HAEMATOLOGICAL INDICES OF BROILER CHICKENS FED TURMERIC (*Curcuma longa*) RHIZOME POWDER, DRIED OKRA (*Abelmoschus esculentus*) FRUIT POWDER AND THEIR COMBINATION

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Abstract
This study was conducted to determine the haematological indices of broiler chickens fed Turmeric (*curcuma longa*) Rhizome Powder (TRP) and Okra (*Abelmoschus esculentus*) Fruit powder (OFP). A total of 120 birds were allotted to four dietary treatments and fed diets containing 0g TRP and OFP; 400g OFP; 400g TRP; 200g TRP plus 200g OFP and were assigned as T1, T2, T3 and T4 respectively. The birds were housed in a deep litter house for 7 weeks. Feed and clean water were supplied ad libitum. Vaccination and other standard management practices were strictly adhered to accordingly. Blood samples were collected at the 7th week for haematological studies. Data collected were subjected to analysis of variance (ANOVA) and significant differences between treatment means were separated using Duncan Multiple Range Test. The result showed significant ($p<0.05$) differences in Heterophils (H) and Lymphocytes (L) while Packed cell volume (PCV), haemaglobin (Hb), red blood cell (RBC) count, white blood cells (WBC) count, Monocytes (M) and Eosinophils (E) showed no significant ($p>0.05$) difference. This implies that the birds in all treatment groups had similar circulation of oxygen. The observed result implies that the birds in all treatment groups had high tendency to resist respiratory stress, this is because, the Haemoglobin (Hb), which is carried on the Red Blood Cell, is the oxygen (O_2) carrying pigment. It was concluded that TRP increased heterophils while combining TRP and OFP increased lymphocyte.

Keywords: Turmeric, okra, haemotological indices, broiler finisher, organic supplement

INTRODUCTION

The increase in human population tends to increase the demand for poultry meat in the nearest future. For this reason, it is imperative to improve the immunity of poultry birds in order to keep them in good health condition for increase productivity. Food additives and synthetic antibiotics have long been added into poultry diets to boost bird's immunity and improve their performance and productivity in order to raise profit margin in poultry production. Recently, turmeric and okra has gain usage as alternative source of antibiotics. This is because turmeric has an active constituent while okra has rich bioactive compounds that are responsible for improving immunity (Almaraj et al., 2017). Both plants have the capacity to improve the quality of meat and also serve as growth promoters.

Turmeric is a plant of the *zingiberaceae* family. It has antibiotic, antioxidant, antimicrobial, anti-inflammatory and anti-protozoan properties (Almaraj et al., 2017). The active constituents present in turmeric rhizome powder are the curcuminoids. Curcuminoids is a group of chemically related active phenolics which consist of curcumin (diferuloylmethane), demethoxycurcumin and bisdemethoxycurcumin (Jurenka 2009).

Okra is a plant rich in bioactive compounds, such as phenolic and flavonoid compounds which act as antioxidants and strengthen the immune system (Ashour et al., 2020). Although, it is not commonly used but it has been found to have antioxidant, antihelminthic, antibacterial properties and also has the ability to improve immunity. (Almaraj et al., 2017). Haematological indices are indicators to monitor and/or evaluate the health, nutritional, physiological and immunity status in birds (Al-Essa et al., 2012). Hence, the need to monitor the haematological variables of the blood from birds fed diets supplemented with turmeric rhizome powder and dried okra fruit powder.

Materials and Methods

Experimental Site

This study was conducted at the Poultry Unit, Teaching and Research Farm, Faculty of Agriculture, Kaduna State University (KASU) Kafanchan Campus, Kaduna State. Kafanchan falls within latitude 90 34^{0}N and longitude 80 17 ^{0}E. The town has an altitude of 752m (Peakvisor, 2020)

Experimental Design and Management

A total of one hundred and twenty (120) Ross day old broiler chicks were allotted to four treatment groups in a completely randomized design (CRD) with three replicate per treatment having 10 birds in

each replicate. Birds were kept in a deep litter house that was thoroughly cleaned, washed, disinfected. Feed and water were supplied ad libitum. Vaccination was administered to the birds as outlined by National Veterinary Research Institute Vom, Plateau State.

Experimental Diets

Four experimental diets were compounded for both broiler starter and finisher phases. TRP and OFP were incorporated at different inclusion levels as 0g of turmeric and okra, 400g of turmeric, 400g of okra, 200g each of turmeric and okra and they were labelled as T1, T2, T3 and T4 respectively as shown in table 1. Both turmeric and okra were sourced in Kafanchan environs; they were processed into powder and added into the feed. The diets were formulated to meet the nutrient requirement of chickens as recommended by (NRC, 1994).

Feed composition for broiler starter and broiler finisher diets

Ingredients (kg)	**Starter**	**Finisher**
Maize	57.00	64.50
Soybean meal	27.90	22.50
GNC	10.44	9.00
Bone meal	3.00	2.80
Methionine	0.20	0.25
Vitamin-mineral Premix	0.25	0.25
Limestone	0.95	0.30
Lysine	0.05	0.15
Common Salt	0.25	0.25
Total	**100.00**	**100.00**
Calculated analysis		
Crude protein (%)	22.13	20.20
ME (Kcal/kg)	2883.99	2979.32
Ether extract (%)	4.66	4.49
Crude fibres (%)	4.19	3.83
Calcium (%)	1.20	1.18
Phosphorus (%)	0.50	0.50
Lysine (%)	1.16	1.09
Methionine + Cysteine (%)	0.86	0.84

GNC = Groundnut cake

Analysis of Haematological Indices

Blood collection was done at end of the feeding trial from three birds per treatment. Blood samples were obtained from the prominent wing vein with the aid of a hypodermic needle and syringe into plastic bottles containing EDTA (ethylene diamine tetra acetic acid) for haematological studies. Blood samples were sent to the National Veterinary Institute Vom (NVRI) for analysis after which the results were subjected to statistical analysis.

Statistical Analysis

All data collected were subjected to analysis of variance (ANOVA) and significant differences between treatment means were separated using Duncan Multiple Range Test (DMRT) of statistical analysis software (S.A.S, 1993).

Results and Discussion

The result on haematological indices of birds fed turmeric rhizome powder and dried okra fruit powder is presented in Table 2. The result obtained, showed significant difference ($p<0.05$) in lymphocytes and heterophils across the treatments means but showed no significant difference ($p>0.05$) on other observed parameters. This means that the different inclusions of Turmeric Rhizome Powder (TRP) and Okra fruit Powder (OFP) had significant effect on lymphocyte and heterophils but no significant effect on the other observed haematological parameters. This may be due to the active

ingredients present in okra and turmeric. This agrees with reports by (Ihekwemere, 2004) and (Okabgare et al., 2011) who reported that blood variables may be affected by dietary influences. Higher values of lymphocyte in T1 (Control group) and T2 (birds fed 400g OFP) and heterophils in T3 (birds fed 400g TRP) and T4 (birds fed 200g TRP and OFP each) may be due to an improved immune competence and stress response as opined by Isroli et al., (2017). This present findings were also in agreement with another previously reported by Hossein-Vashan et al., (2012). When feeding broiler chickens turmeric rhizome powder under stress conditions, the heterophils and lymphocytes ratio has commonly been used as stress and infection indicators (Sugiharto et al., 2017). Considering the antioxidant and immunmomodulatory effects of turmeric and okra (Almaraj et al., 2017; Ashour et al., 2020). The increased proportion of lymphocytes and heterophils seemed therefore to improve the immune system of broilers in the current study. On this basis therefore, it can be inferred that feeding turneric and okra seemed beneficial in alleviating the stress and infections in broiler chickens. The low levels of Eosinophils, Basophils and Monocytes recorded in this study indicate the good health conditions of the experimental birds.

Table 2. Haematological indices of broiler birds fed turmeric rhizome powder and okra fruit powder.

	Treatments				
Parameters	**T1**	**T2**	**T3**	**T4**	**SEM**
PCV (%)	27.50	26.00	26.00	27.50	0.50
Haemoglobin (g/dl)	9.15	8.65	8.70	9.15	0.54
WBC($\times 10^3$/l)	7.10	8.05	7.05	8.05	0.48
RBC($\times 10^{12}$/l)	2.20	1.75	1.80	2.00	0.33
Heterophils (%)	69.50^{bc}	65.00^{c}	75.00^{ab}	80.50^{a}	0.00
Lymphocyte (%)	28.00^{b}	33.00^{a}	23.50^{c}	18.00^{d}	0.00
Monocyte (%)	0.00	0.00	1.50	0.50	0.14
Eosinophils (%)	2.50	2.00	0.00	1.00	0.18
Basophils (%)	0.00	0.00	0.00	0.00	0.00

SEM: Standard error of mean; PCV: park cell volume; WBC: white blood cell; RBC: red blood cell; T1: 0g okra, 0g turmeric; T2: 400g okra; T3: 400g turmeric; T4: 200g okra and turmeric each.

Conclusion and Recommendation

The supplementation of TRP and OFP to broiler diets had no adverse effects on the haematological indices of broiler chickens; rather, it had significant effect on two haematological parameters (Lymphocytes and heterophils). Therefore, Farmers can use turmeric rhizome powder and okra fruit powder to improve immune competence and stress response in broilers.

REFERENCES

Al-Essa M.S., Saad Alkahtani., Al-Farraj S. A., Saud A. A., Al-Dahmash B. and Hamad Al-Yahya. (2012). Seasonal variation effects on the composition of blood in Nubian Ibex (*Capra nubiana*) in Saudi Arabia. *African Journal of Biotechnology*. 11(5): 1283-1286.

Amalraj, A., Pius, A. and Gopi S., (2017). Biological activities of curcuminoids, other biomolecules from turmeric and their derivatives – a review. *Journal of Traditional Complementary Medicine,* 7: 205–233.

Ashour E.A., Bin-Jumah M., Abou Sayed-Ahmed E.T., Osman A.O., Taha A.E., Momenah M.A., Allam A.A., Swelum A.A. & Abd El-Hack M.E., (2020). Effects of dried okra fruit (Abelmoschus esculentus L.) powder on growth, carcass characteristics, blood indices, and meat quality of stored broiler meat. *International journal of Poultry Science*.

Ihekwumere, F. C. (2004). Effect of Human Newpausal Gonadotrophin on Haematological And Serum Biochemical Parameters of Nigeria Indigenous Chickens. *International Journal of Poultry Science*.

Isroli I., Yudiarti, T., Widiastuti E. and Sugiharto S. (2017). Effect of decocted turmeric on performance, haematological parameters and carcass traits of broiler chickens. *Journal of the Indonesian Tropical Animal Agriculture*. 42(4):263-269

Jurenka J.S., (2009). Anti-inflammatory properties of curcumin, a major constituent of Curcuma longa: a review of preclinical and clinical research. *Alternate Medicine Review*.14, 141.

National Research Council, (1994). Nutrients Requirement of Poultry 8th Revised Edition, National Academy Press, Washington DC.

Okagbare, N. G., Llodigwe, E. E., Ajaghaku, D. L. and Esimone, C.O. (2011). Acute and Sub Chronic Toxicities of Ethanol Leaf Extract of Pterocarpus Santalinoides In Experimental Animals. *Journal of Pharmaceutical and Biomedical Sciences*. 12 (18):239-292.

Peakvisor. (2022). "Kafanchan". The Altitude of Kafanchan. Retrieved 06/052022.

S.A.S. (1993). Statistical Analysis System Institute, User's Guide. Version 9 for Windows. North Carolina, U.S.A.

Sugiharto, S., Yudiarti, T., Isroli, I., Widiastuti E. and Putra. F. D (2017). Intestinal microbial ecology and hematological parameters of broiler fed cassava waste pulp fermented with Acremonium charticola. *Veterinary World Journal*. 10:324-330.