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Research Paper

Growth Performances of Weaners Rabbit Fed Two Selected Grasses and Legumes Species Supplemented With Grower Mash

AKINDELE[1], Wasiu Olaide and ADEOSUN[2], Ayodele Olayinka
[1]*Animal Health Unit, Oyo State College of Education, Lanlate, Oyo State, Nigeria*
[2]*Animal Science unit, Oyo State College of Education, Lanlate, Oyo State, Nigeria*

Abstract
Rabbit, a non-ruminant animal with high reproductive potential and space requirement, is preferred by rural households for poverty alleviation and improved nutrition. Yet, much attention has not been given to luxuriant soil tolerant forages in rabbit production especially in small holder areas despite their nutritional value and potential in feeding rabbits. Therefore, twenty (20) cross bred weaner rabbits aged between 5-6 weeks with an initial weight ranging between 459.00g and 512.50g were used to investigate the performance and nutrient digestibility of rabbits fed diets containing mixture of grasses, legumes and concentrate. They were randomly assigned to five treatment diet with two replicates of two (2) rabbits per pen in a completely randomized design. The experiment lasted eight weeks. Five experimental diet were selected, Diet T_1 was Panicum maximum supplemented with grower mash, Diet T_2 contained Andropogon gayanus supplemented with grower mash, Diet T_3 constitute Calopogonium mucunoides with grower mash, Diet T_4 include centrosema pubescens and grower mash while Diet T_5 was the control experiment containing concentrate feed without any forages. The types of forages used in this study have effect on the nutrient intake of rabbits, dry matter and ash digestibilities. It was observed that final weight gain and daily feed intake are significantly ($P<0.05$) affected by experimental diets. For all the parameters considered, Treatment 4 (T4) had the highest value for final weight (1423.00g), average weight gain (925.50g) and daily weight gain (16.52), followed in rank was T_3 and T_5 rabbit respectively. Average weight gain (804.50g) of T_3 rabbits and T_5(756.50) were not significantly different ($P>.0.05$). The lowest final weight and average weight gain of 1047.50g and 547.50g was observed in T_2 (rabbits fed Andropogon gayanus). The best feed efficiency was observed for T_4 (2.58). It can be concluded that incorporation of legumes like centrosema pubescens and grass like Panicum maximum is a good combination as a substitute for concentrated diet in rabbit feeding without any adverse result. The duo hiltherto are recommended in feeding regime for sustainable rabbit production.

Keywords: *rabbit, non-ruminant, Panicum maximum, Andropogon gayanus, Calopogonium mucunoides, Centrosema pubescens, weaners.*

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I. Introduction

Food security is a top priority engagement in many developing countries like Nigeria. Furthermore, nutritional level of the Nigerian population is characterized by inadequate intake of protein both in quantity and quality (FAO 2000). The average daily protein intake of Nigerians is still far less than the recommended value of 35g per head per caput. Hence there is need for paradigm shift in order to move from conventional to non-conventional animal protein sources such as rabbit which underscore on cost, time and space efficiency (Etim *et al*., 2014). Rabbit do not compete directly with human for both cereal and legume grains and can subsist on a diet consisting primarily of grass as monogastric herbivores. The use of rabbit has proven to be a veritable means of alleviating poverty and improving household protein intake in developing countries. One major advantage the rabbit has over other non-ruminants is its ability to degrade substantial amount of fibre, making dietary fibre (Non-starch polysaccharides and lignin) the main constituent of commercial rabbit feed.

Rabbit rearing forms the alternative source of animal protein due to virtues attributable which includes high rate of reproduction and early maturity, rapid growth rate, high genetic selection potential, efficient feed

and land utilization, limited competition with human for similar feed and high quality nutritious white meat. Although, rabbits can survive by consuming virtually only on forage diets, performance is better enhanced by offering a mixed feeding regime including forages and formulated feeds (Arijeniwa *et al.,* 2000). Linga and Lukefahr (2000) advocated raising rabbits on a basic forage diet with an energy supplement. Forages are readily available and cheap in the tropics and rabbit, being a pseudo-ruminants have the ability to utilize forages for growth. Though optimum rabbit production has not been sustained on forages alone, meanwhile it is possible to reduce the cost of rearing effectively by utilizing different forages of origin that are nutritious and palatable in achieving a compromise between level of production and cost that is acceptable to producers. Meanwhile legume-grasses mixture offers a great potential in reducing the quantity and cost of concentrates for rabbit production, however significant amount of legume-grass mixture with or without concentrates needs to be consumed in achieving a desired results.

Since rabbits are herbivores with post gastric digestion, they can effectively utilize roughages and cope with fibrous contained in grasses and legumes. Farinu (1994) evaluated the effects of feeding a compounded diet based on non-conventional feedstuffs on growth and organ characteristics of the rabbits and confirmed that it was economical to raise rabbits on mixed diet of concentrate and forage. Sanni *et al.*,(2005) evaluated the economics of producing grower rabbits feed in different combinations of concentrate and *Stylosanthes spp* and found that 50:75 combinations gave the highest return on investment, thus the cost of feeding grower rabbit could be lower by supplementing concentrate diet with forages.

Cost of grains and their by-products used in concentrate diets have increased dramatically, they are often scarce (Adejumo, 2002) and are also in competitive demand by man and other livestock animals, the high cost of concentrated diet has emanated into high cost of production principally in the monogastic sector of animal production. The inflationary pressures and competition between man and animals for grains used in concentrate feeds has resulted into sharp increase in the cost of producing livestock, especially in the past year. This cost of grains and their by-products have increased tremendously and was claimed to represent about 70% total cost of production. In developing countries, where commercial feeds are either not available or cost-prohibitive, the use of forages in livestock feeding is normal practice and producers are advised to feed forages as a supplement to a basic concentrated diet in order to meet the fibre and some of the vitamin requirements. Forages proffered a solution to a direct competition with human for both cereals and grains, however in conventional feeding the cost of production remains high due to increasing cost of concentrate formulated feeds. It is reported however that a non conventional feedstuff (NCF) can serve as another alternative for the reduction of feeding cost which ultimately leads to reduction in the price of animal products (Daudu, 2009).

Forages such as *Tridax species, Asprilia Africana, Euphobia* among others had been used in feeding rabbits. However, information on the use of soil-tolerant forages such as *Panicum maximum*, *Andropogon tectoum*, *Calopogonium mucunoides* and *Centrosema pubescens* were not fully explored, hence necessitating investigation in to their feeding values, therefore this study was undertaken to evaluate the growth rate, feed efficiency, economy of production and overall performances of growing rabbits fed selected forages supplemented with concentrates.

II. MATERIALS AND METHODS

Experimental site

This experiment was carried out at the rabbitary unit of the Department of Agricultural Education Teaching and Research farm of Oyo State College of Education Lanlate in Ibarapa East local government area of Oyo state. Based on latitude, location of Ibarapa East Local Government area of Oyo state, is found within the tropical interland climatic belt (Oladokun, Oladapo and Ogundele, 2008). The annual rainfall is between 1500mm and 2000mm with relative humidity of over 80% in the morning which fall between 50% and 70% in the afternoon. The mean annual temperature is 27^{o}c and annual temperature range is 8^{o}c (Iloeje, 1981)

Experimental animals and management

Twenty (20) grower rabbits of mixed breeds (chinchilla X New Zealand white) of 5 to 6 weeks of age were used for this experiment. The rabbits were randomly allotted to five treatment diet. Four (4) rabbit were assigned randomly to each of the dietary treatment with two (2) rabbits per replicate in a completely randomized design method over a period of eight weeks. Before the commencement of the trials, the rabbit were fortified with injectable long-acting oxytetracycline and dewormed using ivermectin against any possible internal or external parasites.

Experimental housing

The experimental rabbits were housed in a hutch made of wood measuring 120cmx50cmx40cm length, breadth and height respectively with corrugated roofing sheets and wire mesh floor with wooden frames. The hutch was housed in a well ventilated rabbitary unit. The hutch was disinfected with cresol, ten (10) days prior

to the stocking of the animal for experiment. The faeces and urine of the rabbit dropped through the wire mesh, the feeders and drinkers made of earthen pot reinforced with cement material were provided and hay rack made of wooden material incorporated.

Experimental feeds and feeding

Rabbits were fed a maize-based concentrate diet for a week of acclimatization with cool clean drinking water supplied always before the commencement of experimental feeding. The experimental diet consisted of five (5) dietary treatments of forages (grasses and legumes) to concentrate as a control diet and were represented as T_1, T_2, T_3, T_4, and T_5 respectively. T_1 consist of *Panicum maximum*, T_2 *Andropogon gayanuon*, T_3 *Calopoganium mucunoides*, T_4 *Centrosema pubescens* all supplemented with grower mash while the rabbits in T_5 were fed with concentrate only throughout the period of experiment.

The forages were harvested with sickle daily around the farm premises and after washings with water offered fresh. Each day, a single forage was offered for 6hours from 08.00h to 14.00h to rabbits in treatment 1, 2, 3 and 4. The forages were chopped and 100g fresh forage was offered according to method of Haris *et al.*, (1983). After 6 hours, the uneaten forages were weighed and the total amount consumed recorded. After withdrawal of the forage the rabbits were offered 50g of concentrate meal in the evening, however the T_5 rabbits were fed on concentrate diet only throughout the whole day.

Data Collection

The initial weight of rabbits were determined and recorded. The rabbit weights and feed consumed were calculated and recorded on weekly and daily basis respectively. Known quantity of forages were fed to the rabbits, feed intake was determined by subtracting the weight of the feed not consumed from the feed offered. Feed intake was calculated for each of the replicate on daily basis. Weight change was determined by finding the difference between initial weight and final weight on weekly basis throughout experimental period. Likewise the feed efficiency ratio was determined by dividing the average feed intake by average weight gain.

Chemical analysis and statistical analysis

The basal diet and forages were analysed for proximate composition using the procedure of A. O. A. C (1990) in determining nutrient composition and metabolizable energy, also crude protein, crude fibre, ether extract and nitrogen free extract (NFE). The data were subjected to analysis of variance (ANOVA) in accordance with Steel and Torrie (1980) separation of significantly different means was carried out using Duncan's Multiple Range Test according to Duncan, (1955).

III. Results and Discussion

Determined analysis from the proximate composition of basal diet and test forages were shown in Table 2. The proximate composition of the experimental diets and test forages showed that crude protein content observed in this experiment were significantly ($P<0.05$) higher ranged from 10.38 and 29.93%, this fall between requirements of grower rabbits as prescribed by FAO(1981). The crude fibre contents were very marginal apart from fibre content of the basal diet that is significantly lower amongst others since it is concentrate diet. The fibre content of the test forages falls within the report of Adejumo (2002).

Table 1: Ingredient and nutrient composition of experimental basal diet

Ingredient	**Quantity (Kg)**
Maize	47.31
Wheat bran	38.00
Soya meal	12.49
Bone meal	1.12
Oyster shell	0.58
Salt	0.35
Premix	0.15
Total	**100**
Calculated Composition	
Crude Protein	16.02
ME (kcl/kg)	2400

ME= metabolisable energy: premix supplied per type kg diet: vit. A 100.00 iu; vit. D 2000.000iu: vit. E, 23.00mg: vit.kz: 2,000mg: vit. B, 3.000mg: vit.B2: 6,000mg: Niacin, 50,00mg calcium, 800mg: panthotenate, 10,000mg: Vit. B6, 5000mg: Vit. Biz 250mg: folic acid, 100mg Biotin 50mg, cholinechloride 40,000mg, selenium: 0.12mg and anti oxidant 120,00mg.

Table 2: Proximate composition of the concentrates, *Pannicum maximum, Andropogon gayanus, Calopogonium mucunoides* and *Centrosema pubescens*.

	Dry matter (%)	Crude protein (%)	Crude fibre (%)	Ether extract (%)	Ash (%)	NFE (%)
Basal diet	88.75	17.08	6.27	5.05	6.9	67.64
P. maximum	27.99	11.97	19.78	1.3	17.1	49.35
A. gayanus	25.21	10.38	24.2	1.23	19.32	44.87
C. mucuoides	28.77	29.93	20.11	2.3	13.12	44.54
C. pubescens	30.31	24.12	23.51	2.42	15.23	35.72

Table 3: Performance of rabbits fed P. maximum, *A. gayanus, C.mucunoides, C. pubescences* and concentrates

Parameters	T1	T2	T3	T4	T5	SEM
Initial weight (g)	505.00	500.00	459.00	457.00	512.50	11.86
Final weight (g)	1129.50^{c}	1047.50^{d}	1299.50^{b}	1423.00^{a}	1269.00^{b}	21.61
Weight gain (g)	624.50^{c}	547.50^{d}	804.50^{b}	$925,50^{a}$	756.50^{b}	17.79
Daily weight gain (g)	11.13^{c}	9.83^{d}	14.32^{b}	16.52^{a}	13.50^{b}	0.31
Total feed intake (g)	2070	2147	2136	2390	1482	285.46
Daily feed intake (g)	36.96^{c}	38.34^{b}	38.63^{b}	42.85^{a}	37.76^{bc}	0.46
Feed efficiency ratio	3.31^{b}	3.92^{a}	2.65^{d}	2.58^{d}	2.79^{c}	0.44

Note: ^{abc} Means with in a row with different superscripts differ significantly ($p<0.05$);
Means with the same superscripts are not significantly different ($p>0.05$);
N.S- not significant.

The performance of rabbits on the experimental diets is shown in Table 3. The final weight and total weight gain were all significantly different ($P<0.05$) and affected by dietary treatment except T_3 and T_5 that look numerically similar. Treatment (T_4) had the highest average weight (925.50g) that was significantly different ($P<0.05$) from other parameters even when compared with T_5 rabbit that was fed with conventional diet, this result agreed with work of Taiwo *et al.,* (2004) that rabbits on concentrate diet alone recorded least body weight gain, absence of forage in rabbit's diet tends to have a depressed effect on its ability to utilize feed thus on its growth performance. Biobaku and Dosumu (2003) also corroborated this in their work by noted that rabbits are pseudo ruminant and that they prefer forages to maize based diets. High protein content (24.12%) of *Centrosema pubescens* could as well be attributed factor.

Though with respect to table 2 *Calopigonium mucunoides* had highest crude protein content (29.93%) when compared and contrast with 24.12% of *Centrosema pubescens*, however result obtained in this research shows a conflicting relationship. Conversely T_4 rabbits fed with *Centrosena pubescens* had a significant higher value than T_3 rabbits, crude fibre content of *Centrosema pubeseens* which is 23.51% as against 20.11% of *C. mucunoides* might have been a contributing factor. The result is in concomitant with Lowry *et al.,* (1992) who observed that rabbits are known to effectively utilize lignocellulose fibre through their beneficial bacteria harboured in their hind gut and rapidly void less digestible particles, however fibre from different sources in the digestibility depending on the proportions of cellulose, hemicelulose and lignin. Similarly Giddene and Bellier (200)proposed that rabbit feed should contain high level of fiber to help in regulation of intestinal transit, gut flora and enhancement of intestinal mucosa integrity.

When comparing leguminous forages with grasses, legumes pastures recorded significant ($P<0.05$) weight increase amongst others, this probably may be because of nutrient composition as reflected in Table 2 in term of Dry matter, crude protein, crude fibre ash and Nitrogen free extract which is significantly higher. However among rabbit fed with grasses, P. maximum (T,) recorded higher significant ($P<0.05$) weight gain (624.50g) than rabbits fed with *Andropogon gayanus* with (547.50g). There is positive linear correlation interms of values recorded against feed efficiency ratio in this study because as the feed intake increases the growth rate increases correspondingly, the implication of this is that there is better utilization of feed by the rabbits. The

feed conversion efficiency obtained in this study is similar to that reported by Iyeghe Erakpotibor *et al.,* (2006) who fed rabbits different combinations of concentrate, grass and legume. Generally the low FER can be attributed to the high fibre content of the forage diets and the nature of feeding trial.

IV. Conclusion

Rabbit being a Pseudo-ruminant could efficiently utilize forage legumes and grasses without supplementation with concentrates, this could help in reducing the over dependence on concentrate, thereby reducing the cost of production. Specifically, optimum growth performance of rabbits can be achieved by feeding *Centrosema pubescens* and *Panicum maximum* mixtures, hence incorporations into diet of rabbits give better results in term of sustainable rabbit production.

Recommendations

1. Forage legumes are recommended for feeding of rabbit to attain optimum growth performances and efficient nutrient digestibility in rabbit production.
2. Incorporation of forage grasses like *Panicum maximum* to supplement feeding on concentrated diet is advisable for better result.
3. More studies on the length of period after which supplementation of *Centrosema pubescens* should be continued to reproductive stage of the rabbits so as to establish additional effects especially on prolonged period of feeding regime.
4. Enlighment campaign on biological importance of rabbit meat for human consumption.
5. Reputable and organized market for sales of rabbit and its products should be established by Non Governmental Organization (NGO).

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