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EFFECT OF CONCENTRATE TO FORAGE RATIO ON THE PERFORMANCE AND HAEMATOLOGICAL PARAMETERS OF GROWING RABBITS

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Abstract

The experiment was conducted to examine the effect of concentrate to forage ratio on the performance and haematological parameters of growing rabbits. The rabbits were grouped into 4 treatment of 3 replicate each containing 2 rabbits. They were fed different ratio of concentrate(C) to forage (F) with Treatment 1 (100C: O F), Treatment 2 (75C: 25F), Treatment 3 (50C: 50F), Treatment 4 (25C: 75F). The feeding trial lasted for 56days. The final weight, weight gain, average weight gain and Feed conversion ratio were not significantly affected ($P>0.05$) by dietary Concentrate to Forage ratio. The feed intake, feed cost, cost of intake and total intake were significantly different ($p<0.05$) in rabbit Fed Forages to rabbit fed concentrate only. Highest weight gain was recorded in rabbits on treatment 3 (50C: 50F) compared to the other treatments. There were no significant difference ($P>0.05$) on the haematological indices of rabbit fed forages and concentrate. For optimum performance of rabbit it was concluded that a 50% of concentrate to 50% of forage should be given.

Introduction

Animal protein is very important to human beings. This is because they are better utilized than those from plants. Apart from this certain essential amino acids such as tryptophan and lysine which are present in animal are inadequate in plant protein. Food and Agriculture Organization (FAO) (2000) recommended 27g as the animal protein daily requirement for human being. However the intake per average Nigerian is grossly inadequate (3.24g animal protein/day FAO, 2000). Therefore, efforts should be directed towards exploring all reasonable options to meet the recommended level at a reduced cost. One of the ways of bridging the demand- supply gap is through rearing of rabbits. Rabbit occupies a unique niche in that it is a mini livestock that is easy to manage, highly prolific and has a short generation interval. The cost of feeding rabbits is however very high, a condition that also prevailed for other Nigerian livestock species (Adeyemi *et al*., 2008).

Rabbits also mature early, their meat has high protein, low fat, low energy and low cholesterol (Biobaku and Oguntona 1997). The level of animal protein consumption has direct influence on the general well being and health of the ever increasing population. Animal protein is usually obtain from cattle, sheep and goats. However, these animals have not been able to close the gap of protein shortage because of their long production cycles and some other factors. According to (Biobaku,1998) rabbits are highly prolific animals and when given judicious management, they can kindle about six times in a year with average of 6-7 young per kindling. In the view of increasing demand for animal protein consumption and shortage in supply of animal protein attention has been recently diverted on rabbit production. Rabbits are animals that are inexpensive, easy to manage quiet and restful (Katie *et al*., 1986). They can be raised on high Fibre feeds and materials not utilized by man. Since they do not compete with man for grains, they have the advantage over swine and poultry (cheeke, 1986).

Rabbits have the ability to thrive on forages which are abundant all year round (Aduku and Olukosi, 1990). According to Ojewola *et al.*, (1999), rabbit perform better when fed with mixture of forage and concentrate. A combination of concentrate diet and forage to achieve optimum performance is especially being sought after; to reduce cost of feeding, as well as the total cost of production for the small scale rabbit producers. Feeding rabbits solely on some forage species in the tropics has resulted in negative effect of weight loss (Adegbola *et al.* 1985; Bamikole and Ezenwa, 1999).The use of compounded concentrate alone has not also given optimum results (Adegbola *et al.*, 1985; Bamikole and Ezenwa, 1999). However, there is paucity of information on the appropriate combination of forage to concentrate for optimum performance of rabbit because concentrate alone fed to rabbits do not give 100% performance. This experiment aim to evaluate the effect of varying combinations of forage to concentrate ratio and to determine the appropriate combination for optimum performance of rabbit.

Materials and Methods

Experimental Site

The experiment was carried out at the Rabbitary Unit of College of Animal Science and Livestock Production Farm, Federal University of Agriculture, Abeokuta. The farm is situated in the south-western part of Nigeria which is a derived savannah zone with an annual mean temperature of 37.4^0C and a relative humidity of 82%. It is in the region 70m above sea level of 7^0S'-5^0N longitude 3^0W 11:2^{o}E.

Experimental Materials

Twenty-four weaner rabbits, two iron cage hutches with eight cells, Twenty- four small earthen drinkers and feeders, concentrates and *Tridax procumbens* was used for the experiment.

Experimental Animals and Management

Twenty- four (24), 5 weeks old weaner rabbits of mixed breeds and sexes with initial weight of 380 – 440 grams was divided into four groups of six rabbits each after balancing for weight and sexes. These rabbits were housed two (2) per cell in hutches that was washed and disinfected.

Experimental Design

Four dietary treatments consisting of forage to concentrate was fed in the following ratios.

		Forage (F)		Concentrate (C)
i.	T_1	0F	:	10C
ii.	T_2	2.5F	:	7.5C
iii.	T_3	5.0F	:	5.0C
iv.	T_4	7.5F	:	2.5C

5F : 5C serve as the control experiment

Feeding of Experimental Animals

Feeding of Experimental Animal

Treatment 1 (T_1) – concentrate only at 100g\rabbit\day

Treatment 2 (T_2) – concentrate at 75g \ rabbit \ day +25g of *Tridax procumbens*

Treatment 3 (T_3) – concentrate at 50g \rabbit \ day + 50g of *Tridax procumbens*

Treatment 4 (T_4) – concentrate at 25g \ rabbit \ day + 75g of *Tridax procumbens*

Table 1: Composition of concentrate diet that was fed Ingredients %

Maize	39.24
Maize offal	15.00
Groundnut cake	42.26
Bone meal	3.00
Salt	0.25
Vitamin and Mineral premix	0.25
	100.00

Table 2: Proximate composition of concentrate diet that was fed. %

Dry Matter	91.73
Ash	5.43
Ether Extract	3.69
Crude Fibre	21.94
Crude protein	19.21
Nitrogen Free Extract	59.46

The forage that was used is *Tridax procumbens*

Table 3: Proximate Composition of *Tridax procumbens*

Dry matter	26.49
Crude protein	24.47
Crude fiber	18.15
Ether Extract	18.15
Ash	15.95
Nitrogen Free extract	36.53

The feeding trial lasted for 56days (8 weeks) during which information was collected on the concentrate and forage intake, weight change, feed conversion, feed cost and feed cost per kilogram.

Blood Collection

On the 56th day of the experiment blood samples were collected into sample bottles containing EDTA for determination of Haemoglobin, White Blood cell counts, Red Blood cell counts and packed cell volume. Blood samples were collected into another set of bottles without EDTA which was used to determine the serum indices using the standard method of Baker and Silverton (1985).

Data Collection

Records of weekly feed weight gain, feed conversion ratio were taken. Also cost analysis was done based on the feed that was given.

Weekly Weight Gain

This indicates the live weight of rabbits in each of the hutch taken at an interval of 7days for a period of eight weeks

Feed Intake per Week: This measure the amount of feed consumed per rabbit in a week. It is expressed as: Feed intake =feed offered –feed left.

Feed Conversion Ratio (FCR)

It is express as feed intake in grams divided by the weight gain.

FCR = Feed Intake (g) /weight (g)

Data Analysis

Data collected was subjected to one way analysis of variance. Significantly different means will be separated using Duncan's Multiple Range Test as outline by Lintel *et al.,* (2002).

Statiscal Analysis

The data collected were subjected to one way analysis of Variance (ANOVA) and significant difference between treatments means were separated using Duncan's multiple range test as outline by Lintel (2002) Model for one way analysis.

$Yij = \mu+T_1+\Sigma_1 j$

Where Y_{iJ} = Observed value

μ = Overall mean value

T_I = Treatment effect

Σ_{IJ} = Residual error

The standard error of mean (SEM) was calculated using the formular

$$SEM = \frac{\sqrt{SV}}{N}$$

$$= \frac{\sqrt{\Sigma X^2 (\Sigma X)^2 \backslash n}}{n-1}$$

Where SEM = Standard error of mean

SV = Standard variance

N = Number of observation

X = Individual weight of rabbit.

Result and Discussion

Performance of rabbit fed different ratio of concentrate to forage.

Table 4: Shows the effect of dietary treatment on performance of rabbits.

Parameters	T1(100: 0)	T2(75:25)	T3(50:50)	T4(25:75)	S E M
Intial weight (g)	383 .33	441.67	408.33	410.00	12.16
Fin wt(g)	979.20	1190.70	1178.30	1059.0	48.92
Wt gain(g)	595.80	748.70	770.00	574.0	45.86
Av. Wt gain (g)	10.64	13.36	13.75	10.25	0.81
Feed conv.ratio	4.30	4.44	4.28	6.05	0.33
Feed \ intke \ day(g)	42.85^b	56.88^a	58.40^a	62.11^a	0.98
Feed cost \ kg(N)	63.60^a	51.45^b	39.30^c	26.15^d	0.41
Cost of intake(N)	152.62^a	163.89^a	128.53^b	90.96^c	2.57
Total intake(g)	2399.8^b	3185.5^a	3270.6^a	3478.5^a	55.38
Economic bene(₦)	-	7.27	15.78	40.40	

T1: 100% Concentrate 0% Forage

T2: 75% Concentrate 25% Forage

T3 : 50% Concentrate 50% Forage

T4 : 25% Concentrate 75% Forage

There were no significant difference ($p>0.05$) in the final weight in all the dietary treatment but a higher weight gain was recorded in dietary treatment 2 compared to treatment 1 and this can be attributed to low percentage of forage i.e 25% Forage to 75% concentrate in their diet as supported by ojewola et,al (1999) that rabbit perform better when fed mixture of forage and concentrate.

However treatment 3 has an increase weight gain than treatment 4. It was observed that as the percentage of forage increases in the dietary treatment the final weight is decreasing compared to treatment 2 that was given small percentage of forage.

Treatment 1 has a reduced final weight and this can be attributed to concentrate feeding only without inclusion of forage and this was also reported by Adegbola et, al (1985), that rabbit placed on compounded concentrate only do not give optimum results.

There is increased weight gain in treatment 3 fed 50% forage compared to treatment 2 and 4 fed different ratio of concentrate to forage. Reduced weight gain was observed in treatment 4 fed 25% concentrate and 75% forage and the reduced weight gain can be attributed to higher percentage of forage consumed to concentrate as compared to those fed 50% c to 50% F has increased weight gain.

Furthermore increased weight gain was observed in treatment 3 compared to treatment 2 which has a reduced weight gain and this can be attributed to low percentage of forage to concentrate in the diet of treatment 2. There is no significant difference ($p>0.05$) in the average weight gain in all the dietary treatment. Average weight gain was highest in treatment 3 fed 50% concentrate and 50% forage and this can be attributed to a balanced ratio of concentrate to forage as compared to other treatment having varying ratio of forage to concentrate.

However there is an increased average weight gain in treatment 2 compared to treatment1 fed only concentrate. The increased average weight gain in treatment 2 can be attributed to the feeding of forage at a particular percentage compared to treatment 1 not fed forage at all. Lowest average weight gain was observed in treatment 4 fed 25% concentrate and 75% forage and the reduced weight gain can be attributed to higher percentage of forage and lower percentage of concentrate. Also treatment 2 and 3 fed minimum and average percentage of forage to concentrate have increased average weight gain compared to treatment 1 fed only concentrate and as reported by Bamikole and Ezenwa (1999) that the use of compounded concentrate alone do not give 100% performance. There was no significant different ($p>0.05$) in the feed conversion ratio in all the treatment, however, feed conversion ratio was lowest in treatment 3 and higher in treatment 4 and this can be attributed to higher percentage of forage and poor nutrient retention by the animals in treatment 4. Treatment 3 show a feed conversion ratio that is lower compared to treatment 1 consuming concentrate only.

There are significant difference ($p< 0.05$) in feed intake per day in treatment 2, 3 and 4 compared to treatment 1. Increase in feed intake per day was observed in treatment 2, 3 and 4 and this can be attributed to inclusion of forage in the diet of this treatment and reduced feed intake was observed in treatment 1 and this can be attributed to the absence of forage in treatment 1 fed concentrate alone. And it means that as the percentage of forage increases the fed intake per day also increases. Highest feed intake per day was recorded in treatment 4 fed 25% C and 75% F, lowest feed intake was recorded in treatment 1 fed concentrate only.

There are significant difference ($p<0.05$) in the feed cost per kg in all the dietary treatment. There is a significant difference ($p<0.05$) in treatment 1 compared to treatment 2 and there is a significant difference ($p<0.05$) in feed cost \ kg between treatment 3 compared to treatment 4. Feed cost was highest in treatment 1 and lowest in treatment 4. Higher feed cost observed in treatment 1 can be attributed to consumption of concentrate only; lowest feed cost observed in treatment 4 can be attributed to higher inclusion of forage in the dietary treatment.

Feed cost in treatment 3 was at the 39.30 and it gives the highest weight gain. Feed cot per kg in treatment 2 was not higher to that of treatment 1 because forage was included in the diet of treatment 2. There are significant difference ($p<0.05$) in cost of intake between treatment 1 and 2 compared to treatment 3 and there is a significant difference ($p<0.05$) between treatment 3 and treatment 4. There is no significant difference ($p>0.05$) between treatment 1 and 2.

Also there is significant difference ($p<0.05$) in total feed intake between treatment 1 compared to other treatment (2, 3, 4). There is no significant difference ($p>0.05$) in total feed intake in treatment 2, 3 and 4. However, similarities exist in the total intake in treatment 2, 3 and 4 and this can be attributed to the presence of forage in the dietary treatment.

Haematological Parameters of Growing Rabbit Fed Different Ratio of Concentrate to Forage

Table 5: Effect of dietary treatment on blood indices

Concentrate : Forage ratio

	T_1 100:0	T2 75:25	T3 50:50	T4 25:75
PCV (%)	40:33	38:66	40:00	37:66
Hb (g\dl)	13.56	13.03	13.46	12.76
WBC($cumm^3$)	6100	8000	4633	6367
RBC ($X10^{12}$)	6.29	5.95	6.29	5.58
Neut (%)	29.33	30.00	26.33	33.67
Lymph (%)	69.33	69.33	73.66	66.00
Baso (%)	0.00	0.67	0.00	0.00
Mono (%)	0.33	0.00	0.00	0.00
Eosin (%)	1.00	0.00	0.00	0.33
T.prot.(g\l)	53.26	62.53	51.43	46.73

Table 5 shows the effect of dietary treatment on the blood indices. There were no significant difference in the P C V, Haemoglobin cell, red blood cell, ($p>0.05$).

There are similarities in the packed cell volume with dietary treatment one having (40.33%) the highest and dietary treatment four having (37.66%) as the lowest in the packed all volume. The lowest packed all volume in treatment four may be attributed to low amount of concentrate in dietary treatment four. However, similarities exist between haemoglobin in all the dietary treatment, Treatment one has the highest haemoglobin while treatment four has the lowest. Dietary treatment two has the highest white blood cell count and was poor in dietary treatment three. Similarities also exist between the red blood cell counts.

Furthermore there were no significant difference ($p>0.05$) in the Neutrophils, Basophils, monocytes, Lymphocytes, Eosinophils and total protein. Dietary treatment four has the highest neutrophils and dietary treatment two has the lowest. The higher amount of neutrophils may be attributed to high consumption of forage by dietary treatment four. Similarities

exist between lymphocytes in all the dietary treatment with dietary treatment four, having the lowest lymphocytes. Basophils are absent in dietary treatment 1, 3 and 4 but present in dietary treatment two and this can be attributed to small consumption of forage in dietary treatment two. Monocytes are absent in dietary treatment 2, 3 and 4 but present in dietary treatment 1 and the reason for this is because their feed is supplemented with forage.

Eosinophils are present in dietary treatment l and 4 and absent in dietary treatment 2and 3. There were no significant difference ($p>0.05$) in the total protein in all dietary treatment the result of the haematological indices obtain in the study shows that forage supplementation with concentrate does, not have effect on the blood indices of growing rabbits.

Conclusion and Recommendation

From this study it was observed that for optimum performance of rabbit, they should be fed mixture of concentrate and Forage. Inclusion of forage in the diet of rabbit is also needed to enhance feed intake. For optimum performance of rabbit, they should be fed 50% of concentrate and 50% of forage because it was this percentage that gave highest weight gain and highest average weight gain.

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