EFFECT OF LOCUST (*Zonocerus variegatus*) MEAL ON CARCASS YIELD OF RABBIT MEAT

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ABSTRACT
This experiment was conducted to evaluate the effect of feeding locust meal (LM) on carcass yield of rabbit meat. The rabbits were fed four dietary treatments with varying inclusion levels of locust meal (0, 5, 10 and 15%) as replacement for soyabean meal. The trial lasted for eight weeks, the rabbits were slaughtered, deboned, washed and cut into smaller chops of about 2.5-3cm using a knife according to their treatment groups. Data obtained were analysed using SAS version 9.0. Results showed that rabbits fed diets containing 5% (1639.86 g) and 15% (1642.52 g) levels of LM had significantly higher (P<0.05) live weight than those fed 10% (1450.76 g). The highest value of slaughter weight was obtained in rabbits fed 5% (1565.80 %) and 15% (1570.52 %) inclusion level of LM compared to those fed 10% (1380.76 g). Rabbits fed LM at 15% inclusion level recorded the highest carcass weight (914.43 g) than those fed control diet (829.71 g) and 5% (817.14 g). However, the dressing percentage was significantly (P<0.05) highest in rabbits fed LM at10% (61.66 %) compared to those fed 5% (49.83 %) inclusion level. Hence, it was concluded that dietary replacement of soyabean meal with locust meal may improve performance and carcass characteristics of rabbit meat. It was therefore recommended that farmers may replace soyabean meal with 15% locust meal in the diet of growing rabbits for higher live weight, slaughter weight and carcass weight.
Keywords: Carcass, Dressing percentage, Live weight, Locust meal, Rabbits

INTRODUCTION

The demand for meat is expected to be 58% higher in 2050 than its level in 2010 and a large part of this increase will originate from developing countries (FAO, 2011). In order to bridge this gap, rearing of short cycled animals like rabbits has been advocated (Khan *et al.,* 2017). Rabbit has been shown to grow rapidly and for them to perform optimally; they require good quality feed (Khan *et al.,* 2017). Rabbit meat has been reported to stand for its healthier characteristics due to its higher protein content, low unsaturated fats richer in polyunsaturated ones, absence of uric acid and purines, compared to beef meat (Nistor *et al.,* 2013). However, annual consumption of rabbit meat remains limited worldwide (0.30 kg per capita) in comparison to beef (6.4kg), pork (12.5 kg) and poultry (13.5 kg) (Amenan *et al.,* 2018).

Moreover, the conventional feed resources available are expensive and out of reach of the poor resource farmers, due to increasing costs (Ramos *et al.,* 2002). It has been reported that feed cost constitutes over 70-80% cost of production (Akinmutimi and Ezea, 2006), and subsequently the cost of animal products like meat. One of the potential sources of high value protein which is increasingly being investigated over the last decade, are insects (Josianne, 2015). There is currently a growing interest in the use of some of the protein-rich insect species as a low-cost protein ingredient in livestock ration (Van-Huis *et al*., 2013). According to Rafi Ullah *et al.* (2017), insects grow and reproduce very fast, have high feed conversion efficiency and can be fed on bio-wastes materials. Several studies on the use of insect meal in animal feeding trials have been documented (Olaleye, 2015; Laura, 2015). Abanikannda (2012) reported the replacement of 25% fish meal by migratory locust (*Locusta migratoria*) meal in iso-protein diets of Nile tilapia fingerlings without any adverse effect on the nutrient digestibility, growth performance and haematological parameters. In addition, broiler birds fed desert locust meal (*Schistocerca gregaria*) as a substitute for fishmeal, resulted in higher body weight gain, feed intake and feed conversion ratio (Adeyemo and Longe, 2008). It has been reported that different factors, such as age at slaughter, weight, breed and sex, have an influence on different carcass traits (Bianospino *et al.,* 2006). In Nigerian livestock industry, limited work has been done on the nutritional value of insect meal on rabbit. Therefore, the present study was designed to assess the effect of feeding rabbits with locust meal on the performance and carcass yield.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Rabbitry Unit of the Teaching and Research Farm of Department of Animal Science, Ahmadu Bello University, Zaria. The site is located at Latitude 11^0 9' 46" N and Longitude 7^0 37' 45" E with an altitude of 610m above sea level (GPS, 2020). The temperature ranges between 26^0C - 40^0C while, the relative humidity during the dry and wet seasons ranged between 21% and 72%, respectively. The wet period starts

between May and October with annual rainfall of about 1500mm (Institute for Agricultural Research and Management Services, 2020).

Experimental design and animal management

Twenty-eight weaned rabbits at the age of 6 weeks (average weight 500±12g) of mixed sex and breeds (Dutch and New Zealand White) sourced from an open market in Samaru were used for this study. The animal care and handling procedures was approved by the Ahmadu Bello University Committee on Animal Use and Care (ABUCAUC), which strictly adheres to the International Standards on Animal Use and Care (Amenan *et al.,* 2018). Prior to the commencement of the experiments, the rabbits were acclimatized for two weeks and fed commercial grower concentrates feed. The rabbits were weighed individually on arrival before they were randomly allotted to four dietary treatments comprising of inclusion levels of locust meal at 0, 5, 10 and 15% with seven rabbits per treatment in a completely randomized design. Each rabbit served as a replicate. Each of the rabbits was individually caged and were properly housed in well ventilated pens.

The rabbits were allowed adjustment period of seven days during which they were fed the experimental diets to acclimatize with the environment and the feed. Each of the rabbits was given 0.2mls of Ivomec intra-muscular injection against ecto- and endo-parasites. Anticoccidial drug (Vitacox Plus 100g) was also administered in drinking water to manage coccidiosis. Fresh and clean drinking water was provided *ad libitum* throughout the experimental period. Any disease sign observed during the experimental period was treated accordingly.

Experimental diets and feeding trial

The locust (*Zonocerous variegatus*) was purchased from an open market in Sabon Gari, Zaria, cleaned, milled and incorporated into the experimental diets. Four iso-nitrogenous diets were formulated to contain graded levels of locust meal (LM) at 0, 5, 10 and 15% as replacement for soyabean meal. The diets were formulated to meet the NRC (1995) nutritional requirements of rabbits. The concentrate diet fed to the rabbits included maize (20%), maize offal (23.45%), rice offal (30%), soya cake (24%, 22.80%, 21.60% and 20.40 for 0%, 5%, 10% and 15%, respectively), common salt (0.35%), bone meal (1.50%). Initial weights of the rabbits were recorded and thereafter they were weighed on weekly basis. The feeding trial lasted for eight weeks.

Carcass analysis

At the end of the feeding trial, all the animals were fasted for 16 hours and then transported to the Animal Product Processing Laboratory for slaughtering. They were slaughtered by severing the jugular veins using sharp knife according to the recommended method (Amenan *et al.,* 2018). The animals were bled by turning them upside down for 30 minutes, skinned, washed, eviscerated and separated into primal cuts. Slaughter weight, dress weights and all other carcass characteristics were recorded accordingly.

Statistical analysis

Data obtained were subjected to analysis of variance using general linear model procedure of SAS 9.0 (2002). Treatment means that were significantly different were compared using LSD at 5% level of probability.

RESULTS AND DISCUSSION

Table 1 shows the carcass characteristics of growing rabbits fed diets containing varying inclusion levels of locust meal. It was revealed that there was a significant difference ($P<0.05$) between levels of locust meal on rabbits' carcass parameters measured. Rabbits fed diets containing 15% inclusion levels of locust meal had the highest live weight (1642.52g), slaughter weight (1570.52g) and carcass weight (914.43g) while, 10% inclusion level had the lowest. However, rabbits fed diet containing 10% inclusion level of locust meal had the highest dressing percentage (61.66%) and those fed 5% inclusion level had the least (49.83%).

In this study, it was apparent that including locust meal in the diet of growing rabbits improved the carcass characteristics. The current findings showed that 15% inclusion levels of locust meal in the diet of growing rabbits had the best slaughter weights (1570.52g) and carcass weight (914.43g). This confirmed that feeding locust meal had positive effect on carcass traits of growing rabbits which are the most desirable traits cherished by consumers in different parts of the globe (Burnett *et al.,* 2006; Ozkan *et al.,* 2012; Petracci *et al.,* 2018).

Table 1: Carcass characteristics of growing rabbits fed diets containing varying levels of locust meal as replacement for soyabean cake

	Replacement levels of soyabean meal (%)				
Parameters	**0**	**5**	**10**	**15**	**SEM**
Live weight (g)	1538.96 [b]	1639.86 [a]	1450.76 [c]	1642.52 [a]	19.14
Slaughter weight (g)	1461.96 [b]	1565.80 [a]	1380.76 [c]	1570.52 [a]	13.35
Carcass weight (g)	829.71 [c]	817.14 [c]	894.57 [b]	914.43 [a]	7.66
Dressing (%)	53.91 [b]	49.83 [c]	61.66 [a]	55.67 [b]	1.01

[abc] Means with different superscript on the same row differ significantly ($P<0.05$); SEM = Standard error of mean.

The dressing percentage of rabbits fed 10% inclusion level of locust meal was higher than the reported value of 58% in broiler rabbits (Laura *et al.,* 2019). This result indicates that rabbits have the potential to supply high quality meat for consumption from less competitive feedstuffs available in the society (Burnett *et al.,* 2006; Petracci *et al.,* 2018). However, the values of carcass weight recorded in this study were lower than the reported values of Uhlirova *et al.* (2018) and Laura *et al.* (2019). This difference can be explained by differences in rabbit breeds used and the test ingredients. Although rabbits of mixed breeds and sexes were used in this study, the dressing percentage recorded agreed with the findings of Oloruntola *et al.* (2018) and Uhlirova *et al.* (2018). However, the values recorded for dressing percentage were lower than the reported values of 69% (Kadi *et al.,* 2018). This difference might be related to the physical adaptation of the digestive tract of rabbits fed 5% inclusion level of locust meal to increase in feed intake.

CONCLUSION AND RECOMMENDATIONS

Based on the findings, it could be concluded that dietary replacement of soyabean meal with locust meal improved carcass characteristics of rabbit meat. It is therefore recommended that rabbit farmers in Nigeria could replace Soyabean meal with up to 15% locust meal in the diet of growing rabbits for better carcass yield. Further studies should explore higher levels of inclusion of locust meal in the diet of growing rabbits to reduce competition with conventional feedstuff.

REFERENCES

Abanikannda, M. F. (2012). Nutrient digestibility and haematology of Nile tilapia (*Oreochromis niloticus*) fed with varying levels of locust (*Locusta migratoria*) meal. Bachelor of Aquaculture and Fisheries Management, Federal University of Agriculture, Abeokuta, Ogun State, July 2012.

Adeyemo, G. O. and Longe, O. G. (2008). Effects of feeding desert locust meal (*Schistocerca gregaria*) on performance and haematology of broilers. Competition for Resources in a changing World: New Drive for Rural Development. *Tropentag* 2008, University of Hohenheim, Stuttgart, Germany. October 7-9: 1-4.

Amenan, P. K., Juliana, M. V., Dominic, G., Dany, C., Frederic, G. and Linda, S. (2018). Application of *Carnobacterium maltaromaticum* as a feed additive for weaned rabbits to improve meat microbial quality and safety. *Meat Science*, 135: 174-188.

Akinmutimi, A. H. and Ezea, J. (2006) Effect of graded levels of toasted lima bean (*Phaseolus lunatus*) meal on weaner rabbit diets. *Paskistan Journal of Nutrition,* 5 (4): 368 – 372.

Bianospino, E., Wechsler, F. S., Fernandes, Roca, R. O., and Moura, A. S. M. T, (2006). Growth carcass and meat quality traits of straightbred and crossbred Botucatu rabbits. *World Rabbit Science,* 14 (4):237-246.

Burnett, N., Mathura, K., Metivier, K.S., Holder, R.B., Brown, G. and Campbell, M. (2006). An investigation into haematological and serum chemistry parameters of rabbits in Trinidad. *World Rabbit Science,* 14:175-187

FAO (2011). World Livestock 2011 – Livestock in food security. Food and Agriculture Organization of the United Nations (FAO), Rome.

GPS (2020). Global Positioning System. https://www.gps.gov.

IARMS (2020). Institute for Agricultural Research and Management Services, Samaru, Ahmadu Bello Univeristy, Zaria, Kaduna State.

Josianne, C. (2015). Edible insects in Africa: An introduction to finding, using and eating insects. *Agromisa Foundation and CTA, Wageningen*, Pp86.

Kadi, S.A., Ouendi, M., Bannelier, C., Berchiche, M. and Gidenne, T. (2018). Nutritive value of sun-dried common reed (*Phragmites australis*) leaves and its effect on performance and carcass characteristics of the growing rabbit. *World Rabbit Science*. 26:113-121 doi:10.4995/wrs.2018.5217

Khan, K., Khan, S., Khan, N. A. and Ahmad, N. (2017). Production performance of indigenous rabbits under traditional and intensive production systems in northern Pakistan. *The Journal of Animal and Plant Sciences*. 27 (1): 75-81

Laura, W. (2015). The role of red meat in the diet: Nutritional and health benefits. *Proceedings of the Nutrition Society*. 75 (3): 22-232. https//www.cambridge.org/core.

Laura, G., Sihem, D., Francesco, G., Alberto, B., Achille, S., Marco, B., Gerolamo, X. and Angela, T. (2019). Quality and Consumer Acceptance of Meat from Rabbits Fed Diets in Which Soybean Oil is Replaced with Black Soldier Fly and Yellow Mealworm Fats. *Animals* 9(629):1-14 www.mdpi.com/journal/animals

Liu, G. Y., Sun, C. R., Zhao, X. Y., Liu, H. L., Wu, Z. Y. and Li, F. C. (2018). Effect of substituting guinea grass with sunflower hulls on production performance and digestion traits in fattening rabbits, *World Rabbit Science*. 26: 217-225 doi:10.4995/wrs.2018.9375

National Research Council (1995). *Nutrient Requirement of Rabbits*. 8th Revised Edition. National Academy Press. Washington D.C. 37pp.

Nistor, E., Bampidis, V. A., Pacala, N., Pentea, M., Tozer, J. and Prundeanu, H. (2013). Content of rabbit meat as compared to chicken, beef and pork meat. *Journal of Animal Production Advances*. 3:172-176.

Olaleye, I. G. (2015). Effects of Grasshopper Meal in the Diet of *Clarias gariepinus* Fingerlings. *Journal of Aquaculture, Research and Development*. 6 (4): 321.

Oloruntola, O. D., Ayodele, S. O., Adeyeye, S. A. and Agbede, J. O. (2018). Performance, haemato-biochemical indices and antioxidant status of growing rabbits fed on diets supplemented with *Mucuna pruriens* leaf meal. *World Rabbit Science*. 26: 277-285 doi:10.4995/wrs.2018.10182

Ozkan, C., Kaya, A. and Akgul, Y. (2012). Normal values of haematological and some biochemical parameters in serum and urine of New Zealand White rabbits. *World Rabbit Science*. 20: 253-259 doi:10.4995/wrs.2012.1229

Petracci. M., Soglia, F., Baldi, G., Balzani, L., Mudalal, S. and Cavani, C. (2018). Technical note: estimation of real rabbit meat consumption in Italy. *World Rabbit Science*. 26: 91-96 doi:10.4995/wrs.2018.7802

Rafi Ullah, S. K., Abdul Hafeez, A. S., Nazir, A. K., Naila, C. and Naseer, A. (2017). Silkworm (*Bombyx mori*) meal as alternate protein ingredient in Broiler finisher Ration. *Pakistan Journal of Zoology*. 49 (4): 1463-1470.

Ramos, E. J., Gonzalez, E. A., Hernandez, A. R. and Pino, J. M. (2002). Use of *Tenebrio olitor* (*Coleoptera tenebrionidae*) to recycle organic wastes and as feed for broiler chickens. *Journal of economic Entomology*. 95: 214-220. https://doi.org/10.1603/0022- 0493- 95.1.214

SAS (2002). Statistical Analysis System. SAS institute, SAS user's guide.

Uhlirova, L, Volek, Z. and Marounek, M. (2018). White lupin bran and its effects on the growth performance, carcass characteristics and digestibility of nutrients in fattening rabbits. *World Rabbit Science*. 26: 1-6 doi:10.4995/wrs.2018.8781

Van Huis, A., Itterbeeck, V. J., Klunder, H., Mertens, E., Halloran, A., Muir, G. and Vantomme, P. (2013). Edible insects' Future prospects for food and feed security. FAO Forestry Paper 171.