

HAEMATOLOGY AND SERUM BIOCHEMISTRY INDICES OF FOUR (4) WEEK OLD BROILER CHICKENS ON DIETARY INCLUSION OF GINGER, TURMERIC AND GARLIC

Ochefu, J., Ukwu, H. O. and Iortyer, M. M.*

Department of Animal Breeding and Physiology, Federal University of Agriculture, P. M.B. 2373, Makurdi.

*Department of Animal Production, Federal University of Agriculture, P. M.B. 2373, Makurdi.

Corresponding Author: jochefu@gmail.com

ABSTRACT

This study was conducted to investigate the influence of dietary inclusion of turmeric, ginger and garlic on blood profiles of broiler chicken at four weeks of age. One hundred and forty four (144) day-old broiler chickens were randomly distributed into four treatment groups with three replicates of 12 chicks in each. The treatment groups were T¹ Control diet, while T² contains 2% of turmeric powder, T³ contains 2% of ginger powder and T⁴ contains 2% garlic powder. Feed and water were administered *ad-libitum*. At end of the feeding trials, three chickens were selected randomly from each treatment and sacrificed. Blood sample were collected via the jugular vein. Haematological results revealed that, WBC, MCHC and monocytes means were significantly ($p < 0.05$) different amongst treatment. Serum indices also showed that Albumin and AST vary significantly ($p < 0.05$) amongst treatment means. It can be inferred that 2% inclusion of ginger, turmeric and garlic in broiler diet in the first weeks of chicks' life, influences WBC, MCHC, monocyte, albumin and AST values.

Key words: Ginger, turmeric, garlic, haematology, biochemistry

Introduction

Blood indices are useful indicators of the response of animal to physiological changes due to environmental variations. They are also prognostic for pathological conditions (Ciesla, 2007). Haematological investigation provides the opportunity to clinically study the presence of several metabolites and other constituents in the body of animals and it plays a vital role in the physiological, nutritional and pathological status of an organism (Aderemi, 2004). It also helps in distinguishing normal state from state of stress (Afolabi *et al.*, 2010). Odunsi *et al.* (1999) posited that dietary constituents is reflected in the blood picture of the livestock. Therefore, the primary effect of the use phyto-additives in diets of animals can readily be assessed by haematological studies. Phytic materials (ginger, garlic and turmeric) has been in use as stimulants, spices and additives in human and animal diets (Wang *et al.*, 1998). These substances are known to provide curative, if not remedial actions against pathogenesis of microbes (Govaris *et al.*, 2004). Garlic, ginger and turmeric have been shown to improve feed conversion ratio, growth rate in birds (Katan *et al.*, 1997; Al-kasie *et al.*, 2011). Boosting broiler chicken production without the use of synthetic antibiotic and other chemicals that may have residual effect on the consumer is on the research burner, however, the effect of these non-conventional plant material on the animal must be properly understood. Hence this study was to determine the effect of dietary inclusion of ginger, garlic and turmeric on some haematological indices and serum biochemistry of broiler chicken.

Materials and methods

The study was conducted in the poultry unit of the Federal University of Agriculture Makurdi, Teaching and research farm, located on latitude 7°43' north and longitude 8°3' east, in the Southern guinea Savanna. The annual rainfall ranges from 1105mm to 1600mm. the annual ambient temperature is between 22.8°C to 40.0°C with a humidity of 39.50-64.00% (NIMET 2009).

A total of one hundred and forty four (144) day old broiler (CHI bird's strains) chicks were sourced from a reputable hatchery. The birds were randomly allotted to four treatments of three replicates each after brooding for two weeks. Routine vaccines were administered. Commercial feed was used as the basal diet. Feed and water were offered *ad-libitum*. Turmeric, ginger and garlic powder each were included at 2% in their respective feeds; where T¹ is the control (with 0% inclusion of any the test ingredient), T² contains turmeric at 2%, T³ contains ginger at 2% and T⁴ contains garlic at 2%. The experiment was set in a completely randomized design (CRD). Three birds per treatment were randomly selected and sacrificed. 6mls each of blood sample was collected from the severed jugular of the chicks; 3mls for haematology while 3mls was for serum biochemistry. Data were collected and subjected to statistical data analysis using SPSS® version 19.

Results and discussion

The results of the dietary inclusion of ginger, turmeric and garlic on the haematology of broiler chicken is presented on table 1. Mean of haematological indices observed were within normal reference range except mean corpuscular volume (Mitruka and Rawnsley, 1977) and higher than the range of value (92.42-148.88fl) reported (Onyishi *et al.*, 2017). Since significant difference ($p<0.05$) was not observed among the means, it can be inferred that there exposure to stressors cannot be suggested. Onyishi *et al.* (2017) posited that the high MCV values could be due to the reduced RBC volume. Significant ($p<0.05$) variation were observed in the treatment means of PCV, WBC, MCHC and monocytes. It was observed that T1 presented higher mean value, it can be implied that the test additives acted individually in the reduction of haematological indices concentration in the blood of broiler starter chicken. Ginger and turmeric tend to reduce PCV but garlic was as effective. Ginger also suppressed ($p<0.05$) the volume of circulating white blood cells but turmeric and garlic were milder ($p<0.05$). Table 2 present some biochemical indices of starter chickens on dietary inclusion of ginger, turmeric and garlic powder at 2% each. It was observed that serum total protein, albumin, glucose, cholesterol and aspartate transaminase (AST) differed significantly ($p<0.05$) among their treatment means. Total protein, Albumin, glucose, cholesterol and AST showed higher ($p<0.05$) mean values with inclusion of garlic and turmeric in the diet. Ginger was observed to have a reduction ($p<0.05$) potency on these parameters. Serum protein provide for the replacement of tissue proteins, buffer in acid-base balance and transporter of constituents of blood such as vitamins, iron, copper, hormones, lipids and enzymes (Adegoke *et al.*, 2018). It can be suggested then that turmeric and garlic could facilitate growth of broiler chicken as compared to ginger. Cholesterol concentration was observed to be high with birds that were on 2% garlic. This indicate that garlic does not have the capacity to inhibit lipid peroxidation as compared to ginger and turmeric. The significant ($p<0.05$) increment of AST with 2% inclusion of garlic cannot imply liver dysfunction and thus not lethal since the value is within the normal reference range (Mitruka and Rawnsley, 1977).

Table 1: Effect of ginger, turmeric and garlic on haematological indices of broiler chicken at four (4) weeks old.

Parameter	T ¹	T ² ginger (2%)	T ³ turmeric (2%)	T ⁴ garlic (2%)	RR
PCV (%)	36.67±0.67 ^a	33.67±1.45 ^b	34.67±0.33 ^b	35.33±0.88 ^{ab}	23.0-55.0
RBC×10 ⁶	2.10±0.19	1.87±0.23	2.37±0.35	2.23±0.43	1.25-4.50
WBC ×10 ⁶	5.27±0.13 ^a	3.67±0.07 ^b	4.53±0.18 ^a	4.67±0.44 ^a	9.00-32.00
Hb (g/dl)	12.13±0.30	11.77±0.30	11.43±0.57	11.43±0.13	7.00-18.60
MCV (fl)	178.2±13.8	195.5±25.2	154.2±30.7	164.3±27.4	100.0-139.0
MCH (pg)	59.50±4.65	65.53±8.49	51.3±10.2	54.73±9.19	25.0-48.0
MCHC (%)	33.37±0.03 ^a	33.27±0.67 ^{ab}	33.27±0.03 ^{ab}	33.20±0.00 ^b	20.0-34.0
Lymphocytes (%)	46.00±2.08	46.33±1.86	46.33±1.67	48.67±1.45	29.0-84.0
Heterophil (%)	45.00±1.53	48.67±1.45	46.00±1.00	46.33±1.45	20.0-30.0
Eosinophil (%)	3.00±0.58	3.00±0.58	3.67±0.88	2.33±0.33	1.00-3.00
Basophil (%)	0.33±0.33	0.00±0.00	0.00±0.00	0.00±0.00	0.00-8.00
Monocytes (%)	5.33±0.33 ^a	2.00±1.00 ^b	4.00±0.58 ^{ab}	2.67±0.33 ^b	0.05-7.00

Key: a,b =Means in the same row with different superscripts are significantly ($p<0.05$) different.
RR= Reference Range [Source: Mitruka and Rawnsley (1977)]

Table 2: Effect of turmeric, ginger and garlic on serum biochemical parameters of broiler chicken at four (4) weeks old.

Parameter	Dietary Treatments				RR
	T ¹	T ² ginger (2%)	T ³ turmeric (2%)	T ⁴ garlic (2%)	
Total protein(g/dl)	6.23±0.39 ^b	6.80±0.15 ^{ab}	7.40±0.55 ^a	7.53±0.72 ^a	5.20-6.90
Albumin (g/dl)	3.33±0.33 ^b	3.07±0.13 ^b	3.60±0.06 ^a	3.73±0.12 ^a	2.00-3.45
Glucose (mg/dl)	151.33±5.38 ^c	155.6±12.20 ^b	162.73±7.92 ^{ab}	182.6±15.40 ^a	152.0-182.0
Cholesterol(mg/dl)	157.2±14.20 ^b	143.90±3.87 ^c	140.0±24.50 ^c	210.2±39.7 ^a	52.0-148.0
Creatinine(mg/dl)	1.03±0.07	1.37±0.18	1.20±0.40	1.63±0.17	0.90-1.85
AST (U/L)	116.63±3.20 ^b	116.70±3.21 ^b	122.40±2.72 ^{ab}	128.0±0.57 ^a	88.0-208.0
ALT (U/L)	47.70±1.73	47.37±0.55	48.67±1.66	48.50±0.59	9.50-37.20

Key: a,b,c =Means in the same row with different superscripts are significantly (p< 0.05) different.

AST= Aspartate Aminotransferase, ALT=Alanine Aminotransferase

RR= Reference Range [Source: Mitruka and Rawnsley (1977)]

CONCLUSION

It can be concluded that 2% inclusion of ginger, turmeric and garlic in diet influences haematological and serum biochemical indices of broiler starter chicken

REFERENCE

- Adegoke, A. V., Abimbola, M. A., Sanwo, K. A., Egbeyale, L. T., Abiona, J. A., Oso, A. O. and Iposu, S. O. (2018) Performance and blood biochemistry profile of broiler chickens fed dietary turmeric (*Curcuma longa*) powder and cayenne pepper (*Capsicum frutescens*) powders as antioxidants *Veterinary and Animal Science* 6: 95–102
- Aderemi, F. A. (2004). Effects of replacement of wheat bran with cassava root sieviate supplemented or unsupplemented with enzyme on the haematology and serum biochemistry of pullet chicks. *Tropical Journal of Animal Science*, 7, 147-153
- Afolabi, K. D., Akinsoyinu, A. O., Olajide, R. and Akinleye, S. B. (2010). *Haematological parameters of the Nigerian local grower chickens fed varying dietary levels of palm kernel cake*. Proceedings of 35th Annual Conference of Nigerian Society for Animal Production. p.247.
- Al-kassie GAM, Mosheen AM, abd-AL-laheel R.A. (2011) Modification of productive performance and physiological aspect of broiler on the addition of a mixture of curmin and turmeric to the diet. *Res. Opim & Vet, Sci* 1:31-34
- Ciesla, B. (2007) Haematology in practice. F. A. Davies company Philadelphia pg 4.
- Govaris A, Botsoglou N, Papageorgious G, Botsoglou E, Amurosiadis I, (2004) Dietary versus postmortem use of oregano oil and or a-tocopherol in turkeys to inhibit development of lipid oxidation in meat during refrigerated storage *International. Journal of Food Science and Nutrition*. 55: 115-123.
- Ikhimiya, I. and Imasuen, J. A. (2007) Blood Profile of West African Dwarf Goats Fed *Panicum maximum* Supplemented with *Azelia africana* and *Newbouldia laevis* *Pakistan Journal of Nutrition* 6 (1): 79-84
- Katan, M. B., Grundy, S. M. and Willet, W. C., (1997) Beyond low-fat diets *New English Journal of Medicine* 337: 563-566
- Mitruka, B. M. and Rawnsley, H. M. (1977) Clinical biochemical and hematological reference values in normal experimental Animals. Masson pub. Inc.USA pg. 115 and 140-141
- NIMET (2009) Annual Nigerian meteorological agency bulletin.
- Odunsi, A. A., Onifade, A. A., and Babatunde, G. M. (1999). Response of broiler chicks to virginmycin and dietary protein concentration in the humid tropics. *Archeological Zootechnology*, 48 (183): 317-325

- Onyishi, G. C., Oguine, C. C., Nwani, S. I., Aguzie, I. O. and Nwani, C. D. (2017) Haematological parameters dynamics of developing *Gallus Gallus domesticus* *Animal Research International* 14(2): 2769 – 2776 #
- Wang R L D, Boume S, 1998, Can 2000 years of herbal medicine history help us solve problems in the years 200? Biotechnology in the feed industry. Pages.273-291 in proc. Autechs 14th Annual sump. Kentucky. USA