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EVALUATION OF TWO HERBAL SPICES AS FEED ADDITIVES FOR FINISHER BROILERS

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Abstract: The aim of this study was to evaluate the effect of two herbal spices as feed additives for finisher broilers. 120 5-week old birds were randomly assigned to four treatments in a completely randomized design. Each group was further subdivided into three replicates of 10 birds per replicate. Four experimental diets were formulated such that diet I (T_1) which served as the control contained neither ginger nor garlic. Diets 2 (T_2) and 3 (T_3) contained 0.25% garlic and ginger respectively. Diet 4 (T_4) contained a combination of 0.25% of garlic and ginger. Response parameters evaluated include weight gain, feed intake, feed conversion ratio, blood parameters and carcass characteristics. The experiment lasted for 35 days. Results showed that birds fed supplemented diets had significantly ($P<0.05$) higher body weight gain and superior feed conversion ratio than birds fed the control diet. There was no significant ($P>0.05$) difference in the feed consumption of the birds among the treatments. The hematological indices, serum biochemistry and carcass characteristics of the birds among the treatment were not significantly ($P>0.05$) influenced by the dietary treatments. The results of this study suggest that ginger and garlic can be included in broiler finisher diets without adversely affecting the performance of the birds.

Key words: Blood components, broiler finishers, carcass characteristics, garlic, ginger, performance.

Introduction

Nigeria has a wide range of medicinal herbs scattered over a large area, due to the favourable climatic condition. These herbs posses a number of chemical substances for use in poultry as feed additives *(Akhtar et al. 1984)*. In addition, the intensive poultry management system practiced have led to marked increase in the production of poultry meat and eggs *(Armstrong, 1986)* and also triggered the development of new feed additives in poultry feeding. 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, lower cost of production, reduced risk of toxicity, minimum health hazards and environment friendliness *(Devegowda, 1996)*. Moreover there is a great phobia in using antibiotic as feed additives because of public concern about antibiotic residues 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 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 posses useful pharmacological potent chemical substances for use in poultry *(Akhtar et al.,1984)*. Freshly crushed Garlic (*Allium sativum*) contains allicin, alliin, ajoene, diallylsulfide, dithiin, S-allylcysteine *(www. wekipedia.org)* while Ginger (*Zingiber officinale*) possesses a mixed composition of zingerone, shogaols and gingerols *(Nidaullah et al., 2010)*. Ginger and garlic as natural feed additives in poultry nutrition may be of great benefit and value especially for broiler growers. This is due to their antibacterial, anti-inflammatory, antiseptic, anti-parasitic and immunomodulatory properties of ginger and garlic. However, their influence on growth performance, blood parameters and carcass characteristics of finisher broilers has not been sufficiently documented. Thus the objective of this study was to evaluate the efficacy of ginger and garlic as feed additives and their subsequent influence on the performance and carcass characteristics of finisher broilers.

Materials and Methods

The experiment was conducted at the Department of Animal Science, Ebonyi State University, Abakaliki.

Experimental Animals and Management.120 5-weeks old broiler chicks of Anak breed were used for the experiment. The birds were housed in open sided poultry pen, the floor were concrete and covered with rice husk as litter material. The birds were randomly allotted to four (4) dietary treatments in a Completely Randomized Design (CRD). Each treatment was replicated three (3) times giving ten (10) birds per replicate.

Feed and water were offered for *ad libitum* consumption throughout the experimental period. The experiment was conducted for 5 weeks. Other routine poultry management practices were also maintained.

Experimental Diet. Four (4) experimental diets were formulated such that diet 1 (T_1) which served as the control diet contained neither ginger nor garlic. Diet 2 (T_2) and 3 (T_3) contained 0.25% of garlic and ginger respectively. Diet 4 (T_4) contained a combination of 0.25% of garlic and ginger. The composition of the experimental diets is shown in Table 1. Diets were formulated to meet the requirements by the *National Research Council (1994)* for broilers of this age.

Table 1. Composition of Experimental broiler Finisher Diet

Diet	T_1	T_2	T_3	T_4
Maize	50.00	50.00	50.00	50.00
Wheat offal	14.00	14.00	14.00	14.00
SBM	20.00	20.00	20.00	20.00
PKC	9.50	9.50	9.50	9.50
Bone meal	3.00	3.00	3.00	3.00
Fish meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
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	100	100	100	100
Calculated Chemical composition				
Crude protein	19.36	19.36	19.37	19.38
Crude fibre	5.41	5.41	5.41	5.42
Ether extract	8.96	8.96	8.97	8.97
ME(Kcal/kg)	3002.18	3002.18	3002.19	3002.18

Blood Collection and Evaluation. At the end of the feeding trial, three birds were randomly selected from each replicate group and blood samples collected from the wing vein with sterile needle into well labeled sterilized bottles that contained ethylene diamine tetra-acetic acid (EDTA) as anticoagulant for haematological analysis. The packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC) and the haemoglobin (Hb) concentrations were measured using the Wintrobes Microhaematocrit, improved Neubauer haemocytometer and Cyanomethaemoglobin methods respectively *(Coles, 1986)*, while mean corpuscular haemoglobin (MCH) levels, mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were computed according to *Bush (1991)*. Similarly, blood samples collected without anti coagulant were used for the determination of serum biochemical constituents viz. albumin, globulin, total protein, blood urea and creatinine, using commercially available analytical kits.

Carcass characteristics. At the end of the feeding trial, three birds were selected at random from each replicate; the birds were slaughtered, eviscerated. The body parts and organs were weighed and expressed as percentage of live weight.

Data Collection and Statistical Analysis. Data regarding feed intake was recorded on daily basis. Weight gain was calculated on weekly basis by subtracting weight of the respective week from the last week weight. FCR was calculated by dividing the feed intake by weight gain.

The data thus collected were subjected to statistical analysis by using Analysis of Variance Technique and in case of parameters showing significant treatment effect, comparison of mean values were further compared by Duncan's Multiple Range Test *(Snedecor and Cochran, 1991)*.

Results and Discussion

The effect of garlic and ginger on the performance of finisher broilers is as shown in Table 2. There were significant ($p<0.05$) difference in the weight gain of the birds among the treatments. Birds fed garlic and ginger supplemented diets recorded the highest body weight gain. There was a numerical increase in weight of birds fed garlic and ginger mixture. Birds fed unsupplmented diet had significantly ($P>0.05$) the lowest body weight gain.

Table 2. Performance of Broiler Finisher fed Garlic and Ginger

Parameters	T_1	T_2	T_3	T_4
Initial weight(g)	1081.9	1082.14	1093.67	1084.86
Final weight(g)	1960.00^b	2082.086^a	2091.33^a	2171.82^a
Body weight gain(g)	878.1^b	1000.72^a	997.66^a	1086.96^a
Daily weight gain(g)	31.36^b	35.74^a	35.63^a	38.82^a
Daily feed intake(g)	102.78	100.87	102.53	102.73
Total feed intake(g)	2877.84	2824.27	2870.93	2876.37
Feed conversion ratio	3.28^b	2.82^a	2.88^a	2.65^a

a,b means on the same row with different superscripts are significantly difference ($p<0.05$).

The numerical improvement achieved with mixture of garlic and ginger is in line with the reports of *Ahmed and Sharma (1997)* who reported a numerical increase in body weights of rats fed a mixture of ginger and garlic. Similarly, *Ademola et al. (2009)* reported a numerical increase in final body weight and weight gain of broilers fed a mixture of garlic and ginger.

The improvement in weight achieved by ginger and garlic supplementation over the control indicates that they have great impact on the growth of the birds. This improvement may be due to improved gut environment and microflora

achieved with garlic and ginger supplementation. This effect is attributed to the fact that the susceptibility of pathogenic gram positive bacteria to the antibacterial components of garlic and ginger are higher than that of the physiological desirable intestinal bacteria *(Reeds et al., 1993; Cullen et al., 2005)*. This observation is in line with the findings of *Shi et a/., (1999)* and *Javandel et al., (2008)*. However, this observation contradicts the reports of *Omage et al.,(2007)*, *Ademola et al (2004)* and *Horton et al., (1991)* who reported that the inclusion of ginger and garlic did not improve the weight gain of broilers.

There was no significant (P>0.05) difference in the feed consumption of the birds among the treatments. However, the inclusion of garlic as a sole agent numerically reduced the feed intake of the birds fed the diet. This is not surprising since garlic has a pungent odour that can adversely affect feed intake. Allicin is an extremely odoriferous compound *(Cavallito and Bailey, 1994)*. This suggests that it is the organoleptic properties of garlic that are responsible for the decrease feed intake *(Cullen et al., 2005)*. The sense of taste is an important factor in determining the selection of food by animals *(Baldwin, 1976)* while the importance of olfaction is also recognized *(Forbes, 1995)*. This is of particular importance to the birds as its sense of smell is heavily implicated in feed intake like other monogastric animals *(Mellor, 2000)*.

There were significant (P<0.05) differences in the feed conversion ratio of the birds. Birds fed supplemented diets recorded superior (P<0.05) feed conversion ratio than the control. The improved feed efficiency observed in birds fed garlic and ginger supplemented diets suggests that the antimicrobial action of garlic and ginger may be sufficient to inhibit microbial fermentation *(Ankri and Mirelman, 1999)* According to *Reeds et al., (1993)*, in rapidly growing young animals, the gastro intestinal tract and the skeletal musculature draw from the same limited supply of nutrients and are in effect competitors for the deposition of nutrients. As much as 6% of the net energy in animal diet can be lost due to bacterial utilization of glucose in the small intestine *(Vervaeke et al., 1979)* and these bacteria require amino acids in relatively similar proportional amount as the animal *(Hays, 1978)*. When garlic and ginger were added there may have been a nutrient sparing effect, therefore improving feed conversion ratio. The effects of ginger and garlic on the haematological and serum biochemical indices of the birds are shown on Table 3. There was no significant (P>0.05) difference in the haematological indices among the treatments. The values of the PCV, Hb, WBC and RBC fall within the normal range for healthy broiler chickens as reported by *Anon (1980)* and *IACUC (1998)*. The values for MCHC, MCV and MCH did not differ significantly (P>0.05).

Table 3. Effect of ginger and garlic supplementation on the Haematological parameters of finisher broilers

Parameters	T_1	T_2	T_3	T_4	SEM
PCV (%)	29.63	30.04	30.00	30.35	0.82
Hb g/dl	10.02	10.70	10.99	10.81	0.02
WBC x $10^6 mm^3$	23.84	24.70	24.78	24.61	0.69
RBC x $10^6 mm^3$	2.82	2.93	2.94	2.90	0.32
MCHC (%)	8.40	8.63	8.58	8.60	0.48
MCH (pg)	9.04	9.13	9.13	9.15	0.66
MCV (um^3)	12.29	129.21	128.99	128.82	1.34
Serum biochemistry					
Total protein (g/l)	33.82	35.01	34.93	36.22	1.79
Albumin (g/l)	23.16	22.96	23.04	22.89	1.48
Globulin (mg/dl)	10.68	10.59	10.64	10.61	0.70
Urea (mg/dl)	12.51	12.32	12.43	12.29	0.79
Creatine (mg/dl)	0.63	0.62	0.63	0.63	0.10

It can be inferred that the haematological indices were within safety limits for broilers in this experiment. The normal PCV, Hb and other 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 was adequate. The numerical differences observed in the PCV, Hb and RBC of birds fed ginger and garlic supplemented diets suggest that the diets were better utilized and assimilated into the blood stream for use by the birds.

The biochemical parameters observed in this study did not differ significantly ($P>0.05$). Since no sign of anemia or ill-health was observed in all treatment in the course of the experiment, the quality and quantity of the dietary proteins were nutritionally adequate and there was no alteration of normal systemic protein utilization. According to *Awosanya et al. (1999)* blood protein depends on the quality and quantity of dietary protein.

Table 4. Effect of ginger and garlic on the carcass characteristics of finisher broilers

Parameters	T_1	T_2	T_3	T_4	SEM
Head	2.84	2.86	2.84	2.89	1.65
Neck	3.98	3.78	4.02	3.87	0.76
Breast	14.21	14.68	14.82	14.63	5.30
Drumstick	15.36	15.43	15.40	15.52	7.21
Wing	8.24	8.26	8.24	8.41	0.31
Thigh	10.84	11.02	10.93	10.99	0.66
Shank	4.72	4.76	4.90	5.00	4.01
Gizzard	2.51	2.48	2.50	2.51	1.02
Liver	2.47	2.50	2.46	2.46	0.89
Heart	0.45	0.43	0.45	0.48	0.04

The carcass characteristics (Table 4) evaluated were not significantly (P>0.05) influenced by the dietary treatments and did not follow a definite pattern that can be attributed to treatment effect. The addition of ginger and garlic at 0.25% did not affect the development of the organs. This implies that this level is appropriate for the birds and that the test diets did not contain any appreciable toxin. According to *Bone (1979)* abnormalities in the weights of the internal organs like liver, kidney and gizzard arise because of increased metabolic rate of the organs in attempt to reduce toxic elements or anti-nutritional factors to non-toxic metabolites

Conclusion

Results of this study indicate that ginger and garlic supplementation at 0.25% level in broiler finisher diets enhanced the growth rate and feed conversion ratio of the birds. These supplements did not adversely influence the haematological, serum biochemistry and carcass characteristics of the birds. The results of this study suggest that ginger and garlic can be included in broiler finisher diets without adversely affecting their performance.

Evaluacija dve biljne vrste kao aditiva u hrani za tovne brojlere

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Rezime

Beli luk i đumbir su prirodni proizvodi, jeftini i dostupni u Nigeriji. Njihov potencijal kao aditiv za hranu za životinje nije u potpunosti ispitan. Na osnovu ove premise, izvedeno je istraživanje kako bi se ocenile ove dve biljne vrste i njihov uticaj kao aditiva u hrani za tovne brojlere. 120 pilića starosti od 5 nedelja su postupkom slučajnog izbora podeljeni u četiri tretmana. Svaka grupa je dalje podeljena na tri pod-grupe sa 10 brojlera po grupi/ponavljanju. Četiri ogledna obroka su formulisana I (T_1) koji je bio kontrola i koji nije sadržavao ni beli luk ni đumbir. Obroci 2 (T_2) i 3 (T_3) koji su sadržavali 0,25% belog luka i đumbira, respektivno. Obrok 4 (T_4) je sadržavao kombinaciju 0,25% belog luka i đumbira. Parametri koji su ocenjivani uključuju: prirast, konzumiranje hrane, konverziju hrane, parametre krvi i osobine trupa. Ogled je trajao 35 dana. Rezultati su pokazali da su brojleri hranjeni dopunjenim obrocima imali signifikantno (P<0,05) veći prirast telesne mase i bolju konverziju hrane nego brojleri hranjeni kontrolnim obrokom. Nije utvrđena signifikantna (P>0,05) razlika u konzumiranju hrane pilića

na različitim tretmanima*/ Hematološki indikatori, biološka hemija seruma i osobine trupa brojlera se nije signifikantno razlikovala po tretmanima (P>0.05) pod uticajem tretmana. Rezultati ovog ispitivanja ukazuju da se beli luk i đumbir mogu uključiti u obroke za tovne brojlere bez negativnih uticaja na proizvodne rezultate pilića.

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