Comparative Responses of Weaner Rabbits to Concentrate Diets Supplemented with Different Forages

[1]Maidala, A., [2]Bello, I.B. & [1]Jarmari, S.M.
[1]Vocational and Technology Education,
Abubakar Tafawa Balewa University Bauchi
[2]School of Undergraduate Studies,
College of Education Azare
aminumaidalaa@yahoo.com

Abstract
An experiment was conducted to assess the effect of different forages on performance of rabbits fed concentrates diets. Three different forages i.e cashew leaves, cassia leaves and digitaria leaves were fed to rabbits with control diets which contain concentrate only. The forages were supplemented at the morning and afternoon (100g) each. Forty eight rabbits of mixed breeds and sexes were randomly allotted to four experimental diets. There are twelve rabbits per treatment replicated six times (two rabbits per replication) in a completely randomized design (CRD). Results showed that daily feed intake (74.37-84.88g), daily weight gain (16.37-24.05g) and feed conversion ratio (3.29-5.30) were affected by the different types of forages (P<0.05). Live weight (978.64-1190.40g), dressed weight (42.95-53.22%) and ceacum weight (2.15-3.09%) were affected by the different types of forages (P<0.05). The blood parameters affected by the different types of forages include white blood cells (8.00-8.55%), blood platelets (33.15-53.70%), ASAT (32.00-35.00) and ALAT (32.00-35.00) (P<0.05). Considering the results of this study the different forages influence the performance of rabbits, however Digitaria spp has better performance characteristics compared to other forages and concentrate based diet.

Introduction

The acute shortage of animal protein in developing countries like Nigeria is quite alarming. Daily intake of 35g recommended by Food and Agriculture Organization (FAO, 1992) has not been met. The level of consumption of animal protein in Nigeria is estimated at 8g per day which is about 27g less than the minimum requirement by World health organization (Obioha, 1992). The rapid increase in the cost of animal protein source has now put it out of the reach of most Nigerians (Maidala and Istifanus, 2012).There is therefore, an urgent need to increase livestock production in the country especially those that are highly prolific with rapid turnover rate at very low cost. This brings the rabbit (*Oryctolagus cunniculus*) into focus, as it forms a very important aspect of livelihood for socio economic reasons. Rabbit production has been noted to be one of the best means of alleviating the prevailing low animal protein consumption in developing countries due to certain characteristic of rabbits and rabbit meat (Taiwo *et al.*, 2005; Maidala and Istifanus, 2012). The rabbits thrive on wide range of fresh or preserved grasses, shrubs and leaves (Carew *et al.*, 1989; Bamgbose *et al.*, 2004). The rabbit is also a very efficient converter of feed to animal protein and the meat is very nutritious, easily digested, extremely low in cholesterol and sodium and contains more protein and less fat, when compared to various other meats. The production of animals like rabbits, with very short gestation periods and production cycles, can be a solution to the problem of protein shortage. The advantages projected include

the high reproductive rate, rapid maturity, high genetic potential, efficient feed utilization, limited competition with humans for food and high quality nutritious meat (Cheeke *et al.*, 1986). Egbo *et al.* (2000) reported that rabbits are efficient converters of feed to meat and utilize up to 30% fibre as against 10% by most poultry species. Thus, the daily weight gain of rabbit is high in proportion to the body weight which gives them a rapid growth rate before sexual maturity. Rabbits can be produced on forages alone, although production can improve by adding other feed supplements. The potential of forages as feed for rabbit is of particular significance because of their availability and ability of rabbits to effectively digest leaf protein (Bello, 2003). In addition, the development of high quality forage-based diets is a priority research area in developing countries (Linga *et al.*, 2003). It is against this background this study is design to assess the effect of different forages supplementation with concentrates on performance characteristics of rabbits.

Materials and methods

Experimental site

Katagum local government is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes 11^0 42' and 11^0 40^0 and longitude 10^0 31' and 10^0 11' east (Anon, 2009). It shares common boundary with Itas/Gadau local government in north west, Jama'are to the west, Dambam to the east, Misau to the south west, Giade to the south and Shira to the southwest (Azare, 2013). It has a landmass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by the inter tropical convergent zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), the annual temperature ranged between 22-33^0 C from April to May (Bashir *et al*., 2001). The mean annual rainfall ranged between 615.6-985mm with peak between July- Augusts. The study area is in the Sudan savanna, the vegetation is greatly determined by the nature of the soil. The soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate

Sources and processing of feed ingredients

Other feed ingredients were procured at Azare main market. The rabbits used in this study were obtained from the rabbit farmers in Azare. The supplementary forages include the Digitaria spp, Cassia spp and cashew leaves and all the forages were collected in the Alexandra Yau Doe dry season farming in collages of education Azare. The ingredients were used to formulate four experimental diets. The diets were isonitrogenous; the percentage composition of experimental diets was shown in Table 1. The forages were supplemented at 100g in the morning and 100g in the evening per 2 rabbits. Forty eight rabbits of mixed breeds and sexes were randomly allotted to four experimental diets. There are twelve rabbits per treatment replicated six times in a completely randomized design (CRD). Daily feed intake was measured daily by subtracting the difference between feed giving and reminder, rabbits were measured weekly to determine the weekly weight changes. At the end of the experiment, 12 rabbits (3 from each treatment) were randomly selected, starved overnight, weighed and slaughtered in the morning by slitting the throat. They were skinned, eviscerated then the organs and guts parts were separated; liver, lungs, small intestine, large intestine and ceacum and were weighed individually. The carcass weights were expressed as percent body weight. The blood parameters were analyzed according to Bush, 1975. Data generated for all the parameters were subjected to analysis of variance

technique (ANOVA balanced design) as described by Steel and Torrie (1980). Where there was significant difference between treatment means, Duncan multiple range rest (DMRT) was used to separate the means Duncan's (1955).

Results and Discussion

The experimental diet is shown in Table 1, the diets is 16% crude protein and 2800 metabolisable energy which is adequate for growing rabbits in the tropics (Aduku, 2004). The growth performance of rabbits fed forages is presented in Table 2. Result showed that daily feed intake varied between 74.37g in the control diet to 84.88g in cassia spp and the difference between the values were statistically significant (P<0.05). Rabbits on cassia spp significantly consumed more feed than the control diet. The feed intake values are in conformity with earlier reports (85.21-109.00g) of Mmerole *et al*., 2011 on rabbits fed *Tridax procumbens* leaves. Rabbits in concentrate alone has the lowest feed intake, this suggest that forage played a very important role in feed intake and utilization in rabbits nutrition. The daily weight gain ranged between 16.38g in the control diet to 24.04g in rabbits fed Digitaria spp and the difference between the values are statistically significant (P<0.05), rabbits on Digitaria spp significantly gained more weight than rabbits on other diets, this can be attributed to digestibility and palatability of Digitaria grass compared to other forages based diets. The daily weight is higher than (9.61-11.67g) reported by Aderina *et al*., 2008 on rabbits fed centrosema pubescens or calapogonium mucunoides in rabbits of savanna zone in Nigeria. The depressed weight gain in the control diet can be attributed to the role play by crude fibre in rabbits nutrition, absence of the forage in rabbit's diet tends to have a negative effect on its ability to utilize feed and thus on its growth performance. This result appears to be in agreement with the observation by Taiwo *et al*. (2004) that higher weight gains and improved feed utilization efficiency were obtained in rabbits fed on diet formulated to include *Tridax procumbens* than diet based solely on concentrate alone. The feed conversion ratio ranged between 3.29 in Digitaria based diet to 5.30 in cassia based diet and the difference between the values are statistically significant (P<0.05). Rabbits on Digitaria based diet utilized the concentrate-forage based diet (P<0.05) more effectively and this can be attributed to highly weight deposited by rabbits in the Digitaria spp. The feed efficiency ratio varied between 0.18 in cassia based diet to 0.30 in Digitaria spp and the difference between the values are statistically similar (P>0.05). Rabbits on Digitaria based diet utilize the feed better. The economics of production showed that rabbits fed Digitaria forage has the less cost of gain ₦ 142.23 (Table 2). The live weight gain of rabbits fed forages and concentrate based diet ranged between 968.84 in rabbits fed cassia spp to 11.90g in rabbits fed Digitaria spp based diet and the difference between the values were statistically significant (P<0.05)(Table 3), the values were higher than 650-756g reported by Naandam *et al*., 2011in rabbits fed stylothensis and sida acuta as sole feeds. Similarly the dressing percentage followed the same trend being relatively higher in Digitaria based diet (53.22%) and lower in concentrate based diets (42.95%) (Table 3). The gut characteristics affected by the type of forage include small intestine large intestine, kidney and stomach (P<0.05). Other gut characteristics were statistically similar (P>0.05)(Table 3). The blood parameters affected by the different types of forage were white blood cells, platelets, ASAT and ALAT (P<0.05) (Table 4) The heamatological parameters were within the range of values reported by Naandam *et al*., 2011 on rabbits fed forage diets. Considering the results of this study the different forages influence the

performance of rabbits, however Digitaria spp has better performance characteristics compared to other forages and concentrate based diet and should be recommended to rabbit's farmers.

Table 1: Percentage composition of the experimental diets

Ingredients	**Control 1**	**Cashew 2**	**Cassia spp 3**	**Digitaria spp 4**
Maize	58.26	58.26	58.26	58.26
Full fat soyabean	12.85	12.85	12.85	12.85
Wheat offal	20.00	20.00	20.00	20.00
Forage	00.00	2.00	2.00	2.00
Fishmeal	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Common salt	0.25	0.25	0.25	0.25
Vitamin/mineral premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Crude protein	16.09	16.07	16.05	16.11
Metabolisable energy(Kcal/kg)	2650	2800	2800	2800
Crude fibre	6.50	10.78	11.66	8.43

Table 2: Performance Characteristics of rabbits feed different forages

Parameters	**Control 1**	**Cashew 2**	**Cassia Spp 3**	**Digitaria Spp 4**	**SEM**
Initial weight (g)	520	521	520	521	NS
Final weight (g)	978.64 ^{c}	1080.00^{b}	968.84^{c}	1190.40^{a}	*103.0
Daily Feed Intake (g)	74.37 ^{b}	77.47 ^{b}	84.88 ^{a}	79.05 ^{b}	*10.51
Daily Weight gain (g)	16.38 ^{b}	19.99 ^{b}	16.03 ^{b}	24.05 ^{a}	*3.61
Feed conversion Ratio	4.54 ^{a}	3.87 ^{a}	5.30 ^{b}	3.29 ^{a}	*2.56
Feed efficiency ratio	0.22	0.25	0.18	0.30	NS
Mortality (%)	0	1	1	1	-
Total Feed intake (kg)	2.26	2.67	2.68	2.41	NSA
Cost/kg feeds (N)	120	122	123	122	NSA
Total weight gain (kg/rabbit)	0.46	0.56	0.45	0.67	NSA
Total Feed Cost (N/kg	794.38	839.72	728.84	953.40	NSA
Cost/Kg gain (N/kg)	172.69	149.95	161.96	142.23	NSA

*****= ($P<0.05$), NSA= Not statistically analyzed

Table 3: Carcass characteristics of rabbits feed different forages

Parameters	Control 1	Cashew 2	Cassia Spp 3	Digitaria Spp 4	SEM
Live weight (g)	978.64[c]	1080.00[b]	968.84[c]	1190.40[a]	*103.0
Slaughter weight (%)	93.05	93.89	92.12	92.23	*1.97
Dressing percentage (%)	42.95	48.06	46.06	53.22	*5.11
Pelt (%)	2.78	3.67	3.38	3.17	*0.89
Small intestine (%)	1.91	2.00	2.60	1.74	*0.86
Large intestine (%)	2.42	2.68	1.72	1.57	*1.51
Small intestine cm	13.61	20.07	19.97	18.07	*6.46
Large intestine cm	4.52	4.69	4.15	4.03	*0.89
Kidney (%)	0.37	0.25	0.27	0.46	*0.21
Stomach (%)	0.83	0.62	0.68	0.69	NS
Heart (%)	0.14	0.50	0.22	0.25	NS
Liver (%)	1.67	1.11	1.53	1.65	NS
Lungs (%)	0.26	0.20	0.22	0.37	NS
Ceacum (%)	2.68	2.56	2.15	3.26	*0.73
Ceacum cm	2.15	2.25	3.03	3.09	*1.27

*****= (P<0.05), NS= Not significant

Table 4: Heamatological and serum biochemical of rabbits feed different forages

Parameters	Control	Cashew	Cassia Spp	Digitaria Spp	SEM
Red blood cells (X106/mm3)	5.30	6.85	5.14	6.02	1.55NS
Packed cell volume (%)	38.50	42.00	37.50	44.00	2.45NS
White blood cells (x 103/mm3)	8.55	10.20	7.30	8.00	*2.90
Blood platelets	55.70	46.55	44.10	33.15	*22.55
Albumin (g/dl)	3.01	3.51	2.41	3.91	0.75NS
Globulin (g/dl)	2.41[b]	2.62[a]	2.42[b]	2.32[c]	0.02NS
Total protein (g/dl)	4.41	5.51	5.01	4.91	1.19NS
ASAT	37.00	34.00	36.00	34.00	*3.45
ALAT	35.00	32.00	32.50	34.00	*3.15

*****= (P<0.05), NS= Not significant

References

Aduku, A.O. (2004). Animal Nutrition in the Tropics. Davcon Computers and Business bureau, N0.11 Samaru Zaria.

Aderinola O.A., Ojebiyi O.O., Rafiu T.A., Akinlade J.A., Adepoju L.O.(2008). Performance evaluation of growing rabbit fed diets containing varying inclusion levels of *centrosema pubescens* or *calapogonium mucunoides* in the savannah zone of Nigeria. *9th World Rabbit Congress – June 10-13, 2008 – Verona – Italy*

Anonymous (2009). Mapsofworld. Com. Available at http://www.mapsofworld.com /Nigeria/cities/azare/html mapXL inc. 10s third street Suite 310 San Jose.

Azare, I.M. (2013).Evaluation of farmer's response strategies to climate change in Katagum local government area of Bauchi state. *Journal of Environment Technology and Sustainable Agriculture* **2** (10):26-33

Bamgbose, A. M., Akinlabi, H., Oboh, S. O., Aruna, M. B., Ikhimioya, Oteku, I. T., Igene, F. U. and Otoikhain, C. S. O. **(**2004). Replacement Value of Copra Meal for Soybean Meal in Weaner Rabbit Diets. Proc. 9th Annual conc. Anim. Sci. Ass. Of Nig. (ASAN) 2004: 26-27.

Bashir, M.M., Bala, A., Mohammed, I.T., Isa, H.J., Adamu, M.B., Hamisu, M.S., and Abdullahi, A.(2001).Requestfor the creation of Katagum state out of the present Bauchi state of Nigeria. A memorandum submitted to the speakers, house of representatives, national assembly, Abuja, Nigeria pp 1-28.

Bello, K.M. (2003) Chemical composition of some plants used as feed for rabbits in Bauchi Metropolis. *Nigerian Journal of Animal production*. **30** (1): 32 – 36.

Bush, B.M. (1975).**Veterinary Laboratory Manual**. Williams Heinemann Medical book Limited. London, U.K., pp. 447.

Duncan, D. B. (1955). Multiple Ranges and Multiple F. test Biometrics. New York: McGraw Hill Higher Education.

Egbo, M. L., Doma, U.D. and Lackaks, A.B. (2001). Characteristics of small rabbit production and management in Bauchi metropolis. *Proceedings of the 26th Annual Conference of Nigerian Society for Animal Production* (NSAP), 18th – 21stMarch, 2001, ABU, Zaria, Nigeria. pp. 160 – 162.

FAO (1992). Food and Agricultural Organization. Production Year Book 1992. Rome, Italy.

Lebas F. Rouvier.,R. De Rochembeanu H. (1986). The Rabbit Husbandry head and Production. FAO Animal Production and Health series no. 21. Rome Italy pp 60 -77.

Linga, S.S., Lukefahr, S. D. and Lukefahr, M. J. (2003). Feeding of *Lablab purpurens* forage with molasses blocks or sugarcane stalks to rabbit fryers in sub tropical South Texas. *Livestock production Science*, 80(3): 201 – 209.

Maidala, A. and Istifanus, J.A (2012). The role of micro livestock in alleviating protein deficiency and poverty reduction in Nigeria being a paper presented at the second school of vocational and technical education National Conference Held at College of Education Azare from 4-8th June,2012.

Mmereole, F.U.C. Egoh,J.O. and Obinne, J.I. (2011). Growth performances and cost analysis of weaner rabbits fed varying dietary levels of crude protein supplemented with *tridax procumbens. Pakistan Journal of Nutrition* **10** (2): 120-123, 2011

National population commission (2009). Federal republic of Nigeria. Gazette No. 2:96. Printed and published by federal government printers, Abuja. FGP

Naandam, J. B.A.Y. Padi, P. Bigol, R. Mensah-kumi (2012). Use of *stylosanthes hamata* and *sida acuta* as sole feeds for rabbits *(oryctolagus cuniculus. Online Journal of Animal and Feed Research Volume 2, Issue* **2***: 182-188 (2012))*

Obioha, F.C (1992). A Guide to poultry production in the tropics. Acena publishers. Enugu.

Steel, R. G. D. and Torrie, J. H. (1980). Principles and procedures of Statistics: A biometric Approach New York: McGraw Hill Higher Education. The Cambridge International Dictionary of English 2003 edition. Pp 115-118.

Taiwo, A.A., Adejuigbe, A.D., Adebowale, E.A., Oshotan J.S. and David, O.O. (2005). Performance and nutrient digestibility of weaned rabbits fed forages supplemented with concentrate. *Nigerian Journal of Animal Production.* **32**(1): 74 – 78.

Taiwo, V.O., O.O. Afolabi and A.O. Adegbuji, 2004. Effect of Thevetie peruviana seed cake based diet on the growth, haematology and tissues of rabbit. Tropical and Subtropical Agro-ecosystem, **4**: 7-14