HAEMOCYTOLOGY AND SERUM BIOCHEMISTRY OF BROILERS FED GINGER (ZINGIBER OFFICINALE) AND GARLIC (ALLIUM SATIVUM) AS FEED ADDITIVES IN DUTSINMA LGA KATSINA STATE NIGERIA

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Abstract

A study was carried out to investigate the haemocytologic variations of broilers fed ginger and garlic as feed additives. A total of 120 day-old broiler chicks were sourced from a reputable hatchery and randomly assigned to four dietary treatment groups in a completely randomized design (CRD) with each treatment group replicated thrice having 10 chicks per replicate (n=30). Four experimental diets were formulated with the control diet (T1) free of the additives (ginger and garlic) while birds in group T2 and T3 were fed with graded levels of ginger 0.3g/kg of feed and garlic 0.3g/kg of feed while T4 had mixture of garlic 0.15g/kg of feed and ginger 0.15g/kg of feed for the experiment that lasted 56 days. At the end of the experiment, blood samples were randomly collected from 3 birds per replicate for serum biochemistry and haemocytology analysis. The results obtained showed that birds exposed to combined additives (ginger and garlic) recorded the highest significant (P<0.05) differences in packed cell volumes, haemoglobin, creatinine concentration and Lymphocytosis leading to markedly low mortality in that group. The study established that a mixture of garlic and ginger at 0.15g/Kg each demonstrated the least mortality with eosinopaenia connoting absence of parasitic infection indicating impact of the additives in control of parasitic infections. It is therefore recommended that poultry farm can use the combination of garlic and ginger at 0.15g/Kg each as a replacement for synthetic antibiotics thereby reducing the cost of poultry production.

Key Words: Additive, Broiler, Ginger, Garlic, Haemocytology

INTRODUCTION

Feed is the major component of total costs of poultry enterprises as 80% of the total expenditure is on procurement of feed (Asghar et al., 2000). Feed additives are non-nutrients of biological, mineral and medicinal sources along with other chemical agents used in feeds to bring about possible increase in production and reduction in cost (Wekhe, 2002; Yahaya et al., 2013, 2014a and 2014b). However, in recent times the use of antibiotics is not only limited but their use in livestock and poultry industry were banned in many countries due to the reasons like alteration of natural gut micro biota and drug resistance in bacteria and cancerous effect on humans. As a result, replacement of such antibiotics is not only limited adversely affecting the performance of birds can be achieved through the use of natural growth promoters such as prebiotics, probiotics, synbiotics, enzymes, plant extracts, etc., in broiler production (Borazjanizadeh et al., 2011; Campbell, 1994).

There is a wide range of medicinal herbs which possess a number of chemical substances which are used for use in poultry as feed additives across Nigeria (Akhtar et al., 1984). Herbs could be expected to serve as feed additives due to their suitability and preference, lower cost of production, reduced risk of toxicity and cancerous agents, minimum health hazards and environment friendliness (Devegowda, 1996). Recent research works on herbal formulations as feed additives have shown encouraging results as regards weight gain, feed efficiency, lowered mortality and increased liveability in poultry birds (Kumar, 1991; Babu et al., 1992; Mishra and Singh, 2000; Deepak et al., 2002; Jahan et al., 2008). Herbs/spices like ginger (Zingiber officinale) and garlic (Allium sativum) have been reported to possess useful pharmacological substances (Akhtar et al., 1984). Freshly crushed Garlic (Allium sativum) contains allicin, alliin, ajoene, diallylsulfide, dithiin, S-allylcysteine (www.wikpedia.org)while Ginger (Zingiber officinale) possesses a mixed composition of zingerone, shogaols and gingerols (Nidaullah et al., 2010). Ginger and garlic as additives in poultry nutrition may be of great benefit and value especially for broiler production. This is due to their antibacterial, anti-inflammatory, antiseptic, antiparasitic and immuno-modulatory properties of ginger and garlic (Onu, P.N. 2010). Garlic and ginger as natural growth promoters can be potential alternatives for common artificial growth promoters and synthetic antibiotics (Demir et al., 2003). Ginger is the rhizome of the plant Zingiber officinale, consumed as a delicacy, medicine, or spice. Preliminary research indicates that nine compounds found in ginger may bind to serotonin receptors which may influence gastrointestinal function. Research conducted in-vitro shows that ginger extract might control the quantity of free radicals and the peroxidation of lipids (Al-Aminet et al., 2006) and have anti-diabetic properties (Morakinyo et al., 2011). Garlic (Allium sativum) has been used as a spice and a native medicine for many years. It possesses antibacterial, antifungal, antiparasitic, antiviral, antioxidant...
anticholesteremic, anti-cancerous, and vasodilator characteristics (Hanieh et al., 2010). Ginger and garlic supplements in broiler 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 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; Oloforuh-Okoleh et al., 2014). Researchers attribute the better performance of the broiler birds exposed to ginger and garlic to an improvement in palatability and the quick digestive effect of this natural product. It is evident that ginger and garlic are indeed important feed additive in monogastric nutrition due to their enhancement of growth performance and health status of the animals. This work is therefore carried out to determined the optimum inclusion rate of ginger and garlic for enhanced growth performance and health improvement of the broiler birds and to study the blood parameters and serum biochemistry of broilers fed garlic and ginger.

MATERIALS AND METHODS
The experiment was conducted in the Department of Animal science teaching and research livestock farm, Federal University Dutsin-ma, Katsina State located in the Sudan savannah region of the country Nigeria.

Experimental Design and Diets
One hundred and twenty (120) day-old chicks were used for this experiment. The chicks were sourced from a reputable hatchery. The birds were randomly allotted to four (4) dietary treatments groups of 30 chicks per treatment replicated thrice of 10 chicks per replicate in a completely randomized design (CRD). The treatments groups were designated as T1, T2, T3 and T4. T1 served as control group free of the additives while birds in T2 were fed ginger powder at 0.3g/kg of feed. The birds in T3 were fed garlic powder at 0.3g/kg of feed and T4 were fed a mixture of ginger and garlic powder at the rate of 0.15g each in 1kg of feed for an experiment that lasted for 56 days. The basal diet used in this study consisted of starter diet (23% CP, 2900kcal/kg ME) fed for the first 28days and finisher diet fed from the 28th to the 56th day (20%CP,2900kca/kg ME).

Preparation of Test Ingredients
The ginger and garlic used in this study were sourced directly from Kachia local government in Kaduna state and Kura LGA in Kano state respectively. Their rinds and husks were peeled off using a knife. The peeled ginger and garlic were washed, chopped into pieces, sun dried and ground to fine powder before incorporated into the basal feed accordingly as described by Jahan (2008). Birds were properly housed in a deep litter system in a pen compartment measuring 2*3m² dimensions demarcated with wire mesh and wooden frame. The birds were provided with fresh, clean water and feed was given ad-libitum daily throughout the trial period. All management procedures were strictly adhered to.

Blood Sample Collection
3 Birds were selected per replicate and carefully restrained and handled appropriately to minimize splenic contraction due to adrenergic response that may cause false positive haemo-parameters. Restraint method deployed was dorsal recumbency with wing spread laterally to expose the wing vein. 3milliliters of blood was collected from the wing vein of birds randomly picked per replicate with a 22guage needle and 5ml syringe using aseptic techniques. 1ml of blood was decanted into sample bottle containing ethylene diamine tetra acetic acid (EDTA), labelled and stored at 4°C for analysis of blood cells. The remaining 2mls were decanted into non-anticoagulant containing sample bottles, labelled and centrifuged at 5000gravity for five minutes to allow for proper separation of serum. The serum was then decanted into containers and labelled appropriately and stored at -20°C for serum biochemistry.

Blood Sample Analysis
The blood and serum samples were immediately sent to the Clinical Pathology laboratory of the Department of Veterinary Pathology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria. The serum samples were subjected to serum biochemistry tests to check the levels of serum enzymes. Thick and Buffy coat smears were made from whole blood samples to determine blood pictures. Packed cell volumes (PCV) was also ascertained.

Data Analysis
Data obtained were subjected to the analysis of Variance (ANOVA) according to Steel and Torrie (1980) and the means were separated using Duncan Multiple Range Test (DMRT) according to Duncan (1980) using the Statistical analysis software (SAS).

RESULTS AND DISCUSSIONS
Packed Cell Volume which is a measure of cellular component of the whole blood showed a significant variation (P<0.05) between treatments. The standard PCV value for birds irrespective of breed is 30±2 for males and 21±0.6 for females (Oladele et al, 2000). Birds in group T3 showed highest packed cell volumes (PCV) followed by those in T2 and T4 respectively. Birds in T1 recorded lowest PCVs (Table 1.0). This finding was at tandem with the report of Forbes (2002) who reported 28.5±2 PCV values for birds. Haemoglobin concentration was measured 2*3m² dimensions demarcated with wire mesh and wooden frame. The birds were provided with fresh, clean water and feed was given ad-libitum daily throughout the trial period. All management procedures were strictly adhered to.
most pronounced in group T3 which differed significantly from that of group T4 as shown in table 1.0. This showed the effect of garlic in increasing heamoglobin concentration and PCV in broiler birds which is a determinant indicator of oxygen carrying capacity in animals (Esievo, 2017).

Table 1.0: Effects of Garlic and Ginger Additives on haemogram and mortality of Broilers

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCV (g/dl)</td>
<td>20.00a</td>
<td>24.67b</td>
<td>29.00b</td>
<td>24.33c</td>
<td>0.7453560</td>
</tr>
<tr>
<td>HGB (g/dl)</td>
<td>6.63a</td>
<td>7.40a</td>
<td>9.63a</td>
<td>7.76b</td>
<td>0.5423713</td>
</tr>
<tr>
<td>TWBC x 10⁹/l</td>
<td>10.00a</td>
<td>11.33a</td>
<td>15.10a</td>
<td>13.00a</td>
<td>2.5415437</td>
</tr>
<tr>
<td>TRBC x 10¹²/l</td>
<td>3.37a</td>
<td>3.63a</td>
<td>4.73a</td>
<td>4.23a</td>
<td>0.3358240</td>
</tr>
<tr>
<td>HETERO (%)</td>
<td>16a</td>
<td>17a</td>
<td>16a</td>
<td>18a</td>
<td>4.6815240</td>
</tr>
<tr>
<td>LYMPHO (%)</td>
<td>79a</td>
<td>82a</td>
<td>83a</td>
<td>82a</td>
<td>4.8016201</td>
</tr>
<tr>
<td>MONO (%)</td>
<td>3a</td>
<td>1a</td>
<td>1a</td>
<td>0a</td>
<td>1.2500000</td>
</tr>
<tr>
<td>EOSINO (%)</td>
<td>1a</td>
<td>0a</td>
<td>0a</td>
<td>0a</td>
<td>0.0000000</td>
</tr>
<tr>
<td>BASO (%)</td>
<td>0a</td>
<td>0a</td>
<td>0a</td>
<td>0a</td>
<td>0.0000000</td>
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<tr>
<td>BAND (%)</td>
<td>1a</td>
<td>0a</td>
<td>0a</td>
<td>0a</td>
<td>0.2500000</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>85.00a</td>
<td>50.67b</td>
<td>42.38b</td>
<td>35.00c</td>
<td>3.5079000</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different (P>0.05).
T2 contains 0.3gGin/Kg
T3 contains 0.3gGarl/Kg
T4 contains 0.15g Gin+0.15gGarl/Kg feed

Monocytes titre was numerically higher in the control group though statistically insignificant (P<0.05). This could be attributed to the fact that the control group relied solely on cell mediated immunity to fight infections and monocytes are primarily phagocytic cells that ingest fungi and bacteria (Harvey, 2001). Similarly, all treatment groups subjected to the additives recorded zero levels of eosinophils as compared to the control group. Eosinophils are associated with parasitic infection, It’s absence in the treatment groups clearly demonstrated the effect of garlic and ginger on parasitic organisms. Birds in group T4 recorded the least mortality followed by T3 and T2 respectively and a statistical significance (P<0.05) was recorded for this. This demonstrated the superiority of the synergistic effect of garlic and ginger in maintenance of overall health of birds which led to a decrease in mortality rates. Similar findings were obtained by Kumar, 1991; Babu et al., 1992; Mishra and Singh, 2000; Deepak et al., 2002; Jahan et al., 2008 on broiler production.

Table 2.0: Serum Biochemistry

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin (Mmol/L)</td>
<td>35.00a</td>
<td>36.00a</td>
<td>39.67a</td>
<td>28.67a</td>
<td>4.7404876</td>
</tr>
<tr>
<td>AST(Mmol/L)</td>
<td>19.33a</td>
<td>23.00a</td>
<td>16.67a</td>
<td>21.00a</td>
<td>3.0912062</td>
</tr>
<tr>
<td>ALT (Mmol/L)</td>
<td>4.67a</td>
<td>6.33a</td>
<td>8.67a</td>
<td>6.67a</td>
<td>2.29734146</td>
</tr>
<tr>
<td>CREATININE (Mmol/L)</td>
<td>17.33b</td>
<td>27.67a</td>
<td>23.33a</td>
<td>22.33a</td>
<td>2.2607767</td>
</tr>
<tr>
<td>ALP (Mmol/L)</td>
<td>57.33a</td>
<td>61.33a</td>
<td>45.33a</td>
<td>64.00a</td>
<td>6.1644140</td>
</tr>
<tr>
<td>TSP (g/L)</td>
<td>52.33a</td>
<td>54.33a</td>
<td>58.00a</td>
<td>53.67a</td>
<td>5.8094750</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different (P>0.05).
T2 contains 0.3gGin/Kg
T3 contains 0.3gGarl/Kg
T4 contains 0.15g Gin+0.15gGarl/Kg feed
ALT - Alanine Amino Transferase
AST - Aspartate Amino Transferase

There was no significant rise in the titre values of AST which is associated with wide variety of tissue damage connoting to relative safety of the additives to the birds’ system (Reece, 2005). Numerically, there was increase in albumin in T2 and T3 with a decreased in T4 as compared to the control group.
The difference in albumin levels shows that birds in group T4 were associated with minimal levels of excessive protein break down and loss of albumin as opposed to other groups. This agrees with the reports of Reece, 2005.

CONCLUSION AND RECOMMENDATION
This study established and confirmed the maximum inclusion rate of mixture of garlic and ginger at 0.15g/kg of feed as additives in broiler production. The results revealed that birds in T4 showed enhanced immunologic and health benefits as such established that it could be used as a replacement for synthetic antibiotics. It is therefore recommended for use by poultry farmers in place of antibiotics thereby saving cost of production.

REFERENCES


