ASSESSMENT OF THE OXIDATIVE AND BACTERIOLOGICAL STATUSES OF PORK FROM PIGS FED DIETS SUPPLEMENTED WITH GARLIC

*** P. F.[1,2]DUROWAIYE, T. Z.[2]OGUNRIBIDO, A. A.[2]AKINTOMIDE, D. O.[2]ADIGUN AND G. E. ONIBI**

[1] Ahmadu Bello University College of Agriculture, Kabba Campus, Kabba, Nigeria.
[2] Department of Animal Production & Health, Federal University of Technology, Akure, Nigeria.
durowaiyepfg@gmail.com; 07062159476

ABSTRACT

There has been a lot of concern and restriction on the use of synthetic antibiotics as growth promoters in livestock feeds, leading to the need for alternatives that would be hazard free. This study evaluated the oxidative and bacteriological statuses of refrigerated fresh meat of pigs fed diets supplemented with ground garlic (*Allium sativum*). Four experimental diets, each containing the test additives were prepared to contain a basal diet (17.71% CP, 2653.21 kcal/kg DE) at 0, 1.0, 2.5 and 5.0 g/kg diet. The diets were offered to sixteen (16) pigs of mixed breeds (Large White, Landrace and Duroc) within the range of 24.5 and 27.5 kg live weight. The pigs were randomly allotted to four dietary treatments with each pig housed in separately partitioned pen and treated as a replicate in a completely randomized experimental design. The diets were offered to the pigs at 5% of pig's body weight and fed twice (morning and evening) daily while clean water was provided *ad-libitum* throughout the experimental period of nine weeks. Thereafter, the pigs were slaughtered and meat samples from the thighs were collected and refrigerated for up to five (5) days for determination of oxidative stability and bacteriological status. The results showed that dietary supplementation of garlic for pigs enhanced oxidative stability ($P>0.05$) and reduced bacterial load ($P<0.001$) of the refrigerated meat.

Keywords: Pigs, garlic supplementation, pork, oxidation, bacterial load

INTRODUCTION

The need to meet the growing demand for animal protein in terms of quantity and quality in diets of Nigerians cannot be overemphasized. Pigs are livestock specie with fast growing potential, found in many parts of Nigeria contributing significantly to the meat industry (Adebambo, 1995). As such pig remains one of the veritable sources of animal protein. It is obvious that the animal protein consumption of most Nigerians is still far below the minimum requirement. This could be as a result of poor production and storage facilities. Aletor (1986) noted that in Africa and other less developed nations, the low level of supply of animal protein is as a result of poor performance of livestock. The present rapid increase in population and the resultant increase in demand for meat, however necessitates the need to boost the production of pigs largely because swine are able to utilize many feeds that most classes of livestock do not relish. More emphasis than ever before is now placed on global food security. Hence, pig meat offers considerable potential for bridging the gap between supply and demand for animal protein, especially in Nigeria.

The pressure of huge demand for meat prompts the idea of including growth promoter in diets of livestock so that they can attain market weight within the shortest possible time. Recently, there is increased concern over the use of antibiotics as growth promoters in animal feeds (Marisol, 2010). Peter (2010) reported the current legal tendencies in health matters and political wish in many developed nations which is to clamp down on the use of synthetic drugs throughout the intensive livestock industry. According to Oliver *et al.* (2011), the development of antimicrobial resistance resulting from agricultural use of antibiotic could impact treatment of diseases affecting the human population that require antibiotic intervention and this has become a significant global public health concern. Therefore, attention is being focused on setting new regulations for more natural production methods that are friendly to animals, the consumer and the environment (Wenk, 2000). The huge demand for extra growth in livestock

globally has necessitated the increasing demand and consumption of aromatic plant extracts, such as thyme and eucalyptus because of their effectiveness as an alternative to synthetic antibiotics, antioxidants, vitamins and minerals both in man and animals (Gulsen and Erol, 2010). They also stated that herbs and spices have traditionally been used in cooking as they add flavour to food and possess medicinal properties. Onibi *et al.* (2007) reported the antioxidative influence of garlic in meat which is becoming more imperative in less developed nations, considering storage problems and increasing use of alternative feed sources without consideration for meat quality. In recent years, aromatic plants and their extracts have received increased attention as potential alternatives to growth promoters. Gulsen and Erol (2010) concluded that one of these plants used most intensively and widespread is garlic (*Allium sativum*).

MATERIALS AND METHODS

The experiment was carried out at the Piggery Unit of the Teaching and Research Farm, Federal University of Technology, Akure, Ondo State, Nigeria. Sixteen (16) growing pigs of mixed breeds (Large White, Landrace and Duroc) weighing
between 24.5 and 27.5 kg, comprising eight boars and eight gilts were used. The pigs were fed the basal diet *ad libitum* for a two-week adaptation period after which they were randomly assigned to four experimental diets (0, 1, 2.5 and 5 g garlic/kg) for a nine-week feeding period. The garlic bulbs were peeled, chopped, sun-dried and ground. The basal grower-finisher diet was formulated to contain 17.71% CP and 2653.21 kcal/kg DE. The completely randomized experimental design (CRD) was adopted. There were four replicates per treatment with each pig serving as a replicate as the pigs were individually penned and fed. Each treatment had two growing boars and two gilts. The diets were offered at 5% of pig's body weight and fed twice (morning and evening) daily while clean water was provided *ad-libitum* throughout the experimental period of nine weeks. At the end of the feeding trial, the pigs were starved overnight, stunned and slaughtered. The left thighs of each of the carcasses were refrigerated for up to five (5) days for determination of oxidative stability using the aqueous extraction 2-thiobarbituric acid (TBA) method described by Pikul *et al.* (1989) and Onibi (2003) and bacteriological status according to Lamb (1981). The data collected were subjected to factorial analysis using the Minitab Statistic Package (v.17.1, Minitab Inc. USA).

RESULTS AND DISCUSSION

Table 1 shows the extent of oxidation of pork refrigerated for a day and five days as well as the bacterial load of the meat. The results showed that the level of garlic supplementation had no significant ($P>0.05$) effect on oxidative stability of refrigerated pork but malondialdehyde (MDA) concentration decreased due to dietary garlic supplementation. The MDA concentration of the refrigerated pork significantly ($P<0.001$) increased from 0.13±0.05 mg/kg meat on day 1 to 0.27±0.13 mg/kg at 5 days of refrigeration showing that oxidation of meat continues even during refrigerated storage. The reduction in MDA concentration of meat due to dietary garlic supplementation suggests the antioxidant ability of garlic due to activities of *allicin* and other compounds. This agrees with the reports of Onibi *et al.* (2009) on improved oxidative stability of meat of broiler chickens fed diets supplemented with garlic. The interaction between the level of supplementation and length of storage showed no significant ($P>0.05$) effect on the extent of oxidation.

There was a significant ($P<0.001$) reduction in bacteriological load of the refrigerated meat with increasing levels of dietary garlic. This could be attributed to the inhibitory action of sulphur containing compound in garlic against certain bacteria as reported by Carson (1987).

CONCLUSION

Garlic supplementation at up to 5 g/kg diet for pigs improved oxidative stability and reduced bacterial load of meat during refrigerated storage. Thus, this could be a strategy for improving storability of pork.

REFERENCES

Adebambo, O. (1995). Selection handling of pig breeds for profitable pig farming in Nigeria In: *Pig Production Workshop Training Manual* NAERLS, ABU, Zaria. pp. 215

Aletor, V. A. (1986). Some agro-industrial by-products and wastes in livestock feeding.

Review of prospects and problems. *World Review Animal Production*. 22: 36-44.

Carson, O.L. (1987). Effect of garlic on meat quality and blood lipids in particles with coronary heart disease. *Journal of Clinical Nutrition*. 34: 2100-2103

Gulsen, G. and Erol, A. (2010). Antimicrobial effect of garlic (*Allum sativum*) and tradition medicine. *J. Ani and Vet. Adv.* 9(1): 1- 4.

Lamb, G.M. (1981). Manual of Veterinary Laboratory Technology. In: Kenya Green, Oxford University Press, New York, Toronto. Pp 5-22.

Marisol, C. (2010). Weaner diets: Prebiotics or probiotics? Their exact functions and examples. *Pig Progress International Magazine*. 26(1): 22-23.

Minitab Statistical Package (v.17.1), Minitab Inc., USA

Oliver, S. P., Murinda, S. E. and Jayarao, B. M. (2011). Impact of antibiotic use in adult dairy cows antimicrobial resistance of veterinary and human pathogen: *A comprehensive review Foodborne Path. Dis*. 8(3): 337-355.

Onibi, G. E., Adebisi, O. E., Fajemisin, A. N. and Adetunji, A. V. (2009). Response of broiler chickens in terms of performance and meat quality to garlic (*Allium sativum*) supplementation. *Afr. J. Agric.Res.* 4(5): 511-517.

Onibi, G. E., Agbede, J. O., Afun, S. T. and Aletor, V. A. (2007). Assessment of the meat quality of broiler chickens fed equi-protein replacement of fish meal with frog meal. *Res. Agric. Sci.* 1(2): 73-80.

Onibi, G.E. (2003). Evaluation of thyme as an antioxidant in broiler chicken meat. In: Taiwo, A.A. et al. (eds). Nigerian Livestock: A goldmine for economic growth and food security. Proceeding 28th Annual Conference of Nigeria Society for Animal Production. Institute of Agricultural Research and Training, Ibadan, Nigeria. Pp. 61-64.

Peter, W. (2010). Market demands for feeding just-weaned pigs. *Pig Progress International Magazine*. 26(1): 30-31.

Pikul, L.J., Leszeezynsk, D.E., Kummerow, F.A. (1989). Evaluation of three modified TBA methods for measuring lipid oxidation in chicken meat. J. Agric. Food Chem. 37: 1309 -1313.

Wenk, C. (2000). Herbs, spices and botanicals: 'Old fashioned' or the new feed additives for tomorrow's feed formulations? Concepts for their successful use. In: Biotechnology of the feed industry; Proceedings of All-tech 16th Annual Symposium (ed. T. P. Lyons and K. A. Jacques). pp. 79-96.

Table 1: Oxidative stability and bacterial load of meat from pigs fed diets supplemented with garlic

Level of dietary garlic supplementation (g/kg diet)	Length of refrigerated storage (days)	Extent of oxidation (mg MDA/kg meat)	Bacteria Load ($\times 10^{-4}$cfu/g)
0	1	0.13±0.06	3.15±0.21
	5	0.34±0.13	4.05±0.07
1.0	1	0.13±0.01	2.10±0.14
	5	0.28±0.20	2.65±0.21
2.5	1	0.12±0.08	1.80±0.28
	5	0.24±0.10	2.05±0.35
5.0	1	0.13±0.01	1.55±0.21
	5	0.24±0.06	1.30±0.01
Statistical Significance			
Level of supplementation		NS	***
Length of refrigeration		***	**
Level x Length		NS	*
Mean Separation			
Effect of level of supplementation (g/kg diet)	0	0.24±0.14	3.60 ± 0.54^{c}
	1.0	0.20±0.15	2.38 ± 0.35^{b}
	2.5	0.18±0.10	1.93 ± 0.24^{ab}
	5.0	0.19±0.09	1.43 ± 0.19^{a}
Effect of length of refrigerated storage (days)	1	0.13±0.05	2.15±0.67
	5	0.27±0.13	2.51±1.09

Mean±standard deviation; n=4; NS = Not significant (P>0.05); ***= P<0.001; **=P<0.01; *=P<0.05; MDA = Malondialdehyde.
Means with different superscripts within the column for the same parameter are significant (P<0.05).