

Effect of Varying Levels of Sun-Dried Cassava Peel-Bloodmeal Mixture (3:2) on Growth Performance and Organ Characteristics of Weaner Rabbits

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Abstract: Twenty crossbred rabbit of mixed breeds with average initial weights of between 823.75±18.52 and 865.25±19.46 g were used in a feeding trial lasting for 8 weeks to evaluate the effect of feeding sun-dried cassava peel-blood meal mixture (SDCP/BM) based diet in a ratio of 3:2. The rabbits were randomly assigned to five treatments of four rabbits each in a completely randomized design experiment. The SDCP/BM mixture was included at 0, 5, 10, 15 and 20% levels. Performance characteristics evaluated included daily feed intake, weight gain, feed: gain ratio and some internal organs characteristics. The results showed that the performance characteristics of rabbits fed varying inclusion levels of SDCP/BM mixture compared favourably well ($p>0.05$) with the control diet. It was concluded that SDCP/BM mixture in the ratio of 3:2 can be included in the diets of rabbits up to 20% level.

Key words: Weaner rabbits, sun-dried cassava peel/blood meal mixture, feed intake, daily weight gain, organ characteristics

INTRODUCTION

The problem of inadequate animal protein consumption in most developing countries is a serious one that needs urgent attention. The seriousness of the problem is reflected in the figure by ILCA^[1] that in Nigeria for instance average person consumes 6.8 g animal protein per day^[2], however estimated an intake of 3.25 g/caput/day both of which are lower than the FAO recommendation of 27-35 g animal protein consumption per day^[3,4].

A panacea for this protein deficiency problem in two dimensional. The first is the production and multiplication of small animals that can immediately meet the need and guarantee a future of continuous sustenance while the second is the search into various ways of making possible reduction in feeding cost of such small animals to make their production relatively cheaper and the products affordable.

Rabbit is an animal whose potentials can be tapped because of its obvious advantages over other species. Rabbit has high reproductive potentials^[5,6], has ability to utilize forage^[7] and it requires low initial capital investment^[8], less space per unit number and absence of cultural biases or religious hindrance to its consumption^[9,10].

Rabbit meat is wholesome, high in protein, low in fat, cholesterol and sodium levels and there is high meat to

bone ratio^[11-13]. Obviously, rabbit possesses outstanding potentials that can be utilized in solving the animal protein problem.

In most developing countries, the search for non-conventional feed ingredients to replace the usually expensive conventional ones appears to occupy the attention of animal nutritionists. The main aim of using these non-conventional feed ingredients is to reduce the cost of production to the barest minimum for people to be able to afford at least some animal protein in their menu.

While blood meal has been used in replacing the conventional protein source like fish meal and groundnut cake, cassava peels has been variously included in livestock ration to replace energy sources like maize.

However, there is paucity of information on the possible combination of both as a non-conventional feed ingredient. This study was designed to determine the optimum inclusion level of sun dried cassava peel/blood meal mixture on the performance characteristics of weaner rabbits.

MATERIALS AND METHODS

Location: The experiment was carried out at the Rabbitry unit of the Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomosho within the derived savannah zone of Nigeria.

Preparation of test ingredient:

- Cassava peel meal-Fresh cassava peels were collected from Local garri processing factory located within Ogbomoso North Local Government Area. The peels were washed immediately to remove sand and other extraneous materials and then sun-dried for 5 days. The sun-dried cassava peels was ground into Sun Dried Cassava Peel Meal (SDCPM) using hammer mill and stored in air tight condition.
- Fresh bovine blood void of extraneous materials was collected from the Central abattoir Ogbomoso. The clotted blood was boiled for one hour and then chopped into smaller lumps to facilitate quick and proper drying. The lumps were dried in the sun for 5 days. The dried blood was ground into Blood Meal (BM) using hammer mill and stored in air tight condition.

Formulation of the experimental diets: The SDCPM and BM were combined in ratio 3:2 and used with other ingredients to formulate five experimental diets. Diet 1 which served as the control did not contain SDCP-BM mixture while diets 2, 3, 4 and 5 contained 5, 10, 15 and 20% inclusion levels respectively. The five diets contained equal amounts of other ingredients Except Groundnut Cake (GNC) and Palm Kernel Cake (PKC) (Table 1)

The proximate composition of the SDCPM, BM and that of the experimental diets were determined using the procedure of [14].

Animals, feeding and management: Twenty weaner rabbits of mixed breeds were used for this study. The rabbits were allowed an adjustment period of one week during which they were prophylactically treated against internal and external parasites using Ivomec (0.2 mL rabbit) subcutaneously. They were equally given a broad spectrum antibiotics Oxytetracycline (0.2 mL rabbit) subcutaneously. The rabbits were fed with diet containing crude protein level that ranged between 17.01 and 17.63% while metabolizable energy level ranged between 2400.00 and 2480.31 kcal kg⁻¹. At the end of one week adjustment period, the rabbit were weight balanced such that the initial average weight ranged between 823.75±18.52 g and 865.25±19.46 g. The rabbits were randomly assigned to five dietary treatments of four rabbits per treatment in a completely randomized designed experiment. The rabbits were housed individually in wood-wire cages measuring 44×34×44 cm. They were designed in a way that allows easy collection of feces, urine and left over feeds.

Rabbits in group 1, 2, 3, 4 and 5 were fed diets containing 0, 5, 10, 15 and 20% SDCP/BM mixture, respectively.

The rabbits were served 100 g feed daily divided into 50 g in the morning between 7-8 a.m and 50 g in the evening between 3-4 p.m. Water was supplied *Ad libitum*.

The rabbits were fed with the experimental diet for a period of 8 weeks when the experiment was terminated. While the experiment lasted, feed offered andorts were weighed to determine feed intake. Weekly weights were taken after the initial weight and records kept were used to determine the response criteria in terms of mean weight gain and feed to gain ratio.

At the end of the experiment three animals from each treatment group were randomly selected, tagged and starved for 12 h before being slaughtered for to assess organ characteristics.

Carcass evaluation: Prior to slaughtering, the rabbits were weighed to get the terminal weight. The rabbits were stunned and then bled by cutting of the jugular vein. The fur was removed by scalding. Evisceration was done immediately and the following internal organs, liver, heart, spleen, kidney lungs and pancreas were quickly removed, weighed and expressed as percentage of final live-weight.

Statistical analysis: All data generated were subjected to one-way analysis of variance (AVOVA) according to Steel and Torrie^[15]. Where significant differences were indicated, means were separated using Duncan's multiple range tests Duncan^[16].

RESULTS AND DISCUSSION

The percentage as well as the proximate composition of the experimental diets is presented in Table 1. The crude protein as well as the energy content falls within the range recommended^[17-19] for growing rabbits. The protein content of the experimental diets was similar to that of Dairo^[20] while the energy level is higher than the energy of the diets used in this study.

The crude protein content of the diets used in this study is higher than the crude protein values of the diets used by Balewu *et al.*^[21] and Adegbola and Okonkwo^[23]. This may be attributed to the non-replacement of either maize or corn bran with test ingredients in the composition of the experimental diets.

The performance of the rabbits fed graded levels of SDCP/BM mixture based diets is presented in Table 2. There were no significant ($p > 0.05$) differences among various treatments in the final live weight, average daily weight gain, average feed intake and feed: gain ratio.

Although there was no significant difference among the treatments, the final body weight obtained in this

study is similar to that of Agunbiade *et al.*^[22] who used cassava peel-based diets to feed weaner rabbits and ^[24], but lower than that of Dairo^[20]. However higher values were obtained^[19, 25]. The average daily weight gain showed similarity ($p>0.05$) for all the treatment and similar to the reported values of Yisa^[26] but lower than the values reported by Dairo, Arijeniya and Gene^[20, 24, 27]. The average feed intake recorded in this study were similar ($p>0.05$) among the treatments, the values were however higher than that of^[28, 29]. The values were similar to that of Dairo^[20] but lower than that of Bamigbose^[25]. The values of feed: gain ratio ranged between 8.74±2.07 for treatment 3 (10% SDCPM/BM) and 6.08±0.11 for treatment 2 (5%

SDCPM/BM) yet there were no significant ($p>0.05$) difference among treatments (Table 3). This is similar to the observation of Agunbiade^[22] and Fasanya^[19] who reported no significant difference in the control diet and diets with graded levels dried cassava peel meal. The animals were able to utilize efficiently the feed especially the crude fibre content which falls within the level s above which^[30] concluded will have significant effect on performance of rabbits. The percentage values of liver, heart, spleen, lungs, pancreas and kidney did not showed significant differences ($p>0.05$) across the dietary treatments. This is simila to the reports of Arijeniya^[24] and Adewumi^[31].

Table 1: Percentage composition of experimental diets

Ingredients	Diets				
	1	2	3	4	5
Maize	10	10	10	10	10
Com bran	40	40	40	40	40
Groundnut cake	14.50	11.00	8.00	6.00	3.00
Palm kernel cake	27.00	25.50	23.50	20.50	18.50
SDPM/BM (3:2)	0	5	10	15	20
Fish meal	0.50	0.50	0.50	0.50	0.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.20	2.50
Molasses	2.00	2.00	2.00	2.00	2.00
*Premix	2.50	2.50	2.50	2.50	2.50
Total	100.00	100.00	100.00	100.00	100.00
Determined Analysis					
Crude protein	17.15	17.63	17.06	17.01	17.11
Crude fibre	9.97	9.87	10.06	10.12	10.18
Ether Extract	3.92	4.02	3.86	3.79	3.62
Ash	7.12	6.98	7.24	6.87	7.19
NFE	61.84	61.10	62.04	62.59	61.51
Metabolizable					
Energy (Kcal Kg ⁻¹)	2412.71	2480.31	2400.00	2400.00	2407.00

*Premix composition Kg vit.A 4000 000iu, vit. D₃ 800,000i.u, vit. E 8,000 mg, vit. K₂ 800 mg vit. B₁ 1200 mg, vit. B₂ 2000 mg, Niacin 18,00 mg, calcium pantothenate 4,000mg, vit. B₆ 1600mg, vit. B₁₂ 8 mg, folic acid 400 mg, biotin 20 mg, choline chloride 120,000 mg, manganese, 48,000 mg, iron 40,000 mg, Zinc 32,000 mg, Copper 3,400 mg, Iodine 600 mg, Cobalt 120 mg, Selenium 48 mg, antioxidant 48 mg

Table 2: Proximate composition of sun dried cassava peel meal (SDPM) and blood meal (BM)

Nutrient DM (%)	SDCPM	BM
Crude protein	5.25	73.85
Crude fibre	9.76	1.93
Ether extract	4.18	0.58
Ash	7.32	4.08
Nitrogen free extract	73.49	19.56

Table 3: Performance characteristics of rabbits fed varying levels of sun dried cassava peel meal/blood meal mixture

Parameters	Diets					SL
	1	2	3	4	5	
Average Initial live						
Weight (g) average final	857.50±22.44	823.75±21.56	855.00±22.39	865.25±22.65	855.00±22.46	NS
Liveweight (g) average weight	1561.5±40.87	1661.00±41.54	1493.7±33.59	1534.7±28.87	1515.00±24.36	NS
Gain (g/day) average feed	12.57±0.07	14.95±1.48	11.40±1.93	11.95±1.96	11.74±1.93	NS
Intake (g/day) average feed:	85.47±2.64	88.97±0.80	87.97±2.65	87.38±1.10	88.58±2.35	NS
Gain ratio	6.9±0.66	6.08±0.51	8.74±2.07	7.98±1.37	7.44±2.15	NS
Organ weights (% of live weight)						
Liver	3.61±0.37	3.50±0.27	3.42±0.05	3.30±0.39	3.43±0.15	NS
Heart	7.52±0.66	7.73±0.11	6.33±1.74	7.85±92	7.45±1.00	NS
Spleen	0.03±0.00	0.04±0.01	0.04±0.01	0.04±0.01	0.03±01	NS
lungs	0.85±0.63	0.63±0.26	0.88±0.15	0.86±0.08	0.76±0.12	NS
Pancreas	0.07±0.01	0.12±0.24	0.18±0.03	0.12±0.06	0.11±0.04	NS
Kidney	0.76±0.01	0.73±0.02	0.82±0.94	0.71±0.03	0.77±0.5	NS

SL=Significant level, NS= No significant difference ($p>0.05$)

CONCLUSION

The results of this study showed that sun dried cassava peel-blood meal mixture in ratio 3:2 can be included optimally at 20% in weaner rabbit diets with no adverse effect on the performance characteristics.

REFERENCES

1. ILCA, 1993. International livestock centre for African Handbook of African livestock statistics, ILCA, Addis Ababa Ethiopia, pp: 66.
2. Shaib, B., A. Aliyu and J.S. Bakshi, 1997. Nigeria National Agricultural Research strategy Plan, 1996-2010. Department of Agricultural Sciences, Federal Ministry of Agriculture and Natural Resources, Abuja.
3. FAO, 1986. Food and Agricultural Organization of the United Nations. Rome. The state of Food and Agriculture, pp: 42.
4. FAO, 1993. Food and Agriculture Organization of United Nations Rome. Production Year Book.
5. Biobaku, W.O. and E.O. Dosumu, 2003. Growth response of rabbits fed graded level of processed and undehulled sunflower seeds. *Nig. J. Anim. Prod.*, 30: 179-184.
6. Cheek, P.R., 1986. Potentials of rabbit production in tropical and subtropical agricultural systems *J. Animal Sci.*, 63: 1581-1586.
7. Aduku, A.O and J.O. Olukosi, 1990. Rabbit management in the Tropics. Living books series , GU Publications, Abuja FCT. Nigeria, pp: 1-74.
8. Rao, D.R., C.B. Chavan., C.P. Chem and G.R. Sunki, 1979. Nutritive values of rabbit meat. In the domestic rabbits: Potentials, problems and current research. Oregon State University, Rabbit Research Centre, Corvallis, pp: 53-55.
9. NRC, 1991. Micro livestock: Little known Small Animals with a Promising Economic Future. National Research Council, National Academy, Press, Washington, D.C.
10. Mamattah, N., 1978. Sociological Aspects of Introducing Rabbits with Farm Practices. Proceeding of workshop on rabbit husbandry in Africa. Mongoro, Tanzania, Stockholm, Sweden, IFS., pp: 93-98
11. Reddy, N.U., D.R. Rao and C.P. Chem, 1977. Comparative performance of rabbit and boilers. *Nutr. Rep. Intl.*, 16: 133-135.
12. Beymen, A.C., 1984 . Composition of rabbit meat. *J. Applied Rabbit Res.*, 7: 134.
13. Holmes, Z.A., S.F. Wei, D.J. Harris, P.R. Cheek and N.M. Patton, 1984. Proximate composition and sensory characteristics of meat from rabbits fed three levels of alfalfa meal. *J. Anim. Sci.*, 58: 62.
14. AOAC., 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 Co. Inc., New York., pp: 481.
16. Duncan, D.B., 1955. Multiple range and multiple F-Tests. *Biometrics*, 11: 1-42.
17. Lebas, F., P. Coudert, R. Rouvier and H. de Rochambeau, 1980. The rabbit husbandry, health and production Food and Agricultural Organization of the United Nations Rome, Italy.
18. NRC, 1984. Nutrient requirements of Domestic Animals. Nutrient requirement of rabbits 2nd revised (Edn.), National Academy of Science, Wasington D.C.
19. Fasanya, O.O.A. and M.O. Ijaiya, 2002. Effects of varying levels of dietary protein on performance of rabbit. *Nig. J. Anim. Prod.*, 29: 168-170.
20. Dairo, F.A. S.O. Aina and A.R. Asafa, 2002. The Performance of Growing Rabbits Fed Ration Containing Rumen Content. *Pro C. 7th Ann. Conf. Animal Sci. Ass. Nig. ASAN. Univ. Agric Abeokuta, Nigeria* pp: 131-133.
21. Balewu, M.A., O.A. Adegbite and D.O. Eresema, 2003. Evaluation of Graded Levels of Hatehery By-Product Meal on the Performance Characteristic of Growing Rabbits *Proc. 8th Conf. Animal Sci. Ass. Nig. (ASAN). Fed Univ. Tech. Minna, Nig. State*, pp: 93-94.
22. Agunbiade, J.A., R.A. Bello and O.A. Adeyemi, 2002. Performance characteristics of weaner rabbits on conava peel- based balanced diets *Nig. J. Anim. Prod.*, 29: 171-175.
23. Adegbola, T.A. and J.C. Okonkwo, 2002. Nutrient intake, digestibility and growth rate of rabbits fed varying levels of cassava leaf meal *Nig. J. Anim. Prod.*, 29: 21-26.
24. Arijenwa, A. and F.U.I. gene, 2002 . Evaluation of the Nutritive Value of Some Tropical Legumes in Raw State for Weaner Rabbits, Performance, Carcass and Organ Weights. *Proc. 7th Ann. Conf. Animal Sci. Asso. (ASAN) Univ. Agric. Abeokuta, Nig.*, pp: 124-127.
25. Bamigbose, A.M., M. Abimibola, W.A. Olayemi, A.O. Osofowora, A.O. Oso and O.T. Ojo, 2002. Performance of Warmer Rabbits Fed Supplemented Tridax Procumbers Diets *Proc. 7th Ann. Conf. Anim. Sci. Asso. (ASAN), Univ. Agric. Abeokuta Nigeria*, pp: 69-70.

26. Yisa, A.G. and O.O.A. Fasanya, 2003. Utilization of Sweet Potato (*Ipomea Batatas*) Leaf Vines and Concentrate Mixtures as Feed Supplement by Growing Rabbits Proc. 8th Ann. conf. Animal Sci. Asso. Nig. (ASAN), Fed. Univer. Tech. Minna, Nigeria, pp: 201-203.
27. Ikurior, S.A. and J.O. Akem, 1998. Replacing maize with cassava root meal or its mixture with brewers yeast slurry in rabbit diet. *Nig. J. Animal Prod.*, 25: 31-35.
28. Adama, T.Z. and H. Haruna, 2002. Effect of dietary sources of fibre on feed intake, growth performance nutrient digestibility and carcass characteristics of growing rabbit. *J. Sustainable Trop. Agric. Res.*, 4: 67-71.
29. 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. 28th Ann. Conf. Nig. Soc. For Anim. Prod. (NASAP), Institute of Agricultural Research and Training, Obafemi Awolowo University, Ibadan, Nigeria, pp: 375-378.
30. Omole, T.A. and O.C. Onwudike, 1982. Effect of palm oil on the use of cassava peel meal by rabbits. *Trop. Anim. Prod.*, 8: 27-32.
31. Adewumi, M.K., O.A. Sokunbi, D.O. Adejumo, A.B. Omojola and N.F. Anurudu, 2004. Effect of different fibre sources on performance and physiological response of pre pubertal male rabbits. *Trop. J. Animal Sci.*, 7: 33-40.