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# EVALUATION OF CARCASS CHARACTERS OF WEANED DUTCH RABBITS FED GARLIC (*Allium sativum*) AND GINGER (*Zingiberofficinale*)

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## ABSTRACT

An experiment was carried out to evaluate the weight gain and carcass characters of weaned Dutch rabbits fed garlic (*Allium sativum*) and ginger (*Zingiberofficinale*). Thirty six (36) rabbits were randomly assigned the dietary treatments in a complete randomized design with nine rabbits per treatment. The rabbits were fed with iso-caloric and iso-nitrogenous diets where treatment 1 (control) contained neither garlic nor ginger, treatment 2 contained 0.25% garlic, treatment 3 contained 0.25% ginger and treatment 4 combined 0.25% garlic and 0.25% ginger. Experimental diets and clean drinking water were supplied *ad libitum* throughout the experimental period of ten weeks. At the end of the feeding trial, three rabbits per treatment were slaughtered for carcass evaluation.Results showed that there was significant ($P<0.05$) differences in final liveweight, weight gain and feed conversion of the rabbit in treatments 3 and 4 relatively to the control. Weight gain and feed conversation ratio were best in treatment 3. Significant ($P<0.05$) differences occurred in kidney and hind part of the rabbit in treatment 3 showing the best result at 0.25% inclusion level. Other carcass characters showed no significant ($P<0.05$) differences and treatment 3 had a better mean weight of carcass harvested organs across the table but such means were not able to cause significant ($P<0.05$) differences. Means of treatment 2 with inclusion levels of garlic at 0.25% did not differ much from that of control (treatment 1). Dressing percentages of 49% were recorded in treatments 2, 3 and 4, while the control had 47.32%. From the results, it can be concluded that inclusion of 0.25% ginger (T3) in diets of rabbits and also 0.25% inclusion in garlic and ginger (T4) produced rabbits with better weight and carcass characters.

***Keywords***: *Dutch rabbit, weight gained carcass, ginger, garlic*

## INTRODUCTION

Globally over 900 million people are said to be chronically hungry out of which 800 million are from the developing countries representing about 18 percent of the world's population. (Brawn, 2005; Baje 2008).One out of five persons in the developing countries is unable to meet his or her basic daily needs of life (Lupien and Menza, 2004).Rabbit has immense potentials and good attributes which include high growth rate, high efficiency in converting forage to meat, short gestation period, and high prolificacy, relatively low cost of production, high nutritional quality of rabbit meat which includes low fat, sodium, and cholesterol levels.(Ajala and Balogun, 2004). Thusrabbit production is a veritable way of alleviating animal protein deficiency in Nigeria and its consumption is free of cultural and religious biases (Biobaku and Oguntona, 1997). Medicinal herbs such as garlic (*Allium sativum*) and ginger (*Zingiberofficinale*) have been reported to possess antibacterial, antiseptic, anti-inflammatory, antiparasitic and immunomodulatory

properties (Muhammad *et al.,* 2009). In addition to these attractive properties, these herbs have been shown to increase feed palatability and thus feed intake (Horton *et al*., 1991). Ginger acts as a hypolipidemic agent in cholesterol fed rabbits (Lebda, *et. al.* 2012). The antioxidants in ginger include gingerols, shogaols, monoterpenes, sequiterpenes, some phenolic derivatives and other phytochemicals which are responsible for their pharmacological activities (Li *et al.,* 2001). Also in rabbits, Akhani*et al*. (2004) reported that ginger treatment significantly decreased both serum cholesterol and triacylglycerol.Animal studies suggest that garlic has potential hypolipidemic, hypotensive, hypoglycemic, hypothrombotic, and hypoatherogenic properties (Bordia *et al.,* 1975; Shoetan*et al.,* 1984).Recent research works on ginger and garlic formulations as feed additives have shown encouraging results in regards to weight gain, feed efficiency, lowered mortality and increased livability in poultry birds (Issa and Omar 2012);Oleforuh-Okoleh*et al*., 2014). These prolific attributesof rabbits coupled with the benefits of garlic and ginger in increasing palatability and feed intake could lead to the production of healthy carcass. The aim of this paper is to evaluate the carcass characteristics of Dutch rabbits fed garlic and ginger.

## MATERIALS AND METHODS

### Experimental Site

The experiment was carried out at the Animal Science Departmental Teaching and Research Farm, Faculty of Agriculture, Ahmadu Bello University, Zaria, Kaduna State. The farm is located at an elevation of 676m, and latitude 11.16234° North and longitude 007.63528° East (GPS,2012).

### Experimental Materials

***Feed formulation:*** Commercial animal feed were obtained locally from animal feed shops in Samaru Zaria Kaduna State. The quantity used in the laid out experiment is shown in Table 1 with their inclusion levels of garlic and ginger.

***Processing of Garlic and Ginger***: The wet garlic bulbs and ginger nodes were bought locally at Samaru market, Zaria Kaduna State. The wet garlic bulbs were divided into cloves, cut into chips and sun dried before been grinded into powder. The wet ginger nodes were sliced, and also sun dried before been grounded into powder. The powdered ginger and garlic were later incorporated in the diets according to the procedure of Onu and Aja (2011).

### *Experimental animals*

Thirty- six (36) weaned Dutch rabbits between the age of 6-8 weeks of both sexes were obtained from a commercial rabbit breeder near Shika at Milgoma, Sabo Gari Local Government Area in Kaduna State. They were screened using physical signs such as clear, bright eyes without discharges, alertness, interest, curiosity, self-grooming, clear nostrils without discharges, shiny smooth clear fur especially in the front paw and around the anus and a normal temperature of 37-39.5$^0$C. Selected rabbits were placed in cages and transported by road in a commercial vehicle to Animal Science Departmental Teaching and Research Farm where they were dewormed using ivermectin. They were fed with formulated concentrates of 16% crude protein for 2 weeks to allow them acclimatize. They were weighed and randomly allocated and housed individually in already washed and disinfected cages consisting of nine rabbits per treatment and three rabbits per replicate. The rabbits were weighed at the beginning of the experiment to obtain their initial body weight and subsequently weekly.

**Table1:Composition of formulated rabbit feed**

| Ingredients | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Maize | 73.13 | 72.88 | 72.88 | 72.63 |
| Groundnut cake | 16.82 | 16.82 | 16.82 | 16.82 |
| Wheat offal | 5.00 | 5.00 | 5.00 | 5.00 |
| Fish meal | 2.00 | 2.00 | 2.00 | 2.00 |
| Bone meal | 2.50 | 2.50 | 2.50 | 2.50 |
| Salt | 0.30 | 0.30 | 0.30 | 0.30 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Garlic | 0.00 | 0.25 | 0.00 | 0.25 |
| Ginger | 0.00 | 0.00 | 0.25 | 0.25 |
| Total (kg) | 100.00 | 100.00 | 100.00 | 100.00 |
| | | | | |
| Calculated Analysis | | | | |
| ME(Kcal/kg) | 3100.97 | 3092.39 | 3092.39 | 3083.81 |
| CP (%) | 16.74 | 16.71 | 16.71 | 16.69 |
| CF (%) | 2.75 | 2.74 | 2.74 | 2.74 |
| Ca (%) | 1.09 | 1.09 | 1.09 | 1.09 |
| P (%) | 0.78 | 0.78 | 0.78 | 0.78 |
| Lysine (%) | 0.59 | 0.59 | 0.59 | 0.59 |
| Methionine (%) | 0.34 | 0.34 | 0.34 | 0.33 |

*Vitamin-mineral premix provide per kg of diet vit. A. 13,340iu; vit. D3. 2680.i.u; vit. E. 10.i.u; vit. K, 2.68 mg; Calcium pantothenate, 10.68mg; vit. B12, 0.022mg; folic acid, 0.668mg; choline chloride, 400mg; chlorotetracycline, 26.68mg; manganese, 133.34mg; iron, 66.68mg; zinc, 53.34mg ; copper, 3.2mg, iodine, 1.86mg; cobalt, 0.268mg, selenium, 0.108mg.CF: Crude fibre, CP: Crude protein, Ca: Calcium, P: Phosphorus

They were fed 3% body weight*ad.libitum* in plastic bowlstwice daily with concentrated feed of 17% crude protein containing varying levels of garlic and ginger as shown in the Table 1. The experiment was operated for a period of 10weeks. Residual feeds were weighed weekly to calculate feed consumption. Also fresh carrot leaves were added to the concentrates so as to aid digestion and for proper utilization of protein concentrates.Performance data include feed intake, total weight gain and feed conversion ratio.

**Carcass evaluation**

A total of twelve (12) consisting of three (3) rabbits from each treatment group were randomly selected and slaughtered for carcass evaluation at the end of the 10 weeksperiod ofexperimentation. After selection, the rabbits were taken to the Animal Science Department Meat Laboratory. They were slaughtered there by severing the jugular vein of the neck (transection) with a sharp knife, bled skinned and eviscerated. The dressed weight and the weight of heart, lungs, liver, spleen, kidneys, loin and legs were recorded using an electronic weigh master digital scale. Dressing percentage was determined by dividing the dressed weight by the slaughter weight and multiplied the result by one hundred.

**Data analysis**

Data were evaluated by one-way Analysis of Variance (ANOVA), expressed as means and SEM using SAS 9.0, while significant differences were separated by Duncan Multiple Range test in the SAS package.

**RESULTS AND DISCUSSIONS**

The nutrient composition of the experimental diets isshown in Table1. The calculated crude protein for the treatment diets ranged from 16.69 to 16.74%. The calculated metabolizable energy ranged from 3083.81 to 3100.97 ME(Kcal/kg), the inclusion levels of garlic and ginger ranged from treatment 1 to 3 and treatment 4 had 0.25% and 0.25% of both garlic and ginger. The inclusion of these agents in rabbit diets did not affect the concentration of the crude protein of the diets butthe inclusions significantly ($P<0.05$) influenced final liveweight, weight gained and feed conversion ($P<0.05$) of the rabbits (Table 2).There was 10% and 1.23% increase in weight gained in treatment 3 and 4 relative to the control.

**Table 2: Growth Performance of weaned Dutch rabbits fed ginger and garlic**

| Parameters (kg) | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Initial weight | 1.883 | 1.867 | 1.867 | 1.883 | 0.100 |
| Final weight | $3.367^{b}$ | $3.077^{b}$ | $4.187^{a}$ | $3.450^{b}$ | 0.157 |
| Feed conversion ratio | $8.343^{b}$ | $9.200^{b}$ | $12.313^{a}$ | $10.000^{ab}$ | 0.731 |

$^{ab}$ = Means with different superscripts in the same row are significantly different ($P < 0.05$)

This result is in agreement with Karangiya *et al.,*(2016) who reported that improvement in body weight gain of monogastrics fed on ginger is due to the active components present in the ginger which stimulates digestive enzymes and improves overall digestion and thus leads to increased body weight gain. It has been an established fact that ginger in the diets stimulate lactic acid bacteria and decreases pathogenic bacteria such as mesophilic, aerobic coliform and *Escherichia coli* thus improving absorption of nutrientsto result in better weight gain of monogastrics (Tekeli, *et al.,* 2011). Similar studies on ginger showed increase in weight gain when compared to the control {Mohamed *et al.,* 2012;Sadeghi*, et al*., 2012 and Arshad *et al*., 2012}. Records for rabbits fed ginger supplemented diets compared to the control suggests that ginger positively influenced the utilization of the feed (Onu and Aja 2011). This observation is also in agreement with the reports of Okoye *et al*., (2006).

Rabbits fed garlic and ginger in treatment 4 showed significantly ($P<0.05$) differences when compared to the control, but such significantly ($P<0.05$) were not more than those fed solely ginger (Karangiya *et al.,* 2016).Significant ($P<0.05$) differences occurred in kidney (table 3) and hind part weights (Table 4) of the rabbit in treatment 3 showing the best result at 0.25% inclusion level. This is in agreement with Tekeli *et al.*(2011) who concluded that dietary supplementation of ginger had significant effects on the weight of visceral organs of broiler chickens (monogastrics).

**Table 3: Carcass Characteristics of Dutch Rabbits fed Garlic and Ginger**

| Parameters (g) | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Slaughter weight | 12798 | 12841 | 13896 | 12709 | 621.05 |
| Dressed weight | 12366 | 12263 | 13140 | 12131 | 590.80 |
| Head weight | 116.00 | 120.33 | 118.33 | 117.67 | 6.82 |
| Fore limb weight | 11.67 | 12.67 | 9.33 | 9.33 | 1.40 |
| Hind limb weight | 27.00 | 24.67 | 25.67 | 24.33 | 1.60 |
| Skin weight | 104.33 | 112.00 | 117.00 | 104.00 | 11.64 |
| Kidney weight | $9.00^{b}$ | $10.00^{ab}$ | $11.67^{a}$ | $9.33^{ab}$ | 0.70 |
| Liver weight | 36.33 | 37.00 | 47.00 | 38.00 | 4.21 |
| Lungs weight | 7.00 | 8.00 | 9.00 | 8.00 | 1.07 |
| Heart weight | 4.00 | 3.33 | 3.00 | 3.67 | 0.39 |
| Small int. weight | 46.00 | 53.33 | 53.33 | 39.67 | 7.14 |
| Small int. empty weight | 144.00 | 139.50 | 167.50 | 170.83 | 35.56 |
| Long int. weight | 78.67 | 100.00 | 114.00 | 97.67 | 12.84 |
| long int. weight empty | 52.23 | 35.83 | 63.33 | 45.23 | 9.84 |
| Stomach weight | 85.33 | 83.00 | 90.67 | 85.00 | 8.21 |

$^{ab}$ = Means with different superscripts in the same row are significantly different ($P < 0.05$)

Other characters showed no significant ($P<0.05$) differences and treatment 3 had a better mean across the table but such means were not able to cause significant ($P<0.05$) differences. Means of treatment 2 with inclusion levels of garlic at 0.25% did not differ much from that of control (treatment 1). Similar findings were observed by Ademola*et al*.,2004 who reported that broilers fed garlic did not show significant differences from that of control.

There is better dressing (Table 4) percentages in treatment fed garlic and ginger when compared with the control, the control showed 47.32% while treatment fed garlic, ginger,garlic and ginger (T2, T3 and T4) showed 49% dressing percentage.This may be attributed to the better feed utilization of rabbits fed garlic and ginger supplemented diets, although low dressing percentages below 50% is attributed to the age of the rabbits. This could be in conformity with Fielding (1991) who had noted that the dressing percentage would be 50% or less if the rabbit is young, thin and with a full digestive tract at slaughter.

**Table 4: Dressing percentages and carcass prime cuts of weaned Dutch rabbits fed ginger and garlic**

| Parameters | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Dressing percentage | 47.32 | 49.29 | 49.33 | 49.20 | ------ |
| Carcass (g) | 0.58 | 0.62 | 0.67 | 0.62 | 0.04 |
| Loinweight (g) | 156.33 | 143.33 | 200.00 | 154.33 | 17.32 |
| Chest weight (g) | 228.33 | 249.33 | 241.67 | 245.00 | 17.05 |
| Carcass hind (g) | $199.67^{b}$ | $200.00^{ab}$ | $277.00^{a}$ | $237.00^{ab}$ | 13.23 |

$^{ab}$ = Means with different superscripts in the same row are significantly different ($P < 0.05$)

## CONCLUSION AND RECOMMENDATION

This experiment reported by this paper shows that as little as 0.25% inclusion of these herbs was able to positively affect the weight gain and carcass traits of rabbits. A higher inclusion level of this herbs may produce significant ($P<0.05$) differences in harvested organs that failed to show such differences in this research. It is important for nutritionist to recommend the inclusion of this herbs to the local farmers so as to promote fast growth in rabbits of more beneficial meat quality.

## REFERENCES

Ademola, S.G., Farinu, G.O.,Ajayi-Obe, A.O., Babatunde, G.M., (2004). Growth, haematological and biochemical studies on garlic and ginger fed broiler chicken. *Moor Journal of Agricultural Research.* 5(2):122-128.

Ajala, M.K. and Balogun, J.K. (2004). Economics of Rabbit Production in Zaria, Kaduna State. *Tropical Journal of Animal Science* 7(1):1-10.

Akhani SP, Vishwakarma, SL and Goyal, RK (2004). Anti-diabetic activity of Zingiberofficinale in streptocin-induced type I diabetic rats. *Journal of Pharmacy and pharmacology*, 56: 101-105.

Arshad, M., Kakar, A.H., Durrani, F.R., Akhtar, A., Sanaullah, S. and Niamatullah, M. (2012) Economical and immunological impact of ginger extract on broiler chicks. *Pakistan Journal of Science*., 64(1): 46-48.

Baje, A.O. (2008). Food Crises Hits the World. *Food business International*, 1(5): 11-12.

Biobaku, W.O. and Oguntona, E.B. (1997). The Effects of Feeding Multi nutrient Mini Blocks and Pelleted Diet on the Growth of Rabbits. *Nigeria Journal Animal Production*., 24(2): 147-149.

Bordia, A., H. C. Bansal, S. K. Arora, and S. V. Singal. 1975. Effect of the essential oils of garlic and onion on alimentary hyperlipemia. *Atherosclerosis* 21:1518.

Brawn, J.V. (2005). "The World Food Situation: An Overview". International Food Policy Research Institute. *Paper presented for Consultative Group on International Agricultural Research (C.G.I.A.R) Annual General Meeting,* Marrakech, Morocco, Dec sixth, 2005.

Fielding, D., (1991). Rabbits: The Tropical Agricultural Series. K Macmillan Education Ltd. London, UK.

Global Positioning System (GPS), (2012). Garmin extres 12 Channel Garmin.

Horton, G.M.J., Blethen, D.B and Prasad, B.M. (1991). The effect of garlic (*Allium sativum*) on feed palatability of horses and feed consumption, selected performance and blood parameters in sheep and swine. *Canadian Journal of Animal Science.* 71: 607610.

Issa, K. and Omar, J. (2012) Effect of garlic powder on performance and lipid profile of broilers. *Open Journalof Animal. Science*., 2: 62-68.

Karangiya,V. K.,Savsani,H. H.,Patil, S.S., Garg, D. D., Murthy, K. S.,Ribadiya N. K.andVekariya S. J. (2016). Effect of dietary supplementation of garlic, ginger and their combination on feed intake, growth performance and economics in commercial broilers *Veterinary World, 9*(3): 245-250.

Lebda, M.A. Nabil, M.T. Mahdy, A.K. Abd El-Wahab, A.M. and Amany, M.E. (2012). Biochemical Effect Of Ginger On Some Blood And Liver Parameters In Male Newzeland Rabbits. Department of Biochemistry, Faculty of Veterinary Medicine, Alexandria University, Egypt, *Journal of Animal and Feed Research Volume 2, Issue 2: 197-202.*

Li, W.G. Zhang, X.Y. and Wu, Y. (2001). Anti-inflammatory Effect and Mechanism of Proanthocyanidine from Grape Seeds. *Acta Pharmacologic sinica*, 22:1117-1120.

Lupien, J.R. and Menza, V. (2004). "Assessing Prospects for Improving Food Security and *Nutrition". Food, Nutrition and Agriculture Alimentation, Nutrition ET Agriculture,* (FNA/ANA), 25 pp: 5-9.

Mohamed, A.B., Mohammed, A.M. and Ali Jalil, Q. (2012) Effect of ginger (*Zingiberofficinale*) on performance and blood serum parameters of broiler. *Internal Journal of Poultry Science*., 11(2): 143-146.

Muhammad, J., Durrani, F., Hafeez, A., Khan, R.U. and Ahmad, I., (2009). Effect of aqueous extract of plant mixture on carcass quality of broiler chicks *Journal of Agriculture and Biological Science*. 9 56-59.

Okoye, F.C., Ugwueme, M.C. and Mbarah, J.U., (2006). Effects of local spices on the utilization of cassava peel meal based diets by weaver rabbits. *Pakistan Journal of Nutrition.* 5(3) 202- 205.

Oleforuh-Okoleh, V.U., Chukwu, G.C. and Adeolu, A.I. (2014). Effect of ground ginger and garlic on the growth performance, carcass quality and economics of production of broiler chickens. *Global Journal of Bioscience and Biotechnology*, 3(3): 225-229.

Onu, P.N. and Aja P. M. (2011). Growth Performance AndHaematological Indices Of Weaned Rabbits Fed Garlic (*Allium Sativum*) and Ginger (*ZingiberOfficinale*) Supplemented Diets. *International Journal of Food, Agriculture and Veterinary Sciences ISSN: 2277-209X Vol. 1 (1) October-December, pp.51-59/Onu and Aja.*

Sadeghi, G.H., Karimi, A., Jahromi, S.P., Aziz, T. and Daneshmand, A. (2011). Effect of cinnamon, thyme and turmeric infusions on the performance and immune response in of 1 to 21 day-old male broilers. *Brazilian Journal of Poultry Science*, 14(1): 15-20.

Shoetan,A.,K.T.Augusti, and P. K. Joseph. (1984). Hypolipidemic effects of garlic oil in rats fed ethanol and a high lipid diet. *Experimenta*. 40:261263.

Statistical Analysis Software. (1994). SAS/STAT User's guide: Statistics,Version 6.04. SAS Institute Inc., Cary, NC.

Tekeli, A., Kutlu, H.R. and Celik, L. (2011). Effects of *Z. officinale*and propolis extracts on the performance, carcass and some blood parameters of broiler chicks. *Current Research. In Poultry Sci*ence, 1(1): 12-23.