

Growth Performance and Carcass Characteristics of weaner Rabbits (*Oryctolagus cuniculus*) fed Graded Levels of Sorghum Offal as Replacement for wheat Offal

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Abstract

The study evaluated the growth performance and carcass of weaner rabbits fed graded levels of sorghum (*sorghum bicolor*) offal as replacement for wheat offal in diets of weaner rabbits. A total of 60 mixed weaner breeds of rabbits aged 5-6 week were used in the experiment. Five experimental diets were formulated using graded levels (0, 25, 50, 75 and 100) and designated as diets 1,2,3, 4 and 5 with groundnut haulms constituting 20% and soya beans as protein source with 12 rabbits per treatment. Each treatment was replicated three times with 4 rabbits per replicate in a completely randomized Design. The diets were offered for a period of 8 weeks and carcass analysis was carried out at the end of the experiment. Findings showed that there was no significant difference on all growth parameters measured. Daily weight gain of 25.51g at 100% was obtained; feed conversion ratio 3.75 was highest at 50%. No significant ($p>0.05$) differences on most of the carcass parameters measured except shoulder and back cuts. Dressing percentage of 57.75% was obtained at 100% inclusion. It was concluded that weaner rabbits can tolerate sorghum offal up to 50% level of inclusion without significant adverse effect on growth performance and carcass characteristics.

Keywords: Weaner rabbits, sorghum offal, groundnut haulms, growth performance, carcass

DESCRIPTION OF PROBLEM

The key to abundant animal protein production is readily available feedstuff sources that are cheap and balanced, posing minimal competition to man. Feed dictates how many animals you can grow and how fast they can mature for market (Shaahu et al., 2017). Cost of commercial animal feed in developing countries necessitates the incorporation of agro industrial by-products of cereal grains in diets of pseudo-ruminant livestock such as rabbits. The measure will reduce the cost of producing rabbits, which will favourably impact on the livelihood of farmers and increase protein intake of the populace. Feed remains the most important cost of production. Cereal grains and legumes used in compounding feed fluctuates both in price and quantity and are also in high demand for human and industrial use. This has led to search for alternative feedstuffs such as cereal offals e.g. Sorghum offal. Sorghum contains more crude protein than maize (Malau-Aduli et al., 2003) but, its use is limited by tannin an anti-nutritional factor, which lowers the nutritive values of the grain for non-ruminants

(Jacob et al., 1996) and the reduction of dry matter and protein digestibility. However, the tannin gives sorghum several agronomic advantages such as bird resistance, reduced pre-harvest, seed germination and molding. Other characteristics of tannins as anti-nutritive factors for non-ruminant animals are reduction in dry matter and protein digestibility. Sorghum offal introduced as the main source of energy in an experiment was found to be cost-effective to replace 100% maize grain. Though, it tended to decrease performance (Adeniyi et al., 2003). Hence, the objective of the study is to determine the growth performance and carcass characteristics of weaner rabbits fed diets continue graded levels of sorghum offals.

MATERIALS AND METHODS

A total of 60 cross breed weaner rabbits were used in the experiments aged 5- 6 weeks comprising (Mongrels) of New Zealand white, Californian white, Dutch belted, American chequered, Chinchilla and English spotted of both sexes. The average mean weight of 489–665g were used in the 8 weeks feeding trial. The weaner rabbits were randomly allocated to five dietary treatments in a Completely Randomised Design (CRD) respectively. Five experimental diets were formulated using graded levels (0, 25, 50, 75 and 100) and designated as diets 1, 2, 3, 4 and 5 with groundnut haulms constituting 20% and soya beans as protein source with 12 rabbits per treatment. Each treatment was replicated three times with 4 rabbits per replicate in a Completely Randomized Design. Diet 1 contained wheat offal which served as the control (0%). Treatments 2 – 5 contained sorghum offal, respectively. Data on daily feed intake was determined by subtracting the leftovers (orts) from the feed offered to the rabbits in each treatment accordingly. The weight gains were calculated as the difference in the weight from the previous week. Feed conversion ratio (FCR) was calculated as the ratio of feed intake to weight gain. At the end of the experiments the, two rabbits were randomly selected from each treatment based on the mean live weight of the group and slaughtered for carcass evaluation. Data obtained were subjected to One-Way Analysis of Variance (ANOVA) using the SPSS statistical package version 25 (SPSS, 2017); where applicable, significant differences

between the means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The growth performance of weaner rabbits fed graded levels of sorghum offals based diets in Table 1 showed no significant difference. The daily feed intake of 82.41g – 85.47g was higher than values of 59.14 – 63.16g reported by Ogunsipe *et al.* (2014) and value of 48.1g reported by Uko *et al.* (1999) and lower than values 98.79 – 100.71g reported by Medugu *et al.* (2011) but comparable to values of 80.84g reported by Iyeghe - Erakpotobor *et al.* (2012) and 81.04g obtained with 20% groundnuts haulms meal by Adeyegun (2009). The daily weight gain (22.3 – 25.51g) obtained in this study was comparable to 21.14 – 25.36g and 22.37 – 25.72g reported by Ogunsipe *et al.* (2014) on rabbits fed sorghum offal diets; Aderemi and Wuraola (2010) and Abubakar *et al.* (2006) on rabbits fed malted and unmalted sorghum and reports by Aderinola *et al.* (2008) on rabbits placed on varying levels of *Centrosema pubescens* or *Calapogonium mucunoides*. The numerical decrease in the feed intake along test diets could be attributed to the possible high tannin levels in sorghum than wheat offal (Rostango, 1986). High tannin has been reported to reduce the nutritive value of sorghum due to formation of tannin – protein complexes, which cannot be readily hydrolysed by the digestive system, and could reduce the performance of monogastrics (Magalhaes *et al.*, 2000 and Rostango, 1986).

Table 1: Performance of Weaner Rabbits Fed Graded Levels of Sorghum Offals as Replacement for Wheat Offal

Parameters	Levels of Wheat offal Replaced with Sorghum Offal (%)					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Initial weight (g)	501.23	551.57	577.2	505.5	509.63	13.18 ^{NS}
Final weight (g)	1844.2	1888.87	1825.73	1877.07	1937.93	30.73 ^{NS}
Weight gain (g)	1342.97	1337.3	1248.53	1371.57	1428.3	32.47 ^{NS}
Total feed intake (g)	4763.92	4776.80	4614.96	4696.72	4786.32	38.64 ^{NS}
Daily Feed intake (g)	85.07	85.3	82.41	83.87	85.47	0.69 ^{NS}
Daily weight gain (g)	23.98	23.88	22.3	24.49	25.51	0.58 ^{NS}
FCR	3.57	3.58	3.75	3.43	3.37	0.09 ^{NS}
Mortality	0.00	0.00	0.00	0.00	0.00	0.00 ^{NS}

SEM = Standard Error of Mean, NS = Not significant (p>0.05), FCR = Feed Conversion Ratio

The feed conversion ratio obtained in this study (3.37 – 3.75) was similar to 3.40 – 3.70 for rabbits fed cereal by products (Uko *et al.*, 1999) and better than the values of 3.33 – 5.27 for rabbits placed on varying levels of *Centrocema pubescens* or *Calapogonium mucunoides* leaf meal reported by Okonkwo *et al.*(2010). The FCR values in this study are a true reflection of how the diets were utilized for growth as evidenced in their increased weight gain at higher inclusion level of sorghum offal. Table 2 showed carcass yield values of 49.23 – 57.75% obtained in this study was similar to range of values, 47.17 to 51.77%, reported by

Ogunsipe *et al.* (2014) and values of 46.86 to 51.55% reported for rabbits fed cassava root meal by Eshiet *et al.* (1980). This agrees with findings of Aduku and Olukosi (1990) on carcass yield for tropical rabbits. The higher values observed for the carcass weight, thigh, shoulder, loin, back, neck and feet weight at higher levels of inclusion of sorghum offal could be traced to factors such as age, sex, or genetic (Bill *et al.*, 2007). The non-dietary influence and similar head and pelt weights conform to the earlier study on rabbits fed plantain peel-based diets (Ogunsipe and Agbede, 2010).

Table 2: Carcass Characteristics of Weaner Rabbits Fed Graded Levels of Sorghum Offal as Replacement for Wheat Offal

Parameters (%)	Levels of Wheat offal Replaced with Sorghum Offal (%)					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Live weight (g)	2012.00	1891.33	1997.00	1870.67	1662.33	56.75 ^{NS}
Carcass weight (g)	1017.47	959.85	983.12	939.45	960.00	0.91 ^{NS}
Dressing Percentage	50.57	50.75	49.23	50.22	57.75	1.60 ^{NS}
Thigh	14.34	15.26	17.73	15.63	17.43	0.78 ^{NS}
Loin	11.88	12.21	14.17	12.3	13.59	0.53 ^{NS}
Shoulder	7.59	7.69	9.03	7.65	9.05	0.36 ^{NS}
Back	4.95 ^b	4.60 ^b	5.17 ^b	4.73 ^b	6.66 ^a	0.26 [*]
Rib	8.16	10.17	9.21	8.89	10.9	0.44 ^{NS}
Neck	2.10 ^b	2.63 ^{ab}	2.66 ^{ab}	2.15 ^b	3.57 ^a	0.20 [*]
Tail	0.55	0.55	0.77	0.49	1.35	0.13 ^{NS}
Feet	3.15	3.05	3.8	3.26	2.88	0.27 ^{NS}
Head	8.25	8.68	10.05	8.82	8.76	0.59 ^{NS}
Pelt	8.68	9.07	10.35	8.39	10.38	0.39 ^{NS}

^{a, b}, means with different superscripts on the same row differ significantly (*=P<0.05), SEM = Standard Error of Mean, NS =Not significant (p>0.05).

CONCLUSION AND APPLICATION

Based on the results of this study, sorghum offal in diets of weaner rabbits should not exceed 50% level of inclusion. The study shows that sorghum offal is suitable in the diets of rabbits without any detrimental effects on growth and carcass characteristics

REFERENCES

- Abubakar, M., Adegbola, T.A. and Abubakar, M.M. (2005). Effects of varying levels of groundnut haulms and cowpea shell on the performance of weaner rabbits. *Nigerian Journal Animal Production*, 32:274-279.
- Adeniji, A.A and Ehiemere, S. (2003). Effect of replacing maize with sorghum offal in the diets of weaner rabbits. *Journal of Agricultural Research and Development*, 2: 1-6.
- Aderemi, F. and Wuraola, A. (2010). Effect of dietary replacement of maize with malted and unmalted sorghum on the performance of weaner rabbits. *African Journal of Food, Agriculture, Nutrition and Development*, 10 (9): 4032- 4046.
- Aderinola, O.A, Ojebiyi, O.O, Rafiu, T.A. Akinlade, J.A and L.O Adepoju. (2008). Performance evaluation of growing rabbits 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 Verona Italy.
- Adeyegun, E. (2009). Utilization of groundnuts forage meal on performance of rabbits. B.Sc Project. Department of Animal Science, Ahmadu Bello University Zaria, Nigeria. Pp. 51
- Aduku A.O and Olukosi J.O. (1990). *Rabbit Management in the Tropics: Production, Processing, Utilization, Marketing, Economics, Practical Training, Research and Future Prospects*. G. U Publications, Abuja, Nigeria.
- Bill, M., Gaden, B. and Sundstrom, B. (2007). Dressing percentage for cattle. *Primefacts* 200: 340. <http://www.dpi.nsw.gov.au>
- Duncan, D.B. (1955). Multiple Range and Multiple tests. *Biometrics* 11:1 – 42.
- Eshiet, N. O., Omole, T.A. and A.A. Adegbola. (1980). Crude protein and energy requirements of rabbits in tropics. *Nigerian Journal of Agricultural Science*, 2: 133 – 177.
- Gualitteiri, M. and Rapaccini, S. (1990). Sorghum grain in poultry feeding. *World's Poultry Science Journal*, 46: 246- 254.
- Iyeghe-Erakpotobor, G.T., Tundunwada, I.K., Tijani, A., Muhammed, I.R. and Bello, N. (2012). Influence of level of groundnut haulms and feeding system on performance of growing rabbits. *Nigerian Journal of Animal Production*, 38(1): 64 – 73
- Jacob, J.P., Mitaru, B.N., Mbugu, P.N and Blair, R. (1996). The effect of substituting kanyan serena sorghum for maize in broiler chicken starter diets with different dietary protein and methionine levels. *Animal Feed Science and Technology*, 61: 41- 56.
- Magalhaes, P.C., Rodrigues, W.A and Duraes, F. (2000). Tanino no grao de sorgo: bases fisiologicas e metodos de determinacao. Sete Lagoas, MG: EMBRAPA/CNPMS, (EMBRAPA-CNPMS Circular Tecnica, 27. Pp. 13
- Malau- Aduli, B.S., Edevie, L. Lakpini, C and Malau- Aduli, A.O.E. (2003). Chemical composition of crop residues based rations in non-lactating, red sokototo goats in the sub humid zone of Nigeria. *Animal Science Journal*, 74:89-94.
- Medugu, C.I., Raji, A.O., Igwebuike, J. U. and Bawa, E. (2011). Alternative Cereal grains and Cereal by-products as sources of energy in poultry diets –A Review. *Print ISSN 2221-1896, ONLINE ISSN 2223-0343. www.roavs.com*
- Ogunsipe, M.H, and Agbede. J.O. (2010). The replacement value of unripe plantain peel on growth performance , carcass traits and cost implication of rabbit production in the tropical region, *Research*, 2(11): 24-29.
- Ogunsipe, M.H., Agbede, J.O. and Adedeji, O.A. (2014). Performance, response, carcass evaluation and economic benefit of rabbits fed sorghum offal-based diets. *AJFAND*, 14:8585-8601.
- Okonkwo, J.C, Olonkwo, I.F and S.C Umerie. (2010). Replacement of feed concentrate with graded levels of cassava leaf meal in the diet of growing rabbits: effect on feed and growth parameters. *Pakistan*

- Journal of Nutrition*. **9**(2): 116-119.
- Rostango, H.S. (1986) Utilizacao do sorgo nas racoes de aves e suinos. *Information on Agro-production*, 144: 18-27.
- Shaahu, D.T., Abacky, A. and Tiough, S.M. (2017). Effect of replacing maize with composite cassava meal (CCM) on growth and economic performance of rabbit. *Nigerian Journal of Animal Production*, 44(2): 79-85.
- SPSS, (2017). Statistical Package for Social Science 160 Brief Guide: version 23. Spssinc 223 South Wacker drive, 11th floor Michigan Avenue, Chicago, United States of America. C IL 60606-641216.
- Uko, O.J., Ataja, A.M., Tanko, H.B. (1999). Response of rabbits to cereals by-products as energy sources in diets. *Archives Zoo technology*, 48(183): 285-293.