©Adamawa State University Journal of Scientific Research 04(2): August, 2016
ISSN: 2251-0702

Influence of Feed Replacement Levels on Growth Performance and Carcass Characteristics of Weaner Rabbits in Mubi

Babale, D.M[1], Bilham, H[2]. and M.B. Masudi[3]
1. Department of Animal Production, Adamawa State University, Mubi, Nigeria.
2. Gombi Local Govt. Area, Adamawa State, Nigeria.
3. Department of Animal Production, Adamawa State University, Mubi, Nigeria.
Contact: *babaled@yahoo.com*; 07033749171; 07088247216

ABSTRACT

An experiment was conducted at the Adamawa State University Teaching and Research farm, Gidan Madara, Mubi. It was done to evaluate the effect of replacing maize bran with maize cob in on the growth performance and carcass characteristics of weaner rabbits. This was done in a six weeks' trial from May to June, 2013. Twelve (12) weaner rabbits weighing on average, 1333.3-1633g were allotted to four treatments of three (3) rabbits per treatment in a completely randomized block design. Four isonitrogenous diets (17% CP) were formulated in which maize cob was included at 0, 8, 16 and 24% levels designated as treatments T_1, T_2, T_3 and T_4 respectively. The results showed that the increasing levels of corn cobs had significant ($P<0.05$) difference on all the parameters except daily weight gain which was not significantly ($P>0.05$) different. Feed intakes were 58.49, 70.79, 61.82 and 59.32g for T_1, T_2, T_3 and T_4 respectively. Daily weight gains were 11.12, 15.07, 15.88 and 9.55g for T_1, T_2, T_3 and T_4. Feed conversion ratios were 9.92, 7.70, 7.07 and 12.03 with feed conversion efficiencies of 0.101, 0.130, 0.140 and 0.080 for T_1, T_2, T_3 and T_4 respectively. Dressing percentage and some cut up parts were significantly ($P<0.05$) affected by dietary treatments. Organ weights being kidney (9.65-12.27g), spleen (0.355-0.685g), lungs (8.18-11.43g) and liver (31.45-53.42g) were significantly ($P<0.05$) difference among treatment means. Therefore, in a weaner rabbit diet, maize cob could be included up to 24% without adverse effect on performance.

KEYWORDS: Weaner rabbits, Maize bran, Maize cob, Replacement levels.

Introduction

About one in four people in sub-Saharan Africa do not get enough to eat and food emergency remains an all-too- frequent reminder of poverty (Kyomo, 2013). To fight hunger, African countries need economic growth and food security, which implies food availability and access or capacity to purchase food. He added that if the human population continues to grow at about 2% yearly, food production needs to grow at least 4% yearly if the region is to meet the demand for food (Kyomo, 2013).

Nigeria is experiencing a historic demographic expansion and a spectacular change in food habit (Christopher *et al*., 2010). With a population growth rate nearing 2.8% yearly, her own domestic meat production is far from being able to meet demand (Christopher *et al*., 2010). Although the human population growth in

developed countries is stabilizing, that of developing countries like Nigeria is still increasing rapidly. As the population trend continues, more people are to be fed (Mailafia *et al.*, 2010). The recommended minimum nutrients requirements to be consumed per day are 2,191 Kcal ME and 53.8g crude protein (Agbana *et al*., 2012) while Nigerian meat production index is 22g per caput per day (Adetunji and Rauf, 2012). The minimum recommended crude fiber (CF) content in rabbit feed is 18% (Bunny, 2015). Because of the exorbitant prices of conventional sources of meat such as beef, mutton, chevron, pork and poultry, rabbit production has gained considerable interest recently (Olajide and Ayoola, 2012).

Rabbit production is a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Ali- Balogun, 2004). This is because they have high fecundity and prolificacy with good ability to utilize forage. Rabbit meat has low fat and cholesterol which makes the flesh desirable for diabetics', hypertensive and middle aged people (Ajala and Ali- Balogun, 2004). Rabbit production has become more and more attractive due to its high reproductive potentiality, high mothering ability, adaptability in wide range of climatic conditions, high genetic variability, high roughage utilization potentiality and low cost of production (Das and Sikka, 2007). In spite of the various attributes of rabbit over other livestock, the cost of production has become a nightmare to local farmers due to the ever increasing costs of concentrate feeds (Omoikhoje *et al*., 2006).

Bawa *et al*., (2008) stated that the high cost and scarcity of conventional feedstuffs such as groundnut cake, Soybean cake, Palm kernel cake, Blood meal and fish meal is a major limiting factor to large scale commercial rabbit production in Nigeria. That as more people get involved in rabbit production, it becomes imperative to develop appropriate and cost-effective feeding system for the back yard and commercial rabbit producers. *Ipomoea eriocarpa* is a legume weed which is high in crude protein (16.23%). The hay of this weed could replace Groundnut haulms up to 50% without adverse effect on feed intake, weight gain, feed conversion ratios and carcass qualities of weaner rabbits (Dazala *et al*., 2012).

Maize cob is a waste from maize after removal of grains which may be used in place of maize bran but the replacement level is not known.

Because of the scarcity of information on the optimum replacement level of maize cob for maize bran in a weaner rabbit diet that gives better growth performance and carcass quality, the present study was designed to investigate the growth performance and carcass characteristics of weaner rabbits fed the different diets.

Materials and Methods

Study Site: The experiment was conducted at the Department of Animal Production Rabbitory unit of the Livestock Teaching and Research farm, Adamawa State University, Mubi. It is situated in the Northern part of Adamawa State between Latitude 90^{o} 11^{I} North of the equator and Longitude 13^{0} 45^{I} east of the Greenwich Meridian at an altitude of 696 m above sea level. With an area of 4,728.77 m^2 and population of 245,460, Mubi region falls within the Sudan Savanna vegetation zone of the country (Saidu and Gadiga, 2004).

Experimental animals and their management: Twelve (12) New Zealand white weaner rabbits were procured from reputable breeder and used for this research. They were housed in clean disinfected cages with clean drinking water fed *ad libitum.* Supplemental diets of maize cob replacing maize bran at 0, 8, 16 and 24% designated as treatments T_1, T_2, T_3 and T_4 respectively were fed to the animals with Morning glory (*Ipomoea eriocarpa*) weed hay as basal diet.

Before the commencement of the experiment, one week was allowed for adaptation to allow the animals get used to the environment and the diets. They were dewormed using Piperazine in drinking water. Proper sanitation was maintained throughout the experimental period of six (6) weeks.

Experimental Design: The twelve (12) rabbits were allocated to four dietary treatments each replicated three (3) times in a completely randomized block design (CRBD).

Parameters Determined: Parameters determined were dry matter intake, weekly, daily weight gains, feed efficiencies, feed conversion ratios and carcass characteristics.

Daily dry matter intakes were determined as the differences between fed offered and feed rejected after 24 hours for each day. Weekly weight gain was determined as the difference in weight between the present and the previous after seven days. The daily weight gain was obtained by dividing weekly weight gain by seven days. Feed conversion ratio was determined by dividing feed intake by weight gain. Feed efficiency was the result of dividing weight gain by feed intake.

For carcass evaluation, four rabbits (one per treatment) were selected at random at the end of the feeding trial. They were starved overnight prior to bleeding to clear the gut and live weights were recorded. This was followed by cutting the jugular vein with a sharp knife and flayed. Each carcass was eviscerated with internal and external organs carefully removed and weighed separately. All these were recorded.

Statistical Analysis: Data obtained were subjected to analysis of variance (ANOVA) of a completely randomized block design as described by Steel and Torrie (1980). Means were separated using Duncan Multiple Range Test, at 5% level of significance (P=0.05).

Results and Discussion

Compositions of the experimental diets are presented in table 1. The levels of replacement of maize cob for maize bran are presented. The final calculated crude protein contents are 16.72, 16.66, 16.75 and 17.02% for treatments T_1, T_2, T_3, and T_4 respectively (Table 1). Treatment (T_4) had the highest level of crude protein (CP) of 17.02% while treatment (T_2) had (16.66%) the lowest.

Table 1: Composition of Experimental Diets.

	TREATMENTS			
Ingredients (%)	T_1	T_2	T_3	T_4

Maize	45.0	42.0	40.0	38.0
Soybean	16.8	19.8	21.8	21.8
Fish meal	4.0	4.0	4.0	6.0
Maize bran	32.0	24.0	16.0	8.0
Maize cobs	0.0	8.0	16.0	24.0
Bone meal	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5
Premix	0.2	0.2	0.2	0.2
Totals	100	100	100	100
Calculated CP	16.72	16.66	16.75	17.02

The proximate compositions of the experimental diets are shown in table 2. The analyzed crude protein contents were 17.2, 18.7, 23.1 and 18.9% for diets T_1, T_2, T_3 and T_4 respectively with that of Ipomoea eriocarpa 7.7%. The crude fiber values were 7.2, 8.6, 7.5 and 10.2% for T_1, T_2, T_3 and T_4 for the respective treatments.

Table 2: Proximate Composition of Experimental Diets on % dry matter Basis

	TREATMENTS				
Nutrients	T_1	T_2	T_3	T_4	Ipomoea
Moisture	6.5	5.7	5.8	4.6	9.5
Dry Matter	93.5	94.3	94.2	95.4	90.5
Crude Protein	17.2	18.7	23.1	18.9	7.7
Ether Extract	3.1	2.8	4.2	5.7	11.2
Crude Fiber	7.2	8.6	7.5	10.2	17.3
Ash	4.2	5.7	6.2	7.2	10.4
NFE	69	66.1	60.7	63.6	61.4
ME(MJ/Kg)	11.74	11.74	11.73	11.58	11.2

The crude protein contents of the diets were higher than the minimum recommended by Bunny (2015). However, the crude fiber levels were lower than the 18% minimum or 20-25% best recommended by Bunny (2015). Dana (2014) had earlier recommended rabbit diet containing 22% CF, 14% CP, 1% fat and 1% Calcium. This shows that the experimental diets were of higher quality than the minimum requirement for rabbit diet. This resulted in high daily weight gains.

Table 3: Growth Performance

	DIETS				
Parameters	T1	T2	T3	T4	SEM
Initial weight (g)	1633.00[a]	1400.00[a]	1333.30[a]	1566.70[a]	286.58
Final weight (g)	2100.00[a]	2033.30[ab]	2000.00[ab]	1966.70[ab]	67.39
Total Weight gained (g)	467.00[a]	633.30[ab]	666.70[a]	400.00[ab]	41.54
DMI (Concent.)	58.49[b]	70.79[a]	61.82[b]	59.32[b]	1.93
DMI (Rough.)	51.86[a]	45.32[b]	50.44[ab]	55.59[a]	2.05
Total DMI	110.35[b]	116.11[a]	112.26[ab]	114.91[a]	29.88
Daily Weight gained (g)	11.12[b]	15.07[a]	15.88[a]	9.55[c]	2.84
FCR	9.92[c]	7.70[b]	7.07[b]	12.03[a]	0.65
FCE	0.10[b]	0.13[a]	0.14[a]	0.08[c]	0.03

SEM=Standard Error of Means.

Growth performance of rabbits on the experimental diets is presented on Table 3. The weight gain result showed that there were no significant (P>0.05) difference among treatment means. Total dry matter intakes were significantly (P<0.05) affected by the dietary treatments which is in line with the findings Taiwo *et al.* (2005).

The daily weight gains obtained were in the range of 9.55-15.88g which is lower than 23g obtained by Etchu *et al*. (2012) but similar to 9.67-12.14g obtained by Kagya-Agyemany *et al.* (2013) and 14.81g (Fadare, 2015). Feed conversion ratios (FCR) were 9.92, 7.70, 7.07 and 12.30 for treatment T_1, T_2, T_3 and T_4 respectively. Treatment T_4 had the highest (12.03) with T_3 (7.07) the lowest. The animals in T_3 had the best feed utilization as also observed by Doma (1998). This follows the same trend with feed conversion efficiency (FCE) with treatment T_3 having the highest.

The range for feed conversion ratios was 7.07-12.03 which was higher than 5.11-7.66 obtained by Mmereole *et al*. (2011) with feed conversion efficiency (FCE) of 0.08-0.14 lower than 0.24-0.300 obtained by Etchu *et al*. (2012).

The effects of the diets on carcass quality and organs of weaner rabbits are presented in Table 4. All the traits measured were not significantly (p>0.05) affected by dietary treatment except carcass weight, dressing percentage and legs. Dressing percentage increased with daily weight gain.

Rabbits fed 16% maize cob inclusion in the diet (T_3) had the highest mean live weight gain and dressing percentage (80.1%). This agrees with Adeniji *et al*. (2011) who reported that heavier rabbits produce greater eviscerated yield. There were significant (P<0.05) differences observed for lungs, small intestine and large intestine with increase in the level of maize cob inclusion in the diet. This could be due to the need to cope with added task of detoxification (Adeniji *et al*. 2011). The kidney, spleen and fat did not show significant (P>0.05) difference across treatment means.

Table 4: Carcass Quality and organs of Weaner Rabbits fed with the experimental diets.

	DIETS				
Parameters	T1	T2	T3	T4	SEM
Pre-slaughter wt (g)	1534	1455	1560	1559	41.318
Carcass wt (g)	977.5^{b}	1038.0^{b}	1250.0^{a}	990.5^{b}	26.091
Dressing Percentage	63.90^{b}	71.35^{ab}	80.10^{a}	63.55^{b}	2.202
Head (g)	135.00^{a}	152.50^{a}	152.00^{a}	147.50^{a}	8.898
Legs (g)	42.50^{c}	49.50^{a}	51.00^{a}	49.50^{a}	1.436
Loins (g)	250.00	252.00	251.00	215.00	10.231
Shoulder (g)	325.00	310.00	345.00	295.00	15.470
Skin (g)	155.00^{a}	125.00^{b}	145.00^{ab}	145.00^{ab}	5.000
Thigh (g)	410.00^{a}	290.00^{c}	355.00^{b}	349.00^{b}	8.602
Caecum (g)	50.11^{d}	150.66^{c}	185.69^{a}	162.52^{b}	2.593
Fat (g)	20.07	20.99	21.00	19.37	0.383
Kidney (g)	10.36^{ab}	12.27^{a}	10.29^{ab}	9.65^{b}	0.499
Large Intestine (g)	149.50^{a}	63.22^{b}	39.70^{c}	61.84^{b}	3.077
Liver (g)	42.05^{b}	53.42^{a}	31.45^{c}	37.33^{bc}	1.781
Lungs (g)	9.03^{b}	9.38^{b}	8.18^{b}	11.43^{a}	0.357
Small Intestine (g)	77.50^{b}	69.50^{b}	85.00^{b}	105.00^{a}	3.041
Spleen (g)	0.395^{b}	0.685^{a}	0.525^{ab}	0.355^{b}	0.056

SEM=Standard Error of the Means

Conclusion

Results of the study showed that 24% of maize cob could be included in the diet of weaned rabbit which still results in good performance. The superior weight gain of rabbits on the control diet could be offset by the relatively cheaper unit cost of diet containing maize cob.Farmers could therefore take advantage of availability of the maize cob to lower the feed cost and increase their profit margins. Feeding with *Ipomoea eriocarpa* also increases the protein supply of about 7.5% to the animals with consequent increase in weight gain.It is recommended that Maize cob and the legume weed hay (Ipomoea eriocarpa) be used by the local farmers as alternative cheaper rabbit feeds. Best replacement level of maize cob for maize bran is 16%.

References

Adeniji, A. A., Gana, E.S., Chibugo, I.C. and R.U. Oniyia (2011). The feeding value of *Moringa oleifera* Leaves for growing Rabbits. *Proceedings of the 36th Annual Conference of Nigerian Society for Animal Production (NSAP)* 13th -16th March, 2011.

Adetunji, M.O. and M.O. Rauf (2012). Analysis of Household Demand for Meat in South West Nigeria. *Global Journal of Science Frontier Research in Agriculture and Biology*, 3(1):2-10.

Agbana, J.A., Aribido, S.O. and Dairo, F.A.S. (2012). Carcass yield and Organ weight of weaner Rabbit fed Parboiled Mango Seed kernel Meal. *Proceedings of the 17th Annual Conference of Animal Science Association of Nigeria (ASAN)* held in Abuja, 9th-13th September, 2012. 259-262.

Ajala, M.K. and Ali- Balogun, J.K. (2004). Economics of Rabbit Production in Zaria, Kaduna State. *Tropical Journal of Animal Science* (7): 1-10.

Bawa, G.S., Ajide, S.O., Adeyinka, I.A. and M.K. Ajola (2008). Effects of Varying Levels of Groundnut haulms and Cowpea shells on performance of Weaner Rabbits. *Asian Journal of Animal and Veterinary Advances*. 3: 54-61.

Bunny, B. (2015). Healthy Diet for House Rabbits. Bunny Information service. (http://www.binkybunny.com/BUNNYINFO/tabid/53/categoryID/2/PID/940) 12/5/2015.

Christopher, B., Bonnet, B. and G. Bertrand (2010). Demand for Farm Animal Products in Nigeria: An Opportunity for Sahel Countries. *Institute of Research and Application Methods* (IRAM), N0 51 July 2015.

Dana, K. (2014). What should I feed my Rabbit? Proper Rabbit Maintenance Diet. (http://www.bio.miami.edu/hare/diet.html) 12/5/2015.

Das, S.K. and A.K. Sikka (2007). Effects of Different Housing and Feeding Systems on the Performance of Broiler rabbits in Eastern Himalaya region of India. *Livestock Research for Rural Development 19* (8): 2207.

Dazala, I.U., Moruppa, S.M. and Napoleon, E. (2012). Comparative Evaluation of the Utilization of Groundnut haulms and Ipomoea eriocarpa hay by Rabbits. *Adamawa State University Journal of Agricultural Sciences* 2(2): 69-73.

Doma, U.D. (1998). Utilization of Cowpea shell and Maize cobs as source of Fiber for Rabbits. *M.SC. Thesis Report submitted to ATBU Bauchi (Unpublished)* Pp 84-90.

Etchu, K.A., Humbu, M.E., Ndamukong, K.J.N. and E.B. Agbor (2012). Effects of Varying Levels of Brewers' Dried grain on the Growth Performance of Weaner Rabbits. *Greener Journal of Agricultural Sciences* 2 (6):237-245, 2012.

Fadare, A.O. (2015). Feed Utilization of New Zealand White, California, Palomino brown and Havana black rabbit in the humid Tropics. *Sky Journal of Agricultural Research* 4(2):038-041, 2015.

Kagya-Agyemamy, J.K., Nelson, A. and C. Agya-Agyemang (2013). Growth performance of Weaner Rabbits Fed on Dried Pito Mash as a Replacement for Maize. *ARPN Journal of Agricultural and Biological Science* 8(4):23-27. 2013.

Kyomo, M.L. (2013). Importance of Strong Research-Extension Linkages in increasing Livestock Production in sub-Saharan Africa. (http://www.fao.0rg/wairdocs/ilri/htm. (2/5/2015).

Mailafia, S., Onakpa, M.M. and O.E. Owoleke (2010). Problems and Prospects of Rabbit in Nigeria-A Review. *Bayero University Journal of Pure and Applied Science*, 3(2): 2-10.

Mmereole, F.U.C., Egoh, J.O. and J.I. Obinne (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.

Olajide, A.A. and O.A. Ayoola (2012). Restricted Concentrate with *ad libitum* Forage feeding: Effects on performance and carcass yield of growing rabbits. *Revista Cientifica UDO Agricola* 12 (3):668-674, 2012.

Omoikhoje, S.O., Bamgbose, A.M., Aruna, M.B. and R.A. Animashahun (2006). Response of Weaner Rabbits to Concentrates Supplemented with Varying Levels of Syndrella nodiflora Forage. *Pakistan Journal of Nutrition* 5(60): 577-579, 2006.

Saidu, I. and Gadiga, B.L. (2004) *Population: A write up in Mubi Region, A Geographical synthesis* by Adebayo A.A. Published by Paraclette Publishers Yola. P 117-119.

Steel, R.G. and Torrie, J.D. (1980) *Principles and Procedure of Statistics, a Biometric Approach*, *International Students Edition*, McGraw-Hill Book Company, New York, U.S.A. Pp 140-145.