IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 3 Ver. II (Mar. 2015), PP 59-62
www.iosrjournals.org

Feed Additive Effects of Graded Levels of Ginger (*Zingiber Officinale*) On Serum Metabolites of Broilers

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Abstract: *Ninety eight (98) Anak broiler chicks were used in an experiment to determine the effects of Ginger (Zingiber officianale) meal on the haematology and serum chemistry of broiler birds. The birds were randomly assigned to four dietary treatments in a completely Randomized Design (CRD) consisting of 24 birds per treatment with 8 birds per replicate in a feeding trial that lasted for a period of 8 weeks. The ginger was incorporated at graded levels of 0g, 2g, 4g and 6g per kg feed in T1 (control), T2, T3 and T4 respectively. At the end of the experiment, 3 birds were randomly picked from each treatment (1 bird per treatment replicate) and their blood samples were collected for haematological assay and serum analysis. Results showed that haematological parameters were not significantly influenced by the treatment. Serum components such as Total Protein, Creatinine, Urea, Aspartate, Alkaline Phosphate and Total Cholesterol were not significantly influenced by the treatment however Serum Albumin was influenced significantly in favour of the ginger supplemented diets. The results of this investigation therefore, demonstrate that the inclusion of ginger at all levels did not alter any haematological indices when compared to the control diet and so normal anatomical and physiological function of birds was not disrupted.*

Keywords: *Ginger, Haematology, serum chemistry and Broiler Birds*

I. Introduction

Ginger or ginger root is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine, or spice. The use of ginger as substitute for antibiotic growth promoters is desirable for greater productivity of poultry, increased palatability of feed, nutrient utilization, appetite stimulation, increase in the flow of gastric juice and piquancy to tasteless food (Owen and Amakiri, 2012).

The haematological constituent of an animal reflects the physical responsiveness of the animal to its internal and external environment (Esonu et al., 2001); they are very essential in diagnosing pathogenic and metabolic disorders and are vital tools to assessing the health status of an individual or flock. The changes in haematological parameters are often used to determine the effects of stress or toxic condition due to environmental, nutritional or other factors. Normal ranges of haematological parameters can be altered by the ingestion of plant constituents such as Ginger (Ajagbonna et al., 1999).

Ginger therefore is a potential rhizome with a wide range of medicinal effects which has been used in different forms, doses and durations in broiler and layer production. Documented effects of graded levels of Ginger on poultry feed on feed intake, feed conversion ratio, growth rate, weight gain, haematological parameters and serum chemistry with their possible mechanisms of action abound in literature.

Various feed additives are used in poultry to maximize net returns and carcass quality of birds. In the past, growth-promoting antibiotics were used as feed additives; however, these were associated with storage of undesirable residues in the meat and eggs of poultry products which may be harmful to man when consumed, and have been banned or limited in many countries due to these suspected residual effects (Diarra et al., 2011). As a result, natural alternatives to antibiotics, such as herbs and medicinal plants, have attracted attention due to their wide range of potential beneficial effects (Manesh et al., 2012). Thus the use of plants such as Ginger, Garlic and Onions as alternatives to antibiotic feed additives is becoming more and more popular (Joke and Susan, 2007).

The use of feed additives such as Ginger which is a substitute for antibiotic growth promoters is desirable for greater productivity in poultry, increased palatability of feed, nutrient utilization, appetite stimulation, increased gastric juice flow etc (Owen and Amakiri, 2012), it is therefore necessary to investigate the feed additives in animal feed which justifies the study of the feed additive effects of graded levels of Ginger on haematology, serum chemistry and performance of broiler birds.

II. Materials And Methods

The feeding trial was carried out at Poultry Section of the Research and Demonstration Farm of University of Port Harcourt, Choba, Rivers State, in South – South Nigeria.

Ninety eight (98) Anak day-old unsex broiler chicks were purchase from a reputable source for the eight weeks feeding trial. The birds were randomly selected, weighed to get their initial body weight and then allotted to four (4) dietary treatments T1 (0g of ginger /kg feed), T2 (2g of ginger / kg feed), T3 (4g of ginger / kg feed), and T4 (6g of ginger / kg feed), at 24 birds per treatment and 8 birds per replicate in a Completely Randomized Design (CRD).

Fresh ginger rhizomes were purchased from a reputable source. They were washed, chopped into tiny pieces, oven dried and then milled into powder and incorporated in the diets.

All the birds were properly housed in a deep litter system in an open sided poultry house. The pen compartments measuring 1m x 2m were demarcated with wire mesh and wooden frame. The animals were provided fresh, clean water and were appropriately fed ad libitum daily throughout the feeding period. The animals were placed under good hygienic conditions throughout the 8-weeks feeding period; vaccines and prophylactic treatments as scheduled were administered.

At the end of the feeding trial, three birds were randomly selected from each replicate group for blood collection. Blood samples were collected from the wing vein of the birds by sterilizing and numbing an area of the wing with disinfectant and cotton wool and then collecting about 1ml of blood with the use of sterile needles (5ml syringe and 23G needle) into well labelled sterilized bottles containing ethylene diamine tetra-acetic acid (EDTA) as anticoagulant for haematological analysis such as Haemoglobin concentration (Hb), Packed Cell Volume (PCV), White Blood Cell (WBC) count, and White Blood Cell differentials such as Lymphocytes(L) and Neutrophil (N). Blood samples were also collected into sterile bottles without anti coagulant which were used for the determination of serum biochemical constituents viz. albumin, total protein, urea, alanine, alkaline phosphate, total cholesterol, creatinine and aspartate using commercially available analytical kit.

Serum cholesterol were determined by enzymatic calorimetric methods using Kit GOD-PAP, serum total protein was determined as shown by (King and Wootton, 1965). Other serum indices were determined using commercially available analytical kits (Biosystem Reagents and Instruments). Haemoglobin concentration (Hb) was determined using Haemoglobin –Drabkin Kit. The packed cell volume % (PCV) of Erythrocytes of whole blood was measured using a micro haematocrict centrifuge (Hawksley, London). The white blood cells (WBC) were determined using Cyanomethaemoglobin (Coles, 1986).

All data obtained were subjected to the analysis of Variance (ANOVA) according to Steel and Torrie (1980) and their means separated using Duncan Multiple Range Test (DMRT) according to Duncan(1955) using the Statistical Package for Social Science (SPSS) software.

III. Results And Discussion

Results on haematology and Serum chemistry of birds are presented in Table 2. Haematological Parameters studied include haemoglobin concentration (Hb), packed cell volume (PCV) %, White blood cells (WBC) and white blood cell differentials such as Lymphocyte (L) and Neutrophil (N). The table however show that the treatment (ginger) had no significant influence on the values of these haematological parameters.

Serum components analyzed include Total protein, Albumin, Creatinine, Urea, Alkaline phosphate, Total cholesterol, Alanine and Aspartate. There was no significant difference in serum components between the treatments apart from the case of Albumin which was significantly influenced by the treatments with diets containing ginger having a positive influence on serum Albumin composition.

Haematological Parameters such as haemoglobin concentration (Hb), packed cell volume (PCV) %, White blood cells (WBC) and white blood cell differentials such as Lymphocyte (L) and Neutrophil (N) were not affected by the dietary treatments. All the haematological parameters calculated had values that fell within the normal range and mean of healthy broiler chickens as reported by Mitruka and Rawnsley, 1997 and Banerfee, 2008. It can therefore be inferred that the haematological indices were within safety limits for broilers in this experiment. These normal haematological values portray the nutritional status of the broiler chicken and thus indicating adequate nourishment of the birds (Church et al., 1984). This also implies that the immune system of the birds were active.

Results for Serum chemistry shows that Total protein, Alkaline phosphate, Creatinine, Urea, Total cholesterol, Alanine and Aspartate were not significantly influenced by the treatment, however, serum Albumin content was significantly increased in diets containing ginger. These findings are similar to those of Onu (2010) who reported that supplementation of ginger (0.25%) in the basal diet of broiler chicks did not result in any significant difference in terms of total protein, globulin, urea and creatine. Farinu et al. (2004) also reported that supplementation of ginger at the rate of 5, 10 and 15 g/kg did not affect total protein and albumin in the serum of broiler chickens. The result was contrary to the results of Saeid et al. (2010) who found that serum glucose, total cholesterol, LDL-cholesterol and VLDL cholesterol decreased significantly in broilers fed with 0.4 and 0.6% aqueous ginger extract but HDL-cholesterol concentration increased in these birds according to their findings. Zhang et al. (2009) found that total protein concentration was higher at 21 day and 42 days of

sampling in broilers treated with ginger powder but cholesterol concentration was reduced at these intervals. The discrepancies in these results may be due to the difference in doses used as well as experimental conditions.

IV. Conclusion

Results from this study revealed that ginger supplementation at these levels did not adversely influence the haematology and serum chemistry. The results of this study suggest that ginger can be included at these levels in broiler starter and finisher diets without adversely affecting the physiological functions of the birds. Based on the findings, it is recommended that phytobiotic feed additives such as ginger be used to replace antibiotic feed additives in order to prevent the deposition of toxic substances in poultry meat which may invariably be harmful to man when such products are consumed.

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Table1: Ingredient composition and calculated analysis of Broiler Diets

Ingredient	**T1**	**T2**	**T3**	**T4**	**T1**	**T2**	**T3**	**T4**
Broiler Starter					**Broiler Finisher**			
Maize	48.00	48.00	48.00	48.00	57.00	57.00	57.00	57.00
Soya bean meal	24.00	24.00	24.00	24.00	15.00	15.00	15.00	15.00
Ground nut cake	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Wheat bran	10.00	9.95	9.90	9.85	10.00	9.95	9.90	9.85
Oyster shell	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin/mineral premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ginger	0	0.05	0.10	0.15	0	0.05	0.10	0.15
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Calculated Analysis								
Crude Protein	23.41	23.44	23.46	23.48	20.25	20.28	20.30	20.32
ME (Kcal/kg)	2722.04	2722.85	2723.66	2724.47	2813.12	2813.93	2814.74	2815.55
Crude Fibre (%)	4.49	4.50	4.50	4.49	4.27	4.27	4.28	4.28
Lysine (%)	1.15	1.15	1.15	1.16	0.94	0.94	0.94	0.95
Methionine (%)	0.42	0.42	0.42	0.43	0.37	0.37	0.37	0.37
Calcium (%)	1.45	1.46	1.46	1.46	1.43	1.43	1.44	1.44

Table 2: **The effect of treatment on the haematological parameters and serum chemistry of broiler birds**

Parameters	**T1 (0g ginger/kg of feed)**	**T2 (2g of ginger/kg of feed)**	**T3 (4g of ginger/kg of feed)**	**T4 (6g of ginger/kg of feed)**
PCV (L/L)	27.00 ± 1.56	30.00 ± 1.73	30.67 ± 0.67	32.33 ± 1.20
Hb (g/dl)	9.00 ± 0.40	10.00 ± 0.58	10.02 ± 0.23	10.08 ± 0.39
Wbc (x $10^{9/L}$)	16.67 ± 4.17	22.93 ± 2.07	24.33 ± 3.18	28.67 ± 8.74
Neutrophile	73.33 ± 6.00	74.00 ± 3.06	68.33 ± 8.33	61.67 ± 1.67
Lymphocyte	26.00 ± 3.06	26.67 ± 6.00	31.67 ± 8.33	38.33 ± 1.67
T.P (g/L)	38.33 ± 3.76	40.00 ± 5.86	51.00 ± 3.00	54.33 ± 7.62
ALB (g/L)	13.67 ± 1.20^{b}	14.33 ± 0.33^{b}	18.33 ± 0.67^{a}	21.00 ± 1.53^{a}
Cr (mg/dL)	0.30 ± 0.00	1.10 ± 0.10	1.20 ± 0.10	1.23 ± 0.39
Ur (mmol/L)	1.10 ± 0.10	1.20 ± 0.00	1.20 ± 0.00	1.60 ± 0.26
AST (U/L)	7.00 ± 0.00	7.00 ± 0.00	7.00 ± 0.00	7.00 ± 0.00
ALT (U/L)	4.00 ± 0.00	4.00 ± 0.00	4.00 ± 0.00	4.00 ± 0.00
ALP (U/L)	136.67±12.58	143.00±7.00	150.33±0.58	151.00±0.58
T.C	3.70 ± 0.03	3.23 ± 0.25	3.20 ± 0.25	3.03 ± 0.30

PCV= Packed cell volume Hb= Haemoglobin WBC=White blood cell T.P= Total Protein ALB= Albumin Cr=Creatinine Ur= Urea AST=Aspartate ALT=Alanine ALP= Alkaline phosphate T.C= Total Cholesterol.