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### Relative Organ Weight of Broiler Chickens Fed Supplementary Inclusion of Ginger (*Zingiber officinale*) and Garlic (*Allium sativum*)

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#### Abstract

An experiment to assess carcass traits and sensory evaluation of broiler chickens raised and processed with ginger and garlic was conducted in the Poultry Unit and Meat science and Technology laboratory of the Department of Animal Science Ambrose Alli University, Ekpoma, Edo State. A total of 60 day old (Anak 2000) broiler chickens were used for the experiment. Fifteen chicks were randomly allotted to each of the four treatment diets with diet 1 being the control and diet 2 contained 2% ginger, diet 3 contained 2% garlic while diet 4 contained 2% ginger and garlic mixture in ratio 1:1. Each treatment group contained three replicates with five birds per replicate and were assigned to the four treatment diet in a completely randomized design (CRD). The chicks will be fed commercial starter diet for 2 weeks then were also fed commercial diet (with the inclusion of ginger and garlic) for four weeks starter phase period and 4 weeks finisher phase period respectively. The result on the relative organ weight showed that weight of heart, kidney, spleen, lungs and pancreas were highest among birds placed on 2% ginger and garlic mixture and abdominal fat accumulation was significantly lowest among birds fed 2% ginger and garlic mixture and highest in those fed the control. Since the organs are the engine room for the well-being of the poultry birds and other livestock, it is therefore concluded that the inclusion of 2% Ginger and Garlic mixture in poultry ration improves the quality of the Organs of broiler chickens.

**Keywords:** Broiler, chicken, ginger, garlic

#### Introduction

Feed additives are added in animal feed to improve their nutritive value, boost animal performance by increasing their growth rate, better feed conversion efficiency, greater livability and lowered mortality in poultry birds. Herbs could be expected to serve as feed additives due to their suitability and preference, reduced risk of toxicity and minimum health hazards (Devegouda, 1996). Moreover, there is a great phobia in using antibiotic as feed additives because of public concern about its residual effects in animal products and the potential evolving of antibiotic resistant bacteria. Recent research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality and increased livability in poultry birds (Deepak *et al.*, 2002; Jahan *et al.*, 2008). Ginger and garlic as natural growth promoters can be potential alternatives for common artificial growth promoters like antibiotics Demir *et al.*, (2003). Ginger and garlic supplements in broiler chicken diets have been recognized for their strong stimulating effect on the immune and digestive systems in birds Al-shuwaili *et al.* (2015).

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 Omah, 2012; Oleforuh-Okoleh *et al.*, 2014). Different workers have tried at different levels of garlic and ginger in the diet of birds and but most consistent results were obtained at about 1% level and supplementation of these products beyond 1% of ration may also have a negative effect on overall cost of feeding. As a result, they are incorporated at the level of 1% in the diet of broilers (Bamidele and Adejumo, 2012; Eltazi, 2014). On the other hand, studies on their use as mixtures in the diet of birds have produced inconsistent results. It has been reported to possess useful pharmacological potent chemical substances for use in poultry (Akhtar *et al.*, 1984), this is due to its antioxidants, antibacterial, anti-inflammatory, antiseptic, anti-parasitic and immunomodulatory properties. Positive effect of ginger on blood circulation, gastric secretion, and enterokinesia were reported by Ali *et al.* (2008); Incharoen and Yamauchi (2009). In addition, ginger has been found to enhance digestive enzyme activities (Platel and Srinivasan, 1996, 2000). All of these have favorable effects on animal productivity.

This experiment was therefore set up to assess the relative organ weight of broiler chickens fed supplementary inclusion of ginger and garlic.

#### Materials and Methods

The experiment was conducted at the Poultry Unit and Meat Science and Technology laboratory of Ambrose Alli University Ekpoma Edo State for the period of 10 weeks. Ginger and Garlic for the feeding trial and processing of the chicken meat were purchased from local market within Ekpoma, Esan West Local Government Area of Edo State. It was sundried for about 7 to 14 days to reduce the moisture content to about 10%. The ginger and garlic were milled separately into powder form. They were then stored in an air tight container till they were used for the feeding trial and processing of the chicken meat. Aliquot were taken

from the milled ginger and garlic and will be taken to the laboratory for proximate analysis (Table 1).

**Experimental diets:** Commercially formulated diet was used for the experiment and the ginger and garlic powder were added to basal diets at the levels (2%) apart from the control resulting in four experimental diets (1, 2, 3 and 4) respectively. T<sub>1</sub> that serve as control contained (0% garlic and or ginger), T<sub>2</sub> contained (2% Garlic powder), T<sub>3</sub> contained (2% Ginger) and T<sub>4</sub> contained (2% Ginger/garlic mixture).

Table 1: Proximate composition of (%DM) Ginger and garlic

| Parameters    | GRM   | GBM   | GGM   |
|---------------|-------|-------|-------|
| Dry matter    | 91.00 | 86.40 | 89.20 |
| Crude protein | 10.10 | 7.50  | 8.96  |
| Crude fat     | 3.20  | 3.50  | 3.42  |
| Crude fibre   | 18.30 | 12.40 | 16.02 |
| Ether extract | 4.90  | 5.20  | 5.60  |
| NFE           | 54.50 | 57.80 | 55.20 |

**Experimental birds, management and design:** A total of 60 day old (Anak 2000) broiler chickens were used for the experiment. Fifteen chicks were randomly selected based on their average initial weight to each of the four treatment diets. Each treatment group contained three replicate with five birds per replicate and they were assigned to the four treatment diet in a completely randomized design (CRD). The chicks were fed commercial starter diet for 2 weeks acclimatization period and then were also fed commercial diet (with the inclusion of ginger and garlic) for four weeks starter phase period and 4 weeks finisher phase period respectively. The birds had free access to the treatment diets and water *ad-libitum* throughout the duration of the experiment.

**Relative organ weight of broiler chickens:** On the last day of the feeding trial, three (3) birds were selected based on the overall average weight from each treatment group making a total of 12 broiler chickens. The broilers were starved overnight of feed, but drinking water were provided. Each bird will be tagged and weighed before and after slaughtering to determine the live and bled weight respectively. The slaughtered broilers were dipped in hot water for about two minutes and the feathers were plucked then the weight of organs such as kidney, lungs, heart, liver, pancreas, spleen, bursa, GIT and abdominal fat were recorded and measured relative to the eviscerated weight.

**Statistical analysis:** All data were subjected to analysis of variance (ANOVA) and differences between treatments and means was determined using Duncan's Multiple Range Test at 5% level of probability. All statistical procedures were according to Steel and Torrie, (1990) using SAS (1999) package

## Results and Discussion

The dietary treatment significant improved ( $p < 0.05$ ) the relative weights of heart, kidney, spleen, lungs, pancreas and abdominal fat (Table 2). However, the liver, gizzard, GIT and bursa were not significantly influenced ( $p > 0.05$ ) by the treatment diets. Relative weight of heart was higher among birds placed on 2% ginger and garlic while lowest value of 0.51% was recorded from birds fed 2% garlic bulb meal.

Table 2: Relative organ weight of broiler chickens fed ginger, garlic and the mixture

| Organ weights (%) | Control<br>1             | 2% Garlic<br>2           | 2% Ginger<br>3           | 2% Ginger/garlic<br>4    |
|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Heart             | 0.58 <sup>b</sup> ± 0.08 | 0.51 <sup>c</sup> ± 0.03 | 0.58 <sup>b</sup> ± 0.05 | 0.60 <sup>a</sup> ± 0.04 |
| Kidney            | 0.26 <sup>b</sup> ± 0.02 | 0.29 <sup>b</sup> ± 0.05 | 0.24 <sup>c</sup> ± 0.03 | 0.36 <sup>a</sup> ± 0.03 |
| Spleen            | 0.14 <sup>d</sup> ± 0.01 | 0.18 <sup>b</sup> ± 0.02 | 0.16 <sup>c</sup> ± 0.02 | 0.35 <sup>a</sup> ± 0.17 |
| Lungs             | 0.80 <sup>b</sup> ± 0.19 | 0.81 <sup>b</sup> ± 0.19 | 0.70 <sup>c</sup> ± 0.08 | 1.18 <sup>a</sup> ± 0.07 |
| Liver             | 2.70 ± 0.35              | 2.45 ± 0.71              | 2.46 ± 0.15              | 2.29 ± 0.04              |
| Gizzard           | 4.13 ± 0.49              | 5.32 ± 1.43              | 3.96 ± 0.32              | 4.65 ± 0.70              |
| GIT               | 7.04 ± 1.50              | 6.31 ± 0.41              | 6.73 ± 0.71              | 7.05 ± 0.65              |
| Pancrease         | 0.14 <sup>d</sup> ± 0.50 | 0.21 <sup>c</sup> ± 0.42 | 0.24 <sup>b</sup> ± 0.25 | 0.29 <sup>a</sup> ± 0.28 |
| Bursa             | 2.01 ± 1.50              | 2.04 ± 1.50              | 2.06 ± 1.50              | 2.07 ± 1.50              |
| Abdominal fat     | 1.73 <sup>a</sup> ± 0.30 | 0.69 <sup>b</sup> ± 0.69 | 0.53 <sup>c</sup> ± 0.62 | 0.52 <sup>c</sup> ± 0.77 |

Relative weight of kidney was higher significantly among birds placed on 2% ginger and garlic mixture with a mean value of 0.36% while lowest value of 0.24% was recorded from birds fed 2% ginger root meal. Weight of spleen was also significantly higher among birds placed on 2% ginger and garlic mixture with a mean value of 0.35% while lowest value of 0.16% was recorded from birds fed 2% ginger root meal. Relative weight of lungs was higher among birds placed on 2% ginger and garlic mixture with a mean value of 1.18% and lowest value of 0.70% was recorded from birds fed 2% ginger root meal. However, the relative weights of liver, gizzard, GIT and bursa were statistically similar among birds on the various treatments. Relative weight of pancreas was also higher among birds placed on 2% ginger and garlic mixture with a mean value of 0.29% while least value of 0.14% was recorded from birds fed the control.

The significantly highest value for the relative weight of heart and kidney among birds placed on 2% ginger and garlic mixture could be adduced to the quality of the phytochemical properties present in ginger and garlic that enhance the easy blood flow in the heart which led to the increase in the size and the effective filtration processes carried out by the kidney. The significant higher values recorded in the spleen and lungs in broilers fed diet 2% ginger and garlic mixture is a pointer to the good health status of the birds compared to birds on other treatment diets. This implies that the ginger and garlic combined can be included in the diet of broiler chickens and the immunity of the birds against disease would not be compromised since spleen is the major source of lymphocytes and the storage site for white and red blood cells (Hetland and Svihus, 2001) and lungs is the medium for gas exchange. This lends support from the report of Agbabiaka *et al.* (2012) who reported a significant difference on the weight of spleen and lungs of broiler fed 50% inclusion level of tigermut (*Cyperus esculentus*).

The liver, gizzard and GIT weights in all the treatments were similar and the similarities recorded in weight may be attributed to the non-fibrous and the reduction in the gritty nature of feed particles as a result of the addition of the spices which aided the bulk movement of the feed through the GIT of the birds. The weight of pancreas was significantly affected with highest value recorded among birds fed 2% ginger and garlic mixture and this finding negates the report of Mehditoghiani *et al.* (2011) who reported no significant difference in the pancreas weight of broilers fed probiotic and prebiotic as antibiotic growth promoter. The comparable weights obtained for bursa may be due to the balance of nutrients in all the diets. Omoikhoje *et al.* (2005) reported comparable values for bursa for broilers fed varying levels of cooked Bambara groundnut meal.

The significant variation in the abdominal fat value with the decreasing value down the treatment with least abdominal fat recorded among birds fed ginger and garlic mixture could be due to the synergetic effect of the phytochemical compounds present in ginger and garlic that aid fat reducing ability of the birds on the treatment diet compared to those on control and fat deposition in the abdominal area of broilers is regarded as waste in the poultry industry; since it represents a loss in the market and consumer acceptability, and enhances expense during the treatment of effluent produced when processing broilers. This agrees with the report of Emadi *et al.* (2006) who reported that adding 0.5 percentage of turmeric root powder to the diet caused a significant decrease in the relative weight of abdominal fat. It disagrees with the report of Mehala *et al.* (2008) who concluded that adding aloe vera to the feed of broilers did not affect the composition of the carcass components including abdominal fat.

## Conclusion

Since the organs are the engine room for the well being of the poultry birds and other livestock, it is therefore concluded that the inclusion of 2% Ginger and Garlic mixture in poultry ration improves the quality of the Organs of broiler chickens.

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