects on growth.

MATERIALS AND METHODS

Sixty grower rabbits with an average weight of 1120g were used to evaluate the effect of feeding different levels of concentrate diets supplemented with three forage legumes. Three forage legumes; mucuna, lablab and groundnut haulms ('harawa') were used in combination with 75, 50 and 25% of concentrate meal fed in the control. These levels corresponded with 112.5, 75 and 37.5 grams of concentrate. The control consisted of 100% (150g) of normal concentrate meal and *Digitaria* grass. The concentrate meal was formulated to contain 23% crude protein and 2653 kcal ME/kg (Table 1). Lablab and mucuna were cut at flowering stage while groundnut haulms were collected at harvest. The forages were dried and chopped before feeding. Crude protein and fibre content of the concentrate and forages is shown on Table 2. Forages were fed ad libitum. Concentrate and forages were offered in the morning in earthen flat bottom pots. Water was supplied daily. There were a total of ten treatments, replicated twice with three rabbits per replicate. Parameters considered were; body weight gain, efficiency of feed utilisation, and concentrate cost per kg gain. The study lasted six weeks.

Table 1. Composition of concentrate diet.

Ingredient	Percentage
Maize	44.4
Groundnut cake	37.2
Wheat offal	15.0
Bone meal	2.8
Vitamin/mineral premix	0.3
Salt	0.3
Total	100
Calculated Analyses:	
Crude protein (%)	22.6
Crude fibre (%)	4.1
Ether extract (%)	5.9
Lysine	0.8
Methionine + Cystine	0.7
Calcium	1.1
Phosphorus	1.0
M.E, Kcal/kg	2653.4

Vit/mineral premix supplied per kilogram ration: Vit. A 1251 IU, Vit. D₃ 2750 IU, Vit. E 151 IU, Vit. K 0.002g, Vit. B₂ 0.006g, Nicotinic acid 0.035, Calcium D-Pantothenate 0.01mg, Vit. B₆ 0.0035g, Vit. B₁₂ 0.02g, Folic acid 0.001g, Biotin 0.0005g, Vit. C 0.025g, Cholin chloride 0.39g, Zinc bacitracin 0.02g, Methionine 0.2g, Avatec (Lasolacid) 0.09g, Manganese 0.1g, Iron 0.05g, Zinc 0.04g, Copper 0.002g, Iodine 0.00153g, Cobalt 0.000225g, Selenium 0.0001g.

Table 2. Chemical composition of concentrate diet and forage hays used in the study (%).

Nutrient	Concentrate	Mucuna	Lablab	Groundnut haulm	Digitaria
Crude protein	23.0	14.4	15.1	12.5	7.5
Crude fibre	5.5	15.5	18.7	19.1	34.4

Data obtained was subjected to analysis of variance test and differences between treatment means were compared using Duncan's Multiple Range Test (17).

RESULTS AND DISCUSSION

The result of the growth performance of rabbits is presented in Table 3. Average daily concentrate intake and feed to gain ratio were significantly affected by treatment. The average concentrate intake decreased with decrease in the level of concentrate fed. This lower intake is a consequence of the low amounts of concentrate fed. This is normal as the intake is limited by the quantity of feed on offer. The shortfall in concentrate intake would be made up by forage intake hence the forages were supplied *ad libitum* to the animals. Rabbits would usually prefer to take forage to concentrate. When little concentrate is offered, the little that is ingested becomes insufficient to meet the growth requirement of the

rabbits. This agrees with the work of (14) who reported that restricted feeding of concentrate diet limits growth rate. This is because a restriction of the amount of feed offered reduces intake thereby reducing body weight gains. This could however, be made up by forage intake especially if the forage is of high quality. This is particularly so because rabbits are capable of digesting leaf proteins effectively (4). Though, concentrate diets are denser in nutrients than forages, the level of nutrients in forages would complement the level obtained from concentrate diets. Rabbits require a level of crude fibre in excess of 9% for normal growth and to reduce enteritis incidence (2).

Average daily gain was not significantly affected by treatment imposed. This means that irrespective of the concentrate level and forage fed, the change in weight gain was slight. This would indicate that though it would take longer for the rabbits on the lower levels of concentrate to reach market weight, the difference in time might not warrant the higher amount of money the farmer has to pay to feed the rabbits at optimum concentrate level of 150g daily. This result agrees with the result of (15) who reported non-significant effect of varying the level of concentrate with cabbage fed free choice on average daily gains of weanling rabbits. At higher levels of concentrate (75 and 50%), groundnut haulms appear to perform better than mucuna and lablab hay. The reason for this is not immediately apparent as mucuna and lablab forages contain slightly higher crude protein than groundnut haulms. Shqueir *et al.* (1985) reported numerically lowest average daily gain (27.7g) for rabbits fed 25g/day pelleted diet plus cabbage and highest gain (30.3g) for rabbits fed 100g/day plus cabbage. It was reported by (13) similar average daily gains for rabbits fed 100, 75 and 50g pelleted diet with mixed greens consisting of lettuce, cabbage and red clover compared with those fed the pelleted diet ad libitum while those on 25g had the lowest gain. Higher growth rates have been reported for weaner rabbits by (11) using mucuna forage. He reported daily weight gains of 24.29, 16.13 and 11.96g for New Zealand White rabbits fed 75:25, 50:50 and 25:75 % concentrate:mucuna combinations. The gains he reported for mucuna alone of 13.63g is still higher than that obtained in this study. The consumption of these diets would appear to be insufficient to support optimal growth rates in the rabbits however the growth rate of grower rabbits is slower than for weaner rabbits. This could account for the lower weight gains observed. It was reported by (2) that weanling New Zealand White rabbits should gain at 35-40 g per day. The study of (8) reported daily growth rate of 5-10g for rabbits during the grower phase. (9) also reported a range of 10-20g growth rates for rabbits in tropical countries.

Feed to gain ratios increased with decrease in concentrate level fed. Feed utilisation appears to be better at lower levels of concentrate fed. The study of (15) reported significantly poorer feed:gain ratio for rabbits fed 25g pellets plus

cabbage residue than the free choice (control) group. This report is contrary to the observation in this study. The probable reason for this could be because of the pelleted concentrate diet and succulent forage used in their study compared with concentrate meal diet and hay used in this study. Another reason for the poorer feed:gain ratio observed could be as a result of the poor digestion of crude fibre by rabbits however, rabbits require some quantity of crude fibre in the diet for proper digestion (10).

The cost of concentrate feed per kilogram weight gain decreased significantly with decrease in level of concentrate (Table 3). This is a reflection of the high cost of concentrate feed ingredients available for feeding rabbits. The 100, 75 and 50% concentrate levels had significantly higher cost of feed per kilogram gain than the 25% level. Among the groups, the combination of 25% concentrate

Table 3. Effect of feeding different levels of concentrate and forage legumes to weaner rabbits.

Treatment	Av. daily conc. intake (g)	Av. daily gain (g)	Feed conversion ratio	Feed cost/kg conc. intake (N)	Conc. cost/kg	Savings on conc. feed (%)
100C + D	127.5	9.0	14.5 ^a	3.45	383.1 ^a	0
75C + M	99.5	8.6	11.5 ^{ab}	2.69	313.4 ^{abc}	18.19
50C + M	61.0	6.7	9.2 ^{ab}	1.65	248.1 ^{abc}	35.24
25C + M	36.5	6.8	5.5 ^d	0.99	147.2 ^e	61.58
75C + L	83.0	6.8	12.9 ^{ab}	2.24	347.5 ^{ab}	9.30
50C + L	67.5	6.6	10.5 ^{ab}	1.82	281.8 ^{abc}	26.44
25C + L	34.0	6.7	5.8 ^{dc}	0.92	156.3 ^{de}	59.20
75C + G	98.0	8.6	11.9 ^{ab}	2.65	319.0 ^{ab}	16.73
50C + G	65.0	8.1	8.2 ^{bcd}	1.76	221.1 ^{bcd}	42.29
25C + G	35.5	5.4	6.7 ^{cd}	0.96	179.8 ^{cde}	53.07
SEM		0.86	0.8		46.5	

Means on the same column bearing the same superscript differ significantly ($P < 0.05$). 100C + D, 100% concentrate plus Digitaria; 75C + M, 75% concentrate plus Mucuna; 50C + M, 50% concentrate plus Mucuna; 25C + M, 25% concentrate plus Mucuna; 75C + L, 75% concentrate plus Lablab; 50C + L, 50% concentrate plus Lablab; 25C + L, 25% concentrate plus Lablab; 75C + G, 75% concentrate plus Groundnut haulms; 50C + G, 50% concentrate plus Groundnut haulms; 25C + G, 25% concentrate plus Groundnut haulms. SEM, Standard of mean. Conc. Concentrate.

and mucuna gave the lowest cost compared with the other groups. Consequently, percent saving on concentrate was higher with this combination compared with the other groups. Considering that forages are far cheaper than concentrate diets, it would appear to be cheaper and wiser for a farmer to raise his grower rabbits on a combination of 25% concentrate level, supplemented with forages than to offer 100, 75 or 50% concentrate levels. This is especially so as growth

rate is slower at the grower phase than during weaner stage.

It is recommended that as much as possible, smallholder rabbit farmers should fatten their rabbits on 25% (37.5g) concentrate level supplemented with mucuna, groundnut harawa or lablab fodder. Where possible, mucuna should be used since it gives a better average daily gain and higher savings on concentrate. However, because of their dual-purpose nature, groundnut harawa and lablab fodder could be preferred for a better overall gain on crops and livestock by farmers.

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