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Performance Evaluation of Male Weaner Rabbits Fed Diets Containing Graded Levels of Blood-Wild Sunflower Leaf Meal Mixture

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Abstract : A twelve-week feeding trial was conducted to investigate the effect of Blood-wild Sunflower Leaf Meal (BWSLM) mixture on the performance of cross-bred (New Zealand x Chinchilla) male rabbits aged between 6-9 weeks. Thirty-two rabbits were randomly allocated to four dietary treatments of 8 rabbits per treatment in a Complete Randomized Design experiment. The BWSLM was included at 0, 5, 10 and 15% levels in diets 1, 2, 3 and 4, respectively. The response criteria showed that feed intake, digestibility of dry matter, crude protein, crude fibre, either extract, ash and total digestible nutrients, feed cost/kg weight gain were significantly ($p<0.05$) affected. The daily weight gain and feed to gain ratio were not significantly ($p>0.05$) affected. The study indicated that BWSLM can be included in rabbit diet up to 15% inclusion level.

Key words: Crossbred rabbits · blood-wild sunflower leaf meal · feed intake · daily weight gain · digestibility

INTRODUCTION

In Nigeria as in most developing countries the daily dietary intake of animal protein (3.24 g) falls grossly short of the recommended 27 g animal protein per caput/day [1]. This observed low animal protein consumption may be attributed to the declining animal protein production occasioned by high cost of livestock production especially the cost of feeds which usually accounts for up to 70% of the total cost of production [2]. It is obvious therefore that any effort targeted at reducing the cost of feeding will be one of the possible remedies. In addition, a possible and most appropriate remedy for the shortage of animal protein for human consumption lies in the production of fast maturing animals like rabbit, this is because livestock like cattle, pigs, goats and sheep take longer period to mature.

Rabbit production is suitable because as monogastric herbivores, they do not compete directly with man for both cereal and legume grains. Rabbit is also favoured because of its high fecundity, low cost of investment, short generation interval, as well as ability to utilize diverse forages [3]. Nutritionally, rabbit meat has a higher protein (20-21%), low calories (1749 kcal kg^{-1}) and low fat content (10-11%) when compared with meat from most livestock species [4].

Furthermore, Janieri [5] had reported that rabbit meat has the lowest cholesterol value of 169mg/100g (dry matter basis) when compared with beef (200 mg), chicken (220 mg) and pork (223 mg) and a low sodium content. Consequently, rabbit meat has been listed in the USDA [4] as an approved meat source for hyper-tensive patients.

Despite these obvious advantages, improved feed formulation and strategies for enhancing the production potentials of rabbit especially in the tropical and sub-tropical regions of the world have not been fully exploited. According to M'cenes *et al*. [6] such nutritional strategies would involve feeding of rabbits with agro-industrial by-products together with the use of inexpensive locally available feed ingredients that will drastically bring down the production cost. Among the non-conventional feedstuff, that has gained acceptance in animal nutrition are blood meal [6] and wild sun flower [7, 8]. The wild sunflower (*Tithonia diversifolia* Helms. A.Gray) is of the family Asteracea. In Nigeria it grows on road sides and fallow lands in the forest savannah zone [9]. It grows as annual, biennial or perenial plant depending on the habitat. It has been fed to sheep, goat and cattle [10] and pigs [11]. Therefore, its acceptability by ruminant and non-ruminant livestock and its relative abundance makes it a potential non-conventional animal feed source in the derived savannah zone.

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Investigations had revealed the composition and potentials of blood-rumen content mixture as a good source of protein in monogastric ration [12]. There is however, paucity of information on a possible combination of blood meal and wild sunflower leaf meal inclusion in rabbit diet.

This form the basis of this study, to determine the effect of feeding BWSLM mixture on growth, digestibility and economics of production of male rabbits.

MATERIALS AND METHODS

Site: The experiment was carried out at the Rabbitry unit of the Teaching and Research farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso is in the derived savannah zone of Nigeria. The study area is located on Latitudes 8° 07'N and 8° 12'N and Longitudes 4° 04'E and 4° 15'E. The mean annual rainfall is 1247mm with a relative humidity of between 75 and 95%. It is situated at about 600 m above sea level with a mean annual temperature of 26.2°C [13].

Preparation of test ingredients: The wild sunflower plants used for the preparation of Wild Sunflower Leaf Meal (WSLM) were harvested from the uncultivated plots of the University farm. The leaves and succulent stalks were harvested prior to the flowering stage and air-dried under shade before milling.

Fresh bovine clotted blood was collected from the central abattoir within Ogbomoso locality, void of extraneous materials and then boiled for 1 h before been chopped into smaller lumps to facilitate faster drying and then sun-dried for 5 days before milling.

Experimental diets: Four experiemtnal diets containing 0, 5, 10 and 15% blood - Wild Sunflower Leaf Meal (BWSLM) 1:2 mixture were formulated. The four diets were iso-nitrogenous and Iso-caloric (Table 1).

Experimental animal and management: Thirty-two (32) cross bred (New Zealand white x Chinchilla) male weaner rabbits of between 6-9 weeks of age were used for the study that lasted for 12 weeks.

Prior to the commencement of the experiment the rabbits were prophylactically treated against internal and external parasites by subcutaneous injection of Ivomec (0.2 ml/rabbit). A broad spectrum antibiotics (Oxytetracycline L.A) was also given subcutaneously at the rate of 0.2 ml/rabbit. The rabbits were weight balanced such that the initial weight ranged between 514.89±6.51 and 523.35±6.26 g. Thereafter, they were randomly allocated to the four dietary treatment groups with eight rabbit per treatment in a complete randomized design experiment. The rabbits were managed intensively and housed individually in specially constructed metal cages measuring 45 x 35 x 45 cm with facilities for feeding, drinking and trays for the collection of faeces. The cages were kept in open sided house with asbestos roofing sheets. A total of 100 g feed was supplied to each rabbit per day at rate of 50 g in the morning (8:00 am) and 50 g in the evening (3:30 pm) to reduce wastage. Orts were collected and weighed daily in order to determine the daily feed intake.

Table 1: Percentage composition of experimental diets

	Diets			
Ingredients	1	2	3	4
Maize	18.5	17.5	14.5	11.5
Corn brain	36.0	36.0	36.0	36.0
BWSLM mixture	-	5.0	10.0	15.0
Groundnut cake	16.0	12.0	10.0	8.0
Palm Kernel cake	20.0	20.0	20.0	20.0
Fish meal	1.0	1.0	1.0	1.0
Bone meal	3.0	3.0	3.0	3.0
*Premix	2.0	2.0	2.0	2.0
Salt	0.5	0.5	0.5	0.5
Molasses	3.0	3.0	3.0	3.0
Total	100.0	100.0	100.0	100.0

*Premix composition per kg feed: vit. A, 1500 IU, vit. D_3 2500 IU, vit. E IIIU; vit. B_2 10 mg; vit. B_3 40 mg; vit B_6 20 mg; choline chloride 400 mg; Mn 120 mg; fe 70 mg; Cu 10 mg, Iodine 2.2 mg, Se 0.2 mg. Zn 45 mg, Co 0.02 mg

Data collection: Feed intake, weight gain, feed conversion efficiency were monitored.

Feed conversion ratio/efficiency: Feed conversion efficiency is calculated as the quantity of feed that will produce 1kg weight gain. This was computed using the expression:

$$\text{F.C.R} = \frac{\text{Total feed intake (g)}}{\text{Total weight gain (g)}}$$

Digestibility trial: In the last week of the experiment, faecal output was collected during the 8th week of the experiment from each animal for 5 days. Feaces were bulked together at the end of the 5th day, sub-sampled, oven dried for 48 h and analysed for proximate composition. Digestibilities of nutrients were determined with the use of the formular:

$$\text{Digestibility coefficient} = \frac{\text{Nutrient digested}}{\text{Nutrient intake}} \times 100$$

Chemical analysis: Proximate analysis of blood meal, wild sunflower leaf meal, blood-wild sunflower leaf meal mixture and experimental diets as well as the faecal samples were carried out using the procedures of A.OA.C. [14].

Statistical analysis: All data generated were subjected to one-way analysis of variance (ANOVA) according to Steel and Torrie [15] and where significant differences were indicated, Duncan's multiple range test [16] was used to separate the means.

RESULTS AND DISCUSSION

The results of the proximate analyses of the test ingredients and the four experimental diets are presented in Table 2. Diet 4 (15% BWSLM) had the highest level of crude protein (17.85%) while diet 2 (5% BWSLM) had the lowest (16.4%). The crude protein level of the diets increased with increase in BWSLM mixture inclusion. Generally, the level of nutrients increased with increase in BWSLM mixture level except nitrogen free extract which decreased with increasing level of BWSLM mixture. However, the nutrient values obtained agreed with the recommendation of N.R.C. [17] for weaner rabbits.

The crude protein content and ether extract of blood meal used in this study was slightly higher than the value reported by Aduku [18]. The differences in values may be due to the method of preparation and preservation of the blood meal as well as the shelve life of the sample before analysis. The crude protein content of the wild sunflower leaf meal was lower than the value reported by Odunsi *et al*. [7] and Olayeni *et al.* [11] but the value of nitrogen free extract obtained was slightly higher. However, the value obtained for crude fibre, ether extract and ash were similar.

The values obtained for the mixture of blood-wild sunflower leaf meal was different from values reported by Dairo *et al.* [19] for blood rumen content mixure. This may be due to the mixing ratio as well as the differences between the proximate composition of rumen content and wild-sunflower leaf.

The performance characteristics of the rabbit are presented in Table 3. The mean daily feed intake,

Table 2: Proximate composition of the experimental diets and test ingredients

Nutrients	Blood-meal	Wild-sunflower	BWSLM mixture	Diet 1	2	3	4
Dry matter(%)	89.76	90.16	91.8	89.21	89.18	89.25	98.31
Crude protein (% DM)	78.35	15.95	36.60	16.80	16.45	17.45	17.85
Crude fibre (% DM)	1.46	12.06	16.64	10.35	10.16	10.95	11.18
Ether extract (% DM)	0.72	5.00	6.21	3.15	3.29	3.32	3.46
Ash (% DM)	3.96	14.00	13.56	7.48	8.04	8.10	8.16
NFE (% DM)	15.01	52.99	26.99	62.22	62.06	60.48	59.35

BWSL - Blood Wild Sunflower Leaf Meal, DM - Dry Matter, NFE - Nitrogen Free Extract

Table 3: Performance characteristics of rabbits fed graded levels of BWSLM mixture

Parameters	Diet 1	2	3	4	SEM ±	SL
Final weight (g)	1455.60	1537.20	1543.26	1470.00		-
Initial weight (g)	514.88	522.44	523.35	579.20		-
Total weight gain (g)	940.92	1014.76	1019.91	950.80		-
Daily weight gain (g)	11.20	12.08	12.14	11.13	0.96	-
Daily feed intake (g)	61.49^{b}	61.66^{b}	65.96^{a}	66.28^{a}	2.11	*
Feed: gain ratio	6.03	5.43	5.30	5.54	0.65	-
Total feed consumed (kg)	3.44^{b}	3.45^{b}	3.69^{a}	3.71^{a}	0.69	*
Cost/kg of feed (₦)	36.47	35.12	33.07	31.67	1.02	NS
Total cost of feed consumed (₦)	125.58^{a}	121.27^{a}	120.30^{a}	117.55^{b}	1.77	*
Feed: gain ratio	6.03	5.43	5.30	5.54	0.65	NS
Weight (₦)	219.91^{a}	191.75^{ab}	175.27^{ab}	175.45^{b}	1.59	*

^{a,b} Means along the same row with different superscript are significantly different ($p<0.05$)

SEM = Standard Error of Mean, SL= Significant level, * = significant, NS= Not significant

ranged from 61.49 to 66.28g for rabbits on diets 1 and 4, respectively. The variation observed were significant ($p<0.05$). The daily feed intake values obtained were lower than the reported values of Agunbiade *et al*. [20], Dairo *et al.* [19] and Biobaku and Oladipupo [21] but higher than the values of Agunbiade *et al.* [22] and Jokthan *et al*. [23] but similar to the values reported by Fasanya and Ijaiya [24] and Ikurior and Akem [25].

The progressive increase in feed intake recorded contradict the observation of Odunsi *et al.* [7] in laying hens fed diets containing wild sunflower leaf meal. The level of crude protein increased as the level of BWSLM increased while the level of metabolizable energy decreased. Animals generally eat to meet their energy requirements if fed *ad libitum*. Since increase in BWSLM level decreased the metabolizable energy and increased the crude protein level, the animals therefore tend to eat more so as to meet their energy requirements.

The average final live weight was not significantly ($p>0.05$) different among treatments. However, the values obtained in this study are similar to the values reported by Agunbiade et al. [20] and Adama and Haruna [26] but higher than the values reported by Jokthan *et al.* [23] and Adejumo [27].

The average daily live weight gain per rabbit ranged from 10.19 g for diet 1 to 12.44 for diet 3. However there were no significant ($p>0.05$) differences among various treatments. The values recorded in this study are however lower than the values reported by Jokthan *et al.* [23] and Ikurior and Akem [25] but similar to the value reported by Agunbiade *et al.* [22].

The feed: gain ratio ranged from 5.30 for diet 3 to 6.03 for diet 1, however this values were not significantly ($p>0.05$) different. These results agreed with the findings of Dario *et al.* [19] and Adejumo [27]. However, values in this study are higher than those of Ijaiya and Awonusi *et al.* [28], Ikurior and Akem [25] and Oruwari *et al.* [29] but lower than the values of Jokthan *et al.* [23].

Feed economy: The cost analysis of the experimental diets is presented in Table 3. Increasing the inclusion levels of BWSLM led to reduction in feed cost. There were significant ($p<0.05$) differences among treatments on cost per kg weight gain. The highest cost per kg gain of (₦219.91) was recorded diet 1 while the least cost (₦175.27) was recorded diet 3. Although diet 3 had the least cost, it was not significantly different from the cost of diet 4. Generally, as the level of inclusion of BWSLM mixture in the diet increases, the economic efficiency of the diets increases. The results obtained contradict the findings of Whyte and Wadak [30] who observed increase in the cost per unit gain with increase in level of sweet potato in poultry and rabbit diets. However, the finding in this study agree with Ngodigha and Okejim [31] who observed a reduction in production cost below the control diet when sweet potato used in the diet was cultivated by the farmers and Agunbiade *et al*. [20] who reported that savings in feed cost was achievable as a result of the use of dried cassava peel in rabbit diets. Since there is abundant availability of wild sunflower plant especially during the wet season, a farmer can harvest, processed and store at a very minimal cost for use in livestock feeding.

There were significant ($p<0.05$) differences among treatments in digestibility of dry matter, crude protein, crude fibre ether extract and ash as well as total digestible nutrients (Table 4). Rabbits on 15% BWSLM mixture diet recorded the highest digestibility values for the nutrients, these results showed marked improvement in digestibility of nutrients up to 15% BWSLM mixture inclusion level reflecting efficient utilization of nutrients with increasing level of BWSLM mixture. These results corroborated the

Table 4: Digestibiliy of nutrients by rabbits fed graded levels of BWSLM mixture

	Diets					
Parameters	1	2	3	4	SEM	SL
Dry Matter	78.81^{ab}	79.84^{a}	78.26^{b}	83.51^{a}	1.53	*
Crude Protein	74.19^{b}	75.01^{b}	76.17^{b}	80.81^{a}	1.83	*
Crude Fibre	18.46^{b}	24.04^{b}	24.49^{b}	32.37^{a}	2.24	*
Ether Extract	90.76^{ab}	89.36^{b}	90.18^{ab}	92.37^{a}	0.76	*
Ash	75.11^{bc}	79.74^{b}	73.80^{c}	86.43^{a}	1.82	*
Nitrogen free extract	90.62	88.31	89.76	91.21	0.93	NS
Total Digestible Nutrient	79.82^{a}	53.15^{b}	78.19^{a}	82.41^{a}	1.40	*

$^{a-c}$ Means along the same row with different superscript are significantly different ($p<0.05$)

SL = Significant level, * = Significant, NS = Not significant

findings of Obeh and Tewe [32] who reported that feeding of cassava leaves with concentrates to pigs resulted in better utilization of nitrogen from leaves, improves digestibility of nutrients, as well as give better growth and higher feed intake. However, the result observed in this study did not agree with the findings of Iyayi [33] who reported that digestibility values of dry matter, crude protein, crude fibre, ether extract, ash and nitrogen free extract were not significantly ($p>0.05$) different when growing rabbits were fed diets containing Albizia saman pods. The digestibility values for crude fibre however were lower in all the treatments than those of other nutrients. This is similar to the findings of Oduguwa [34]. Rabbits are less efficient at digestibility of fibre than sheep and cattle [35, 36]. The lower digestibility could be due to the type of fibre in the diet, since fibres from different sources could vary in their digestibility depending on the proportions of cellulose, hemicellulose and lignin.

CONCLUSIONS

From the results of this study, it can be concluded that the inclusion of BWSLM mixture up to 15% level in the diets of male weaner rabbits will not adversely affect growth performance, improve digestibility and reduce production cost per kg gain of rabbit meat.

REFERENCES

1. FAO., 1993. Production Year book of Food and Agricultural Organization of the United Nations, Rome, Italy, 1: 17.
2. Ijaiya, A.T., O.O.A. Fasanya and B.A. Ayanwole, 2002. Reproductive performance of breeding rabbit does fed maize and fermented cassava peel meal. Proc. 27th Ann. Conf. Nig. Soc. For anim. Prod. NSAP. March 17-21, Fed Univ. of Technol. Akure, Nigeria.
3. Taiwo, A.A., A.D. Adejuyigbe, E.A. Adebowale, J.S. Oshotan and O.O. David, 2004. Effect of Tridax procumbens, panicum maximum and pawpaw leaves (*Carica papaya*) supplemented with concentrate on the performance and nutrient digestibility of weaned rabbits. Proc. 29th Ann. Conf. Nig. Soc. For Anim. Prod. (NSAP) March. 20-25, Usmanu Danfodio University Sokoto, Nigeria.
4. USDA., 1973. The ABCs of Domestic farm raised rabbit meat. Circular No. 549, Washington D.C., pp: 44-49.
5. Janieri, A., 1987. Nutritional quality of rabbit meat. Italian R.V. Agriculture, 24: 275.
6. M'cene, W.B., J.K. Tuitoek and H.K. Muirui, 1999. Nitrogen utilization and performance of pigs given diets containing a dried or un-dried fermented blood/molasses mixture. Anim. Feed Sci. and Technol., 78: 239-247.
7. Odunsi, A.A., G.O. Farinu and J.O. Akinola, 1996. Influence of dietary wild sunflower (*Tithonia diversifolia* Helms. A Gray) leaf meal on layers performance and egg quality. Nig. J. Anim. Prod., 23: 28-32.
8. Farinu, G.O., A.A. Odunsi, J.O. Akinola and V.A. Togun, 1999. Yield and chemical composition of wild sunflower (*Tithonia diversifolia* Helms. A. Gray) and feeding value of wild sunflower forage meal in broiler chicken diets. Trop. J. Anim. Sci., 2: 31-37.
9. Akinola, J.O., A. Larbi, G.O. Farinu and A.A. Odunsi, 1999. Seed treatment methods and duration effects on germination of wild sunflower. Expl. Agric., 36: 63-69.
10. Thomas, V.M., D.N. Snedon, R.E. Raftert and C.A. Murray, 1982. Digestibility and feeding value of Sunflower silage for beef Steer. J. Anim. Sci., 12: 40-49.
11. Olayeni, T.B., G.O. Farinu, V.A. Togun, O.S. Adedeji and O.A. Aderiola, 2006. Performance and haematological characteristics of weaner pigs fed wild sun flower (*Tithonia diersifolia* Hemsl. A. Gray) leaf meal. J. Anim. Vet. Adv., 5: 499-502.
12. Adeniji, A.A. and O.O. Balogun, 2002. Utilization of flavour treated blood-rumen content mixture in the duets of laying hens. Nig. J. Anim. Prod., 29: 34-37.
13. Oguntoyinbo, J.S., 1978. Vital Statistics in Ogbomoso community. Daybis Ltd., Ibadan, Nigeria.
14. A.O.A.C., 1990. Association of Official Analytical Chemists. Official Methods of Analysis. 15th Edn., Washington D.C. USA., pp: 69-88.
15. Steel, R.G. and J.H. Torrie, 1980. Principles and procedures of statistics. A biometrical approach. 2nd Edn. McGraw-Hill Book G. New York.
16. Duncan, D.B., 1955. Multiple range and multiple F-test. Biometrics, 11: 1-42.
17. NRC., (National Research Council) 1984. Nutrient requirements of Rabbits. 2nd Edn., (Washington, DC., National Academy of Press.
18. Aduku, A.O., 1993. Tropical feed stuff analysis table published by Department of Animal Science. Ahmadu Bello University, Zaria, Nigeria, pp: 1-2.

19. Dairo, F.A.S., O.O. Aina and A.R. Asafa, 2005. Performance evaluation of growing rabbits fed varying levels of rumen content and bloodmeal content mixture. Nig. J. Anim. Pord., 32: 67-72.
20. Agunbiade, J.A., R.A. Bello and O.A. Adeyemi, 2002. Performance characteristics of weaner rabbits on cassava peel-based balanced diets. Nig. J. Anim. Prod., 29: 171-175.
21. Biobaku, W.O. and O.O. Oladipupo, 2002. Determination of optimum methionine and lysine requirements for growing rabbits. Proc. Ann. Conf. Anim. Sci. Ass. of Nig. (ASAN) Sept 16-19 Univer. of Abeokuta, Nigeria, pp: 101-103.
22. Agunbiade, J.A., A.O. Onabanjo, A.A. Taiwo, O.E. Fasina and O.A. Adeyemi, 2003. Effect of source of fibre and chemical treatment of dietary maize cob, saw dust and mango leaves on the productive performance of growing rabbits. Proc. of the 28th Ann. Conf. of the Nig. Soc. Anim. Prod. (NSAP)., pp: 358-362.
23. Jokthan, G.E., J.P. Alawa,A.M. Adamu and I.A. Adeyinka, 2003. The effect of different fibre sources on the performance of young rabbits. Proc. of the 28th Ann. Conf. of the Nig. Soc. Anim. Prod. (NSAP)., pp: 375-377.
24. Fasanya, O.O.A. and M.O. Ijaiya, 2002. Effects of varying levels of dietary protein on the performance of rabbits. Nig. J. Anim. Prod., 29: 168-170.
25. Ikurior, S.A. and J.D. Akem, 1998. Replacing maize with cassava root meal or its mixture with yeast slurry in Rabbit diets. Nig. J. Anim. Prod., 25: 31-35.
26. Adama, T.Z. and H. Haruna, 2002. Efffect of dietary sources of fibre on feed intake, growth performance nutrient digestibility and carcass characteristics of growing rabbit. J. Sust. Trop. Agric. Res., 4: 67-71.
27. Adejumo, J.O., 2002. Utilization of different levels of Gliricidia leaf meal by growing rabbits. Proc. 7th Ann. Conf. Anim. Sci. Ass. Nig. (ASAN) Sept. 16-19th Univer. Of Abeokuta, Nigeria, pp: 98-100.
28. Ijaiya, A.T. and E.A. Awonusi, 2002. Effect of replacing maize with yam peel meal on the growth performance of weaner rabbits. Proc. 7th Ann. Conf. Anim. Sci. Ass. of Nig. (ASAN) Sept. 16-19th Univer. of Abeokuta, Nigeria, pp: 161-163.
29. Oruwari, B.M., M.O. Ironkwe and O.O. Mgbere, 2002. Influence of dietary treatments on the fat free dry matter body composition in the rabbit. Proc. 7th Ann. Conf. Anim. Sci. Ass. of Nig. (ASAN) Sept. 16-19th Univer. Of Abeokuta, Nigeria, pp: 88-90.
30. Whyte, E.P. and I. Wadak, 2002. Evaluation of rumen content on the growth performance of weaner rabbits. Proc. 7th Ann. Conf. Anim. Sci. Ass. of Nig. (ASAN) Sept. 16-19th Univer. of Abeokuta, Nigeria, pp: 143-146.
31. Ngodigha, E.M. and J.A. Okejim, 1999. Performance of weaner rabbits fed graded levels of sweet potato meal. Proc. (NSAP) March 21-25th, Uniersity of Ilorin, Ilorin Nigeria, pp: 82-83.
32. Obeh, S.O. and O.O. Tewe, 1992. Effects of replacement of maize with sundried and oven-dried sweet potato on performance and economy of production in broilers. J. Anim. Prod. Res., 12: 1-7.
33. Iyayi, E.A., 2001. Cassava leaves as supplement for feeding weaner swine, Trop. Anim. Prod. Invest., 4: 141-150.
34. Oduguwa, O.O., 2006. Utilization of whole pods of Albiza saman in diets of growing rabbits. Nig. J. Anim. Prod., 33: 197-202.
35. Adegola, T.A. and J.C. Okonkwo, 2002. Nutrient intake, digestibility and growth rate of rabbits fed varying levels of cassava leave meal. Nig. J. Anim. Prod., 29: 21-26.
36. Slade, L.M. and H.F. Hintz, 1969. Comparison of digestion in horses, penies, rabbits and guinea pigs. J. Anim. Sci., 28: 842-847.
37. Joyce, P.J., P.V. Battray and J. Parker, 1971. Utilization of pasture and barley by rabbits. Feed intake and live weight gains. New Zealand J. Agric. Res., 14: 173-179.