INFLUENCE OF PHYTOBIOTICS BLEND (TURMERIC, GARLIC, GINGER AND CLOVE) ON COOK LOSS, WATER ABSORPTIVE POWER, CHILLING LOSS AND COLOUR OF RABBIT MEAT

Okanlawon E.O.[1], Bello K.O.[2], Akinola O.S.[1],Adeola A. A.[2,] and Ademolue R.O.[1]
[1] Department of Animal Production and Health;
[2] Institute of Food Security, Environmental Resources and Agricultural Research;
Federal University of Agriculture Abeokuta
Corresponding Author: edenokanlawon@gmail.com, +2348056813070

ABSTRACT

*The present study was conducted to investigate the effect of natural feed additives on meat quality of rabbit. A total of forty eight (48) 7-8 weeks old crossbreed rabbits were used to determine the influence of phytobiotics blend (turmeric, garlic, ginger and clove) on rabbit meat quality. The rabbits were allocated into two treatments. T1-24 rabbits fed diet without blend and T2- 24 rabbits fed mash diets with 10g inclusion of phytobiotics blend in a one way analysis of variance arrangement. Data collected on cook Loss, water absorptive power, chilling loss and colour and were analyzed using analysis of variance. Significant (P<0.05) differences were obtained on meat colour A, B, A*and B*. Rabbits fed the blend-containing diet had the highest (P<0.05) value A (10.88), while those fed the diet without the blend-containing diet had the least value (9.43). The blend-containing diet-fed rabbits had the highest (P<0.05) B (8.42) value, while the blend-free diet-fed rabbits had the lowest value (7.42). Highest (P<0.05) A* (11.91) value was recorded with rabbits fed diet containing the blend whereas those fed diet without the inclusion of the blend had the least value (10.37). Rabbits fed the blend-containing diet had the highest (P<0.05) B* (10.21) value, while those fed the diet without the blend had the lowest value (9.15). In conclusion feeding diet containing phytobiotic blend had positive effect on cook Loss, water absorptive power, chilling loss and colour of rabbit meat. Therefore it is recommended to feed rabbit with diet containing phytobiotic blend in order improve the meat quality.*

Keywords: rabbit, phytobiotic blend, meat colour, Cook loss, Refrigeration loss

INTRODUCTION

The oxidative stability of rabbit meat, which is prone to deterioration due to its nutritional composition, can be improved by dietary supplementation with natural antioxidants (Dalle Zotte 2002). Various aromatic herbs such as (turmeric, garlic, ginger, and cloves) and essential oils have been used in rabbit feed to enhance performance, health, and meat quality because they have flavoring properties and can cause changes in the color indexes of both raw and cooked meat, according to (Dal Bosco *et al*., 2012; Peiretti *et al*., 2013; Gerencs *et al.,* 2014; Purwanti *et al.,* 2018; Simone *et al.,* 2018). Colour is one of the most significant factors influencing their choice when it comes to the visual evaluation of raw meat (Joo *et al.,*2013). Since color is the first thing a consumer sees and is used to indicate freshness and wholesomeness of meat. The color of meat varies depending on the species, age, and type of muscle. These variations in color are caused by the different amounts of myoglobin in the muscles (Joo *et al.,* 2013). To the consumer, however, the look of the meat surface is determined not only by the amount of myoglobin present but also by the kind of myoglobin molecule, its chemical state, and the physical and chemical state of other meat components (Lawrie and Ledward, 2006).

There is need to investigate into the combination of turmeric, ginger, garlic and clove as natural feed additives in rabbit nutrition since it has been reported by (Vispute, 2019) that the four phytobiotic are limited by plant species, soil type, location, weather condition, processing and storage that might reduce the potency of active ingredient so there is need to combine the phytobiotic in other to synergize or compliment there action to improve quality of rabbit meat .

MATERIALS AND METHODS

The study was conducted at the Rabbitary unit of Institute of Food Security, Environmental Resources and Agricultural Research Federal University of Agriculture Abeokuta.

Fresh Turmeric, Garlic, Ginger and Clove were purchased from Bode Market, Ibadan, Oyo state. Each sample was washed (except garlic and clove) using clean water to remove the dirt completely and where prepared by the method described by (Okanlawon *et al.,* 2020).

A total of forty eight (48) 7-8 weeks old crossbreed rabbits were used for the study and turmeric, garlic, ginger, and of clove were combine at 2.5g each to form 10g of the blend. The animals were purchased from a reputable farm and were acclimatized for two weeks. They were weighed and allotted to 2 treatments on equal weight basis in a one way analysis of variance arrangement. Treatments, T1- 24 rabbits were fed diet without blend. T2- 24 rabbits were fed diets with 10g inclusion of blend. Each treatment having 12 replicates of 2 rabbits each. Before stocking, the pen was cleaned thoroughly and disinfected. The animals were fed with experimental diet containing 17.25% Crude Protein (CP) and 2829.2 kcal/g Metabolizable Energy. Feed and water were supplied *ad libitum* daily. The feeding trial lasted for 10 weeks after which four animal per treatment were slaughtered for meat quality analysis.

Colour Determination

Colour attributes of raw rabbit meat according to treatment and replicate were evaluated by placing the colorimeter on each meat sample and the readings were taken. They were measured by L^* (brightness), a^* (redness-greenness) B^* (yellowness-blueness) as described by Yam and Papadakis (2004). Two repeated measurements were taken for each sample according to the guidelines for meat color evaluation procedure of (Hunt *et al.,*1980)

Determination of water absorptive power

Water absorptive power of rabbit meat were done by using three gram (3%) each of meat sample from the thigh muscle was weighed and placed in clean test tubes; 10mls of distilled water was poured in and left for an hour. After the time elapsed, each sample was removed and reweighed. The increase in the weight of the sample indicated the volume of water absorbed.

WAP (%) = Final weight (%) Initial weight (%) according (Sanwo *et al.,*2011)

Determination of chilling loss

Determination of rabbit meat chilling loss were also done by using 30% of meat sample from the thigh muscle of each treatment and replicate was weighed and labelled before refrigeration at 4^{o}C and weighed again after 24hours of refrigeration to determine the chilling loss as follows:

Chilling loss (%) = Weight before refrigeration (%) – weight after refrigeration (%) Sanwo *et al.,*2011)

Determination of rabbit meat cook loss

Determination of rabbit meat cook loss were done using a sample of 200g of thigh muscle meat was weighed, wrapped in an individual airtight polythene bag, and cooked for 30 minutes at 70^{0}C in a water bath. Following cooking, all meat samples had any remaining moisture removed, and they were allowed to cool to room temperature. The meat samples were reweighed accordingly and difference in weight was obtained as cooking weight loss.

Cook loss (%) = Weight before cooking (%) – weight after cooking (%) Sanwo *et al.,*2011)

Data collected were analysed using analysis of variance (ANOVA) according to SAS (2002). Significant means were separated using Duncan Multiple Range Test of SAS (2002).

RESULTS AND DISCUSSION

Table 1 shows the main effect of phytobiotic blend on cook loss, water absorptive power, chilling loss and colour of rabbits meat fed diets containing turmeric-garlic-ginger-clove blend in mash and pellet form. Significant ($P<0.05$) differences were obtained on meat colour A, B, A*and B*. Rabbits fed the blend-containing diet had the highest ($P<0.05$) value A (10.88), while those fed the diet without the blend-containing diet had the least value (9.43). The blend-containing diet-fed rabbits had the highest ($P<0.05$) B (8.42) value, while the blend-free diet-fed rabbits had the lowest value (7.42). Highest ($P<0.05$) A* (11.91) value was recorded with rabbits fed diet containing the blend whereas those fed diet without the inclusion of the blend had the least value (10.37). Rabbits fed the blend-containing diet had the highest ($P<0.05$) B* (10.21) value, while those fed the diet without the blend had the lowest value (9.15). The final cook loss, total cook loss, final water absorptive power, total chilling loss, L, and L* did not differ in a way that was statistically significant ($P>0.05$). The inclusion of blend had no significant effect on cook weight, water absorptive power, chilling weight of rabbit

meat. This result was not in line with the report of Purwanti *et al.* (2018) who stated that inclusion of turmeric and ginger had significant effect on meat of broiler chicken. It was observed that the value of cook weight and chilling weight decreased because of the increasing value of the water absorptive power of meat with the inclusion of the blend. Soeparno (2005) stated that the shrinkage has a negative relationship with the cooking water holding capacity. It was also reported that low water absorptive power will result in high value cooking shrinkage (Aulia *et al.,* 2005) which is in line with the result of this research that as the water absorptive power decreases there is an increase in cook weight and refrigeration weight.

Blend had major impact on the color of the meat (L and A, B and A*, B and B*) rabbit meat. The result in this present study shows that inclusion of the blend had influence on the meat colour due to the active ingredient consisted in the blend of turmeric, garlic, ginger and clove which are (curcumin, allicin, gingerols and Eugenol) which had been proven to have positive effect on meat and this is in agreement with the report of Purwanti *et al.* (2018) and Simone *et al.* (2018) who reported that dietary turmeric and garlic powder induced modification in colour indexes of both raw and cooked meat.

Table 1 : Main effect of blend on cook loss, water absorptive power, refrigeration weight and colour of rabbits meat

Parameters	Without	With	SEM	P-value
Initial cook loss (g)	200.00	200.00	0	0
Final cook loss (g)	195.85	196.50	0.27	0.15
Total cook loss (g)	4.15	3.50	0.27	0.15
Initial WAP (g)	3.00	3.00	0	0
Final WAP (g)	3.82	3.88	0.05	0.34
Total WAP (g)	0.82	0.88	0.05	0.34
Initial CW (g)	30.00	30.00	0	0
Final CW (g)	28.55	29.09	0.11	0.33
Total CW (g)	1.45	0.91	0.11	0.33
L	61.95	62.21	0.82	0.51
A	9.43^{b}	10.88^{a}	0.38	0.04
B	7.42^{b}	8.42^{a}	0.26	0.03
L*	69.48	67.39	1.02	0.28
A*	10.37^{b}	11.91^{a}	0.41	0.04
B*	9.15^{b}	10.21^{a}	0.32	0.02

ab: Means in the same row with different superscripts differ significantly ($p<0.05$)
WAP=Water absorptive power
CW=Chilling weight
L= Lightness
A=Redness
B=Yellowness

CONCLUSION AND RECOMMEDATION

The study concluded that feeding diet containing phytobiotic blend had positive effect on cook Loss, water absorptive power, refrigeration loss and colour of rabbit meat. Therefore it is recommended to feed rabbit with diet containing phytobiotic blend in order improve the meat quality.

REFERENCES

Aulia, O. A., Dwiloka, B and Arifin, M. (2005). Perbaikan manajemen pemotongan ternak untuk menghasilkan daging sapi lokal berkualitas impor. Seminar Nasional Teknologi Peternakan danVeteriner Universitas Diponegoro, Semarang.

Dal Bosco, A., Mourvaki, E., Cardinali, R., Servili, M., Sebastiani, B., Ruggeri, S., Mattioli, S., Taticchi, A., Esposto S, Castellini C. (2012). Effect of dietary supplementation with olive pomaces on the performance and meat quality of growing rabbits. Meat Sci. 92:783–788

Dalle Zotte A. (2002). Perception of rabbit meat quality andmajor factors influencing the rabbit carcass and meat quality. Livest Prod Sci. 75:11–32.

Gerencs_er, Z., Szendr€o, Z., Matics, Z., Radnai, I., Kov_acs M., Nagy, I., Cullere, M., Dal Bosco, A. and Dalle Zotte, A. (2014). Effect of Dietary supplementation of Spirulina (Arthrospira platensis) and Thyme (Thymus vulgaris) on apparent digestibility and productive performance of growing rabbits. World Rabbit Sci. 22:1–9.

Hunt, M. C. 1980. Meat colour measurement. Proceedings of Meat Conference. 33:41.Joo, S. T., Kim, G. D., Hwang Y. H. and Ryu, Y. C. (2013). Control of fresh meat quality through manipulation of muscle fiber characteristics. Meat Science, 95(4), pp. 828-36.

Lawrie, R. A. and Ledward, D. A. (2006). Lawrie's meat science. 7th edition. Woodhead Publishing, Cambridge, England.

Okanlawon, E.O., Bello, K.O., Akinola, O.S., Oluwatosin, O.O., Irekhore and Ademolue, R.O. (2020). Evaluation of Growth, Reproductive Performance And Economic Benefits Of Rabbits Fed Diets Supplemented With Turmeric (Curcuma Longa) Powder. Egyptian Poultry Science Journal , 40 (3): 701-714

Peiretti, P.G., Gai, F., Rotolo, L., Brugiapaglia, A, and Gasco, L. (2013). Effects of tomato pomace supplementation on carcass characteristics and meat quality of fattening rabbits. Meat Sci. 95:345–351.

Purwanti. S. (2018). Physical and Sensory Quality of Broiler Meat as Influenced by Dietary Supplementation of Turmeric (Curcuma longa), Garlic (Allium sativum) and in Combinations as a Feed DOI: 10.20884/1.jap.2018.20.1.633.

SAS. (2002). SAS/STAT Software: Changes and Enhancements through Release 8.1, SASInstitute Inc., Cary, NC.

Sanwo, K. A., Iposu, S. O., Oladoyin, F. O. and Adegbite, J. A. (2011). Quality characteristics of sausages prepared from local and exotic cockerals. Nigerian poultry Science Journal.8:26-30

Simone, M., Guilia, S. Giovanna, P. and Giuliana, P. (2017). Ginger (Zingiber officinale Roscoe) powder as dietary supplementation in rabbit: life performances, carcass characteristics and meat quality. Pages 867-872

Soeparno. 2005. Ilmu dan Teknologi Daging. Edisi ke-2. Gadjah Mada University Press. Yogyakarta.

Vispute, M.M. (2019). Improvement in poultry performance through application of phytobiotics.www.side share.net. (Accessed 3-9-2019, 3:11pm)