EFFECT OF DIETARY TURMERIC-GINGER COMBINATION ON SERUM ELECTROLYTES OF BROILER CHICKEN

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ABSTRACT

The study was conducted to examine the health promoting efficacy of turmeric-ginger combination in the diets of broiler chickens using serum electrolytes. A total of two hundred and forty (240) 1-day old Arbor acres strain of broiler chicks were randomly allotted to five dietary treatments in a completely randomized design (CRD). Each treatment was replicated thrice with 16 chicks per replicate (n=48). Five isocaloric-isonitrogeneous experimental diets were formulated in such a way that; birds in group T1 were fed diet containing 1% ginger, 0% turmeric while T2, T3, T4 and T5 groups were fed 0.75%-0.25%; 0.50%-0.50%; 0.25%-0.75% and 0%-1.00% ginger-turmeric combinations, respectively. The feeding trial covered a period of 49 days. There were no significant (P>0.05) difference in terms of chloride (CL), sodium (Na), and aspartate amino transferase (AST). However, there were significant (P<0.05) effects on potassium (K), alanine transaminase (ALT) and alkaline phosphatase (ALP), whereby T5 (0% ginger -1% turmeric) recorded the highest value than T4, while T1, T2 and T3 lack significant (P>0.05) difference. Hence, T1 and T2 recorded the higher values in terms of ALT and ALP compared to the remaining treatment groups. Moreover all the serum electrolytes in this study were within the normal reference values of a healthy broiler chicken. The study concluded that, ginger and turmeric has no detrimental effects on serum electrolytes of a broiler chicken. Furthermore, blends of the two phytobiotic feed additives ginger-turmeric combination can substitute commercial antibiotics and impart positive effects on health performances of broiler chickens.

INTRODUCTION

Broiler chickens have faster growth rates and development that can be harvested at the age of 30-35 days (Andriyanto *et al.,* 2016). In broiler chickens industries, feed is the most important part of the management systems (Sitorus *et al*., 2011). However, haematology and serum biochemical indices are helpful tools in animal production. They are used in determining health and nutritional statuses, metabolic diseases, nutritional deficiencies and welfare of animal (Menon *et al*., 2013). Incidence of disease and malnutrition are diagnosed from the normal reference values of various serum biochemical indices and haematological parameters measured depending on the case being investigated (Ayodele *et al.,*2021).The emergence of drug resistance microorganisms, side effects of antimicrobials and the harmful residual toxicity effects of drugs observed in the food chain as well as the ban of the use of antibiotics in many countries have put pressure on the poultry industry to encourage organic livestock farming (Alagawany *et al.,* 2016). This has stimulated increased interest in the usage of consumer accepted natural alternatives such as phytogenic feed additives (PFA) to improve productivity (Ghaedi *et al*., 2014). Therefore, this study was designed to examine the efficacy of turmeric-ginger combination on serum electrolytes of broiler chicken.

MATERIALS AND METHODS

Experimental site: The study was conducted at the poultry unit of Animal Science Department Teaching and Research Farm, Federal University Dutse Jigawa State. The location of Dutse is at Latitude 11°46 39 North and Longitude 9°20, 30" East in the Sudan

Savannah ecological zone of Nigeria (Wikipedia, 2011). The zone is characterized by hot and dry climate and short duration of rainfall (3-4 months).The rainy season starts from May to September with August being the month of highest rainfall, while the dry season starts from October to April. The mean annual temperature is about 25°C but the mean monthly values range between 21°C or below in the coldest months and 31°C or above in the hottest month. The total annual rainfall is about 600mm and the relative humidity is generally low ranging from 5% - 43.5%. **(**Olofin, 2008).

Experimental Materials

The turmeric and white ginger used were purchased from *Yan,kaba* market in Kano, Kano state. All the ingredients were thoroughly clean, sorted and all impurities were removed and then dried under the shade for 28- days. Thereafter, they were ground into powder form using grinding machine and sealed into clean polythene bags for inclusion into the experimental diets. The macro feed ingredients used were; Maize, wheat offal, full fat soya bean, groundnut cake, fish meal and bone meal. Before particle size reduction all macro ingredients were thoroughly threshed, clean and all impurities were removed. Soya bean was toasted mildly in order to remove anti-nutritive factors; trypsin inhibitor, according to Adamu *et al.* (2008). And then ground to appropriate particle sizes to ensure proper compounding and achieve uniformity in diet texture. Micro ingredients used were; mineral-vitamin premix, Methionine, lysine and common salt..

Proximate Composition:

Samples of turmeric and ginger (phytobiotic feed additives) and major feed ingredients were ground by using a Wiley mill (Thomas® Wiley Cutting Mill) to pass through a 1 mm screen for proximate composition prior to experimental feed formulation.

Blood collection and analysis:

Bleeding was done from the left wing vein, Using a 5 mL scalp vein needle set, quantity of 2 mL blood was collected from each sample bird into a sterilized sets of plain bottles for the determination of serum electrolytes using standard procedures, as described by Weiss and Wardrop (2010). The coagulated blood samples were centrifuged for 15 minutes at 4000 rpm, and the clear serum was separated. Samples were analyzed using the instrument HumaStar 80 automated chemistry analyzer (HUMAN Gesellschaft fuer Biochemical und Diagnostic GmbH, Germany). Serum electrolytes determination was undertook at pathology and biochemistry department of Dutse General Hospital Laboratory.

Statistical Analysis:

Data for the serum electrolytes indices were subjected to analysis of variance (ANOVA) of a completely randomized design (CRD). Significant ($p<0.05$) differences among treatment means were determined using Duncan Multiple Range Test as contained in SAS (2010) package.

RESULTS AND DISCUSSION

Proximate composition of the experimental diets: The results show that, the proximate composition of the experimental diets fed at both starter and finisher phases presented in Table1. The (crude protein, ether extract, crude fiber, ash, dry matter, phosphorous and metabolizable energy) for experimental diets have meets the nutritional requirements of a healthy broiler chicken.

The effects of ginger-turmeric combination on serum electrolytes of broiler chicken: There were no significant ($P > 0.05$) differences in terms of chloride (CL), sodium (Na), and aspartate amino transferees (AST). However, there were significant ($P<0.05$) effects on potassium (K), alanine transaminase (ALT) and alkaline phosphatase (ALP), whereby T5 (0% ginger -1% turmeric) recorded the highest value than T4, while T1, T2 and T3 lack significant ($P>0.05$) difference. Hence, T1 and T2 recorded the higher values in terms of ALT and ALP

compared to the remaining treatment groups. Ikpitanyi and Igwe (2020) reported that, were significant different ($p<0.05$) from ginger treated group on Sodium and potassium levels. Ikpatanyi and Igwe. (2020) also observed significant ($P<0.05$) effects on AST, ALT ALP whereby the ginger treated groups recorded the lower values. However all the serum electrolytes were within the normal reference values of a healthy broiler chicken.

Table 1: Proximate composition of Experimental Diets

Parameters	**T1**	**T2**	**T3**	**T4**	**T5**
Ginger	1.0%	0.75%	0.50%	0.25%	0.0%
Turmeric	0.0%	0.25%	0.50%	0.75%	1.0%
Starter					
CP	22.03	22.02	22.5	22.5	22.6
P	0.33	0.32	0.31	0.30	0.30
EE	3.11	3.13	3.15	3.18	3.21
CF	4.23	4.56	4.56	4.69	4.78
Ash	7.05	7.03	7.03	7.06	7.08
DM	89.87	89.87	89.98	89.79	89.79
ME kcal/kg	3151	3149	3147	3148	3145
Finisher					
CP	21.34	21.34	21.27	21.25	21.23
P	0.29	0.29	0.26	0.28	0.30
EE	3.11	3.17	3.19	3.21	3.22
CF	4.06	4.02	4.1	4.5	4.12
Ash	7.06	7.05	7.07	7.07	7.09
DM	90.18	90.12	90.09	90.07	90.05
ME kcal/kg	3176	3177	3174	3168	3154

Note; CP= crude protein. ME= metabolizable energy. EE= ether extract. CF=crude fiber. DM= dry matter. P=phosphorous.

Table2. Serum electrolytes of broiler chickens supplemented with varying levels of Ginger-Turmeric combination

Parameters	**Treatment**						
	T1	**T2**	**T3**	**T4**	**T5**		**NL**
Ginger	1.0%	0.75%	0.50%	0.25%	0.0%	**pvalue**	
Turmeric	0.0%	0.25%	0.50%	0.75%	1.0%		
Cl um/L	97.00±2.08	98.00±3.06	103.3±4.33	97.67±3.29	96.33±3.84	0.2802	99-124
K mq/L	$4.27±0.26^{ab}$	$4.27±0.20^{ab}$	$4.630.38^{ab}$	$3.87±0.22^{b}$	$5.20±0.60^{a}$	0.1875	4-6.1
Na %	137.6±1.45	138.33±5.78	139.0±4.58	143.3±3.38	138.6±2.19	0.8390	130-150
ALT (µ/l)	$29.33±2.7^{a}$	$18.33±0.3^{c}$	$17.00±2.5^{bc}$	$23.67±4.3^{ab}$	$14.00±2.0^{b}$	0.0197	19-107
AST (µ/l)	29.67±0.88	17.33±3.76	23.33±5.59	25.00±5.69	16.33±1.76	0.1854	44-60
ALP (µ/l)	$118.6±7.5^{ab}$	$138.3±9.33^{a}$	$128.0±9.2^{ab}$	$112.6±5.5^{b}$	$109.0±5.5^{b}$	0.0482	15-160

Note: Cl=chloride. K=potassium. Na=sodium. ALP=alkalinephospatase. ALT=alanine transaminase. AST=aspartate aminotransferase P=probability. NL=normal range. NR source= Bonous and Stedman, (2000) and wikivet, (2023).

CONCLUSION

Different and blends of the two phytobiotic (ginger and turmeric) additives had some favourable effects drearily and equivalent to commercial antibiotics (Oxcytertacycline) with no significant effect on erum electrolytes. Moreover (serum electrolytes are on a normal range)

REFERENCES

Alagawany, M., Ali, A. E. and Reda, F. M. (2016). Effect of Dietary Supplementation of Garlic (*Allium sativum*) and Turmeric (*Curcuma longa*) on Growth Performance, Carcass Traits, Blood Profile and Oxidative Status in Growing Rabbit. *Annual Journal of Animal Science,* (16): 489-505.

Andriyanto, I. M., Paramita, D., Aripin, N., Nugraheni, P. and Putri, Z. U. (2016). Administration of Jamu Jahkenkun to Improve Productivity and Haematology Profiles of Broiler Chickens. *International Journal of Poultry Science*, (15)**:** 126-133.

Ayodele, A. D., Tayo, G. O., Olumide, M. D., Adeyemi, O. A. and Akanbi, A. S. (2021). Haematological and serum biochemical responses of pullet chicks fed diets containing single and combined levels of turmeric and clove. *Nigrian journal of Animal Producion* 48 (3): 71 - 85. doi.org/10.51791/ *Nigerian Society for Animal Production*

Bounous, D. and Stedman, N. (2000). Normal Avian Hematology: Chicken and Turkey. In: Feldman, B. F., Zinkl, J. G., Jain, N. C. Editors. *Journal of Veterinary Haematology*,1147-1154.

Ghaedi, H., Nasr, J., Kheiri, F., Rahimian, Y. and Miri, Y. (2014). The Effect of Virginiamycin and Black Pepper (*Piper nigrum* l.) Extract on Performance of Broiler Chicks. *Research Opinion in Animal and Veterinary Sciences*, (4): 91-95

Menon, D. G., Bennett, D. C., Shaefer, A. M. and Chengm, K. M. (2013). Haematological and Serum Biochemical Profile of Farm Emus (*Dromaiusnovae hollandiae*) at the Onset of their Breeding Season. *Journal of Poultry Science*, (92): 935-944

Olofin E.A (2008). The physical settings in (E.A.Olofin, A.B. Nagebu and A.M Danbazau) Wudil within Kano region: *A geographical perspective synthesis, Kano city, Adamu Joji publisher pp.1-34.*

SAS (2010). Statistical Analysis Software Version 9.3. SAS Institute, Inc., Cary, North Carolina,USA, (48): 12-54.

Sitorus, H., Salim, M. And Ambarita, L. A. (2011). Pola Penggunaan Tanaman Obat Tradisional Di Desa Segara Kembang dan Desa Tungku Jaya di Kabupaten Ogan Komering Ulu. *Journal ofPembangunan Manusia*, (5): 1-12.

Weiss and Wardrop. (2010). Clinical Pathology updates; Haematology and biochemistry of the Rabbit. *Journal of Clinical Pathology* **13** (6): 75-77.

Wikipedia veterinary reference values Wikivet, (2023). Poultry haematology Manual for Developing Poultry Industries ASA Nutritional Manual, *American Soybean Association St. Louis USA. Pp* 1-29.