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Haematology and serum biochemistry of broiler chicken fed ginger, turmeric and scent leaf blend

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Target Audience: Poultry farmers, feed millers Animal Scientist and Nutritionist

Abstract

There has been a paradigm shift in the poultry industry on the use of antibiotics in animal feed to improve performance which compromise consumer's health. There are several researches on turmeric, ginger and scent leaf, however, the synergetic potential of these spices has not been documented. This study was carried out to evaluate the effect of Ginger, Turmeric and Scent leaf (GTS) blend on haematological and serum biochemistry indices of broiler chicks. One hundred and twenty day old broiler chicks of Cobb 500 were randomly assigned to four (4) treatment groups replicated thrice with ten (10) chicks per replicate in a complete randomised design which lasted for 8 weeks. Ginger, turmeric and scent leaf were blend singly then mixed in equal ratio (1:1:1) and incorporated into broiler chick's diet as T1 (0g/kg control 1), T2 (0.25g/kg, T3 (0.5g/kg) and T4 (1g/kg). Blood samples were collected from three chicks per treatment through wing vein and evaluated for haematological and serum biochemistry indices. The results of this study showed that GTS blend had significantly influence on the haematological parameters except MCH and MCHC. Packed cell volume (PCV), Red blood cell counts and haematocrit increased with increasing GST blend in the diets, T4 had the highest red blood cell counts of 2.92 x10^{6}/L and lowest in T2 (1.92 x10^{6}/L). A significant effects were reported in serum biochemistry of chicken fed GTS blend with T3 having the highest AST(10), ALT (3.7), ALB (4.6), ALP (108) and Urea (17.5). Supplementation of GTS blend improved the blood profile of broiler birds with 0.25g/kg better profile. Therefore, GTS blend supplementation at 0.25g/kg is recommended for better health status in broiler chicken.

Keywords: blood profile, broiler chicken, ginger, turmeric, scent leaf

Hématologie et biochimie sérumique du mélange de gingembre, de curcuma et de feuilles parfumées de poulet à griller

Résumé

Il y a eu un changement de paradigme dans l'industrie avicole concernant l'utilisation d'antibiotiques dans l'alimentation animale pour améliorer les performances, ce qui compromet la santé des consommateurs. Il existe plusieurs recherches sur le curcuma, le gingembre et la feuille parfumée, cependant, le potentiel synergique de ces épices n'a pas été

documenté. Cette étude a été réalisée pour évaluer l'effet du mélange de gingembre, de curcuma et de feuilles parfumées (GTS) sur les indices hématologiques et biochimiques sériques des poussins de chair. Cent vingt poussins de chair âgés de Cobb 500 ont été répartis au hasard dans quatre (4) groupes de traitement répétés trois fois avec dix (10) poussins par répétition dans un plan randomisé complet qui a duré 8 semaines. Le gingembre, le curcuma et les feuilles parfumées ont été mélangés individuellement, puis mélangés dans des proportions égales (1:1:1) et incorporés dans l'alimentation des poussins de chair sous forme de T1 (0 g/kg, témoin 1), T2 (0,25 g/kg, T3 (0,5 g/kg).) et T4 (1 g/kg). Des échantillons de sang ont été prélevés sur trois poussins par traitement dans la veine de l'aile et évalués pour les indices hématologiques et biochimiques sériques. Les résultats de cette étude ont montré que le mélange GTS avait une influence significative sur les paramètres hématologiques, à l'exception du MCH et du MCHC. L'hématocrite (PCV), le nombre de globules rouges et l'hématocrite ont augmenté avec l'augmentation du mélange de GST dans les régimes, T4 avait le nombre de globules rouges le plus élevé de 2,92 x106/L et le plus bas en T2 (1,92 x106/L). ont été rapportés dans la biochimie sérique de poulets nourris avec le mélange GTS, le T3 ayant les taux d'AST (10), d'ALT (3,7), d'ALB (4,6), d'ALP (108) et d'urée (17,5) les plus élevés. La supplémentation en mélange GTS a amélioré le profil sanguin des poulets de chair. oiseaux avec un meilleur profil de 0,25 g/kg. Par conséquent, une supplémentation en mélange GTS à 0,25 g/kg est recommandée pour un meilleur état de santé des poulets de chair.

Mots-clés: profil sanguin, poulet à griller, gingembre, curcuma, feuille parfumée

Introduction

Plant materials are sources of medicinal compounds that play a dominant role in the maintenance of human health since antiquity (Rama-Rao *et al*., 2019). The use of plants based feed additives in livestock production has gained interest against the use of antibiotics because of its adverse residual effects on antibiotic resistance in animals (Lee, *et al*., 2004; Panda, *et al*, 2008). It is estimated that about 80% of the world population relies on herbal prescriptions and natural remedies for the treatment of various diseases, this practice being an alternative way to compensate for some perceived deficiencies in orthodox medicine like side-effects and cost. It is known that a number of bio-active compounds that are beneficial for the health of chickens is present in some foliage (Rama-Rao *et al*., 2019). Herbal plants have the potential to be used in ethnomedicine, most of which are considered to be very safe for human being and animals (Alagbe, 2017).

Poultry egg and meat are vital sources of high-quality proteins, minerals, and vitamins that help to keep the human diet balanced (Madhu *et al*., 2019). In order to improve the performance of poultry, commercially accessible antibiotics have been utilised in poultry feed for past decades to provide therapeutic and prophylactic treatments against exogenous and endogenous infections. These antibiotics aid in the reduction of morbidity and mortality in chicken farming but they also have the potential to harm public health by promoting the development of drug resistance microflora (Dono, 2014).

However, there are some phytogenic substances which are natural feed additives that are non-harmful and residue-free which can be added to animal feeds as growth booster and antimicrobial. A variety of herbs and spices are widely used as nutritional

additives in poultry diets such as ginger, turmeric, scent leaf, bitter leaf, and Neem leaf (Zhang *et al*., 2009). These medicinal plants are competitively used as spices for food by human due to their biological properties such as anti-inflammatory, anti-oxidant, and anti-microbial activity. The ginger, turmeric, and scent leaf had been used separately as growth promoters in animal feed by some researchers (Agbalaya *et al.,* 2021; Salihu *et al.,* 2020; Agu *et al.,*2017; Doley *et al.,* 2009) but there is dearth of information on the utilization of ginger, turmeric and scent leaf blend mixture as feed additive. Hence, the synergetic properties of ginger, turmeric and scent leaf prompted this research on broiler chickens.

Materials and Methods

The study was carried out at the Poultry Unit of the Department of Animal Production, Lagos State University of Science and Technology, Ikorodu. One hundred twenty (120) day old broiler chicks of Cobb 500 breed were purchased from a reputable hatchery. Ginger and turmeric rhizomes, and scent leaf were purchased from a market in Ikorodu, Lagos. The rhizomes were washed, sliced thinly, sun dried for 5 days, then oven-dried. The scent leaves were air-dried at room temperature (27℃). The dried test ingredients were milled into powdery form (Table 1) and included into experimental diets containing 22.66% CP and 2991kcal/kg ME (Table 2). The proximate compositions of the ginger, turmeric, scent leaf and test mixture were determined using the methods of AOAC, (2010). Ginger, turmeric and scent leaf (GTS) were mixed in a ratio of 1:1:1 and added as supplement to experimental diet at 0g/kg, 0.25g/kg, 0.5g/kg, 1g/kg tagged T1, T2, T3, and T4, respectively. The chicks were allotted to the four dietary treatments, replicated three times with ten chicks per replicate in a completely randomized design. Feed and water were offered unrestricted. Vaccine and medication schedules were strictly adhered to throughout the 8 weeks of the study.

Table 1: Proximate Composition of test Ingredients

	GINGER	TURMERIC	SCENT LEAF	Test Mixture
DRY MATTER	86	89.78	90.67	86.53
ASH	2.75	6.99	2.59	3.70
FAT	9.23	1.56	4.88	4.16
PROTEIN	10.13	7.92	15.56	12.24
CRUDE FIBRE	12.09	5.28	9.93	7.78
NITROGEN FREE EXTRACT	51.8	68.03	57.71	58.65

Blood Collection

Three birds were selected randomly from each treatment. Each bird was held firmly, the wing straightened followed by the collection of 2mL of blood using needle copulated with syringe. The samples of blood collected were emptied into labelled bottle containing ethylene di-amine tetra acetic acid (EDTA) for hematological analysis which include: Haemoglobin (Hb), Red blood count (RBC), packed cell volume (PCV), white blood cell (WBC) and Lymphocytes. Blood samples for serum biochemistry were collected into heparinized bottles and allowed to coagulate. Coagulated blood samples were centrifuged (2000rpm for 15 mins) thereafter stored at -20^{o}C for further serum biochemical parameters such as Total protein (TP) using biuret method as

described by Reinhold (1953), Albumin using BCG (BROMOCRESOL GREEN) as described by Peters *et al*. (1982), Creatinine, by method described, Aspartate transaminase (AST) by method described by Schmidt and Schmidt (1967) and Urea was determined by urease method,

Statistical analysis

All data collected were subjected to one way analysis of variance. The significant means were separated using Duncan's Multiple Range Test of SPSSS version 25.

Table 2: Composition of experimental diet

Ingredients	**Quantity (Kg)**
Maize	55
Groundnut cake	21
Soya bean meal	14
Corn offal	6
Fish meal	2
Dicalcium phosphate	2
Methionine	0.15
Common salt	0.25
Lysine	0.05
Toxin binder	0.1
Vitamin Mineral Premix	0.25
Total	100
Calculated analysis	
Crude Protein (%)	22.66
Metabolizable energy (kcal/kg)	2991
Ether extract (%)	3.88
Crude fibre (%)	4.00
Lysine (%)	1.15
Methionine (%)	0.52
Calcium (%)	1.00
Phosphorus (%)	0.90

Results and Discussion

Presented in Table 3 are the haematological parameters of broiler chickens fed ginger, turmeric and scent leaf blend (GTS) blend. The haematological parameters were significantly influenced by the dietary GTS blend supplementation except MCV, MCH, MCHC and platelet. There was a progressive trend in the mean values of packed cell volume (PCV), red blood cell (RBC) count and haemoglobin (Hb) as the GTS blend increased in the diet. The values for PCV were lower than the control and may be alluded to acclimatisation of the chicken to the test ingredients at different levels of supplementation. The mean value for PCV, RBC and Hb are within the normal range for broiler chicken as reported by Mitruka and Rawnsley (1977). The highest RBC counts was recorded in T4 ($2.92x10^{6}$/L) and the lowest in T2. The highest value indicates improved production of RBC that is evidence in the PCV and Hb. It also, suggested a significant relationship with the supplementation of the GTS blend which may stimulate erythropoietin. The white blood cell counts in this study were greatly influenced with T3 having the highest WBC value ($5.06 \times 10^{9/}$ L) followed by T4. T2 had the least value. Higher level of WBC of broiler chicken in T3 administered (0.5g\kg) GTS blend may have individually boost production of antibodies involved in immunological response of chicken. Hartcourt-Brown (2002) reported that antibodies help in sourcing for neutrophils and macrophage to site of infection. MCV was higher (175.00) in chickens fed control diet and lower (100.00) in T4. A decrease in the MCH level in birds is an indication that the birds were exposed and poorly dealing with stress (Huff *et al.,* 2008). The lymphocyte had highest (62.50) value in T3 (0.5g/kg GTS) and lowest (56.00) value was recorded in T2. The lymphocyte values of birds fed GTS blend were similar to the result reported by Patra *et al.* (2010) who reported stimulation of immune response due to increased lymph and lymphopoiesis. The MCV and MCHC are within the normal range for chicken which are 90-140fl and 36-35g/dlL respectively as reported by Bounous and Stedman (2000).

The Serum biochemistry parameters of broiler chickens fed diet supplemented with ginger, turmeric and scent leaf blend are shown in Table 4. The serum biochemistry parameters of broiler chickens were significantly ($p<0.05$) different. The serum protein value shows that T2 is similar to control diet while the values of other treatments were lower than the control. The values obtained ranged from 37.42-41.88g/L which were within the normal ranged value of normal bird 3.3-5.5g/dL as reported by Ukoha, *et al.* (2022) this depicts better feed protein utilisation and no loss of blood protein. Alkaline phosphate (ALP) and Aspartate transaminase (AST) are important enzymes in determination of the proper functioning of the liver (Ambrosy *et al*., 2015). Birds fed 0.5g/kg blend had the highest values in both parameters compared to the control. According to Yildirim *et al*. (2011) as reported by Ekine *et al.* (2021), that increased level of AST and ALP above normal level might indicate liver damage. Also these enzymes are usually present in the blood when there is liver damage. Creatinine (CRT) was significantly highest in birds fed T2 compared with birds on the control diet. This might be alluded to the antioxidants in the test ingredients. The values obtained were within the normal range while higher values than normal reflect kidney damage or malfunction (Onunkwo *et al.*, 2022) or interfere with energy metabolism (Ayo-Ajasa *et al.*, 2022). The Urea level of broiler birds fed GTS blend increases as the level of inclusion increases. The birds fed diet containing 1g/kg had the highest value which probably implies increased protein metabolism.

Albumin value increased with increasing levels of GTS and the range value (3.9 - 4.6g/dL) was higher than the reference range 2.1g/dL- 3.45g/dL as reported by Mitruka and Rawnsley, (1977) and 1.3-2.8g/dL as reported by Ukoha *et al*., 2022. The increased values signify liver activity.

Table 3: Haematological parameters of broiler chickens fed diet supplemented with Ginger, Turmeric and Scent leaf blend

Parameters	Dietary treatments				SEM
	T1	T2	T3	T4	
WBC($\times 10^9$/L)	3.85^{c}	3.25^{d}	5.06^{a}	4.40^{b}	0.29
RBC($\times 10^6$/L)	2.74^{b}	1.92^{d}	2.28^{c}	2.92^{a}	0.13
Hb (g/dL)	9.70^{a}	6.00^{d}	6.80^{c}	7.70^{b}	2.22
PCV(%)	30^{a}	25^{b}	27^{ab}	29^{a}	3.50
MCV *fl*	175.00^{a}	130.70^{b}	120.2^{b}	100^{c}	183.75
MCH *pg*	31.2	31.3	29.8	26.4	32.87
MCHC g/dL	32.20	23.90	24.80	264	338.10
PLT($x10^6$/L)	4.00	4.00	4.00	3.00	4.20
Lymphocytes (%)	60.00^{ab}	56.00^{b}	62.50^{a}	61.80^{a}	2.01

abc mean with different superscript on the same row are significant (p>0.05);
GTS= ginger, tumeric and scent leaf blend; T1 (control) = 0g/kg GTS, T2= 0.25g/kg GTS, T3=0.5g/kg GTS, T4=1g/kg GTS

Table 4: Serum Biochemistry of broiler chickens fed diet supplemented with Ginger, Turmeric and Scent leaf blend

Parameters	Dietary treatments				SEM
	T1	T2	T3	T4	
PRO (g/L)	41.58^{a}	41.88^{a}	38.91^{b}	37.42^{c}	1.04
AST (x 10 u/L)	4.40^{d}	7.40^{c}	10.00^{a}	8.40^{b}	0.50
ALT (u/L)	3.20^{b}	3.10^{b}	3.70^{a}	3.20^{b}	0.85
ALP (x10 u/L)	97.00^{b}	102.00^{ab}	108.00^{a}	100^{ab}	3.01
Urea (mg/dL)	17.00^{a}	11.70^{b}	17.50^{a}	16.90^{a}	0.84
ALB (g/dL)	3.90^{b}	4.00^{b}	4.60^{a}	4.40^{a}	0.11
CRT (mg/dL)	1.02^{b}	1.60^{a}	1.10^{b}	1.04^{a}	0.14

^{abc} mean with different superscript on the same row are significant (p>0.05).PRO= Serum Protein, AST= Aspertate Amino Transferase, ALP= Alkaline Phosphate, ALB= Albumin, CRT= Creatine. ALT – Alanine Amino Transferase.; T1 (control) = 0g/kg GTS, T2= 0.25g/kg GTS, T3=0.5g/kg GTS, T4=1g/kg GTS

Conclusion and Recommendation

This study revealed that the synergetic effect of ginger, turmeric and scent leaf blend as supplement positively influenced the blood profile of the broiler chickens and can be supplemented in broilers diet at 0.25g/kg with no adverse effect on the heamatological profile and serum

biochemical. More study is recommended to determine the gut microbial contents, organ development and carcass characteristics of broilers chickens fed GTS blend.

References

Agbalaya, K. K., Ishola, O. J., Onigemo, M. A., Agbaye, F. P., Oso, Y. A. A., Tijani, L. A., Anjola, A. O. J. and Olufeko, S. O. (2021). Semen quality of FUNAAB Alpha cocks fed diet supplemented with turmeric and ginger powder. International Journal of Agriculture, Forestry and Plantation (IJAFP) Vol. 12:129 – 132.

Agu, E. C., Okeudo, N. J., Aladi, N. O. and V. M. O. Okoro. (2017). Effect of dietary inclusion of ginger meal (*Zingiber officinale* Roscoe) on performance, serum cholesterol profile and carcass quality of broilers. Nig. J. Anim. Prod. 2017 44(1):254 – 266.

Alagbe, J. O. (2017). Effect of dietary inclusion of Polyalthia longifolia leaf meal compared to antibiotics on the nutrient retention, immune response and serum biochemistry of broiler chickens. *Greener Journal of Agricultural Sciences. GJAS*, Vol. 7(3), May 2017.

Ambrosy, A. P., Dunn, T. P. and Heidenreich, P. A. (2015). Effect of minor liver function test abnormalities and values within the normal range on survival in heart failure. *The American Journal of Cardiology*. 115(7): 938-941.

AOAC (2010). Official Method of Analysis. *16th Ed. Association of Official Analytical Chemist. Washington DC, USA*.

Ayo-Ajasa, O., Akani, B., Falase, G., Sogunle, O., Egbeyale, L., Abiona, J. and Adeboye, F. (2022) Effect of different feed types on haematology and serum biochemistry parameters of male and female weaner rabbits. *Nig. J. Anim.Sci. 24(2):*118-130.

Bounons, D. I and Stedman, N. L (2000). Norman avian haematology: chicken and turkey. In: Feldman, B.F., Zinkl, J.G and jain. Schalm's veterinary haematology, 5th Ed. Lippincoltt, Williams and wilkins, Philadelphia. Pp 1147-1154.

Doley, S., Gupta, J. J. and Reddy, P. B. (2009). Effect of supplementation of ginger, garlic and turmeric in broiler chicken. *Indian Vet. J.* 86. 644-645.

Dono, N. D. (2014). Turmeric (Curcuma longa Linn.) supplementation as an alternative to antibiotics in poultry diets. WARTAZOA. Indonesian Bulletin of Animal and Veterinary Sciences. 23(1):41-9. DOI: 10.14334/wartazoa.v23i1.958.

Ekine, O. A., Ejeh, I. V. and George, O. S. (2021). Effects of Gongronema latifolium (UTAZI) as a feed additive on the performance, organ weights, serum enzymes and lipid profile of broiler chickens. Nigerian Journal of Animal Science, 23(1), 116-121

Harcourt-Brown, F. (2002). Textbook of rabbit medicine. *Reed educational and Professional publishing Ltd, Linacre House, Jordan Hill, Oxford OX2 8DP 225 Wildwood Avenue Woburn, MA* 01801-2041.

Huff, G. R., Huff, W. E., Rath, N. C., Anthony, N. B. and Nestor, K. E. (2008). Effect of Escherichia coli challenge and transport stress on haematology and serum chemistry value of three lines turkeys.

Lee, K. W., Everts, H., Kappert, H. J., Van, J., Lemmens, A. G., Frehner, M. and Beynen, A. C. (2004). Growth Performance, internal viscosity, fat digestibility and plasma cholesterol in broiler chickens fed a rye containing diet without or with essential oil components. *Journal of Poultry Science* 9:613-618.

Madhu, C. P, Naik, D. and Vishak Nair, T. U. (2019). Effect of topical hemocoagulase therapy in wound healing. Int J Surg Sci. 3:151–156. doi: 10.33545/surgery.2019.v3.i4c.234. [CrossRef] [Google Scholar]

Mitruka, B. M. and Rawnsley H. M. (1977).. Clinical biochemical and haematological reference values in normal experimental animals. *Animal Science Journal* 78:164-172.

Onunkwo, D. N., Ufot, U. E., Ezenyilimba, B. N., Omumuabuike, J. N. and Ezeoke, F. C. (2022). Blood profile of starter broiler chickens fed diet containing leaf meal composite as alternative to commercial broiler premix. *Nig. J. Anim.Sci. 24(2):*103-110.

Panda, A. K., Rao, S. S., Raju, M. V. and Sharma, S. S. (2008). Effect of probiotics (Lactobacillus sporogenes) feeding on egg production and quality, yolk cholesterol and humoral immune response of White Leghorn layer breeder. *Journal of Science Food Agriculture* 88; 43-47.

Patra, G., Ali, M. A., Chanu, K. V., Jonathan, L., Joy, L. K., Prava N., Ravindran, R., Das, G. and Devi, L. I. (2010). PCR based diagonosis of Eimeriatenellainfection in broiler chicken. *International Journal of Poultry Science*, 9 (8):813-818. [Google Scholar].

Peters, T., Biamonte, G. T. and Doumas, B. T. (1982). Protein (total protein) in Serum, Urine and Cerebrospinal fluid; albumin in serum. Selected method of clinical chemistry. vol 9 WR.

Rama-Rao, S. V., Raju, M. V. L N, Prakash, B., Rajkumar, U. and Reddy, EP. K. (2019). Effect of supplementing moringa (Moringa oleifera) leaf meal and pomegranate (Punicagranatum) peel carcass attributes, immune and antioxidant chickens. Animal Production meal on performance, responses in broiler *Science*, 59:288-294.

Reinhold, G. J. (1953). Standard methods of clinical chemistry, vol? pp 88 Reiner M: (Edu): Academic press, New York

Salihu, E. A., Onimisi, P. A., Omage, J. J., Afolayan, M., Moses, O. and Reuben, R. S. (2020) Evaluation of *Ocimum gratissimum* and *Ocimum canum* as natural growth promoters on the growth performance, intestinal microbiota and villi morphometry of broiler chickens. *Nig. J. Anim. Prod.* 47(1):186 – 196.

Schmidt, E and Schmidt, F. W. (1967). Release of enzyme from the liver. *Enzyme biology clinical* vol 3: 1-8

Ukoha, O. A., Onunkwo, D. N., Ewetola, I. A. and Goodluck, C. N. (2022). Effect of bitterleaf meal on Haematology Serum Chemistry of Broiler Chicken. *Nig. J. Anim. Prod.* 49(4)88-96.

Yilidrim, E., Yalchinkaya, I., kanbur, M., Cnar, M. and Orue, E. (2011). Effects of yeast lucomannan on performance, some biochemical parameters and pathological changes in broiler chickens. *Journal of Veterinary Medicine,* 162: 413-420.

Zhang, G. F., Yang, Z. B., Wang, Y., Yang W. R., Jiang, S. Z., and Gai, G. S. (2009). Effect of ginger root (zingiber officinale) processed to different particles sizes on growth performance antioxidant status and serum metabolites of broiler chickens *Poultry.Sci*., 88:2159-2166.

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