ISSN:
Print - 2277 - 0755
Online - 2315 - 7453

Journal of Agricultural Science and Environment

EFFECTS OF KINGS OF BITTER (*Andrographis paniculata*) LEAF MEAL AND GARLIC (*Allium sativum*) MEAL AS ALTERNATIVE TO ANTIBIOTICS ON HAEMATOLOGY, SERUM BIOCHEMISTRY AND CARCASS CHARACTERISTICS OF BROILER CHICKENS

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ABSTRACT

The continuous use and misuse of antibiotics have induced the development of resistance by microorganisms, antibiotics residue in animal products and alteration of natural gut microflora hence alternative growth promoters must be found. This study investigated the effects of dietary *Allium sativum* powder (ASP) and *Andrographis paniculata* leaf meal (APLM) supplementations as feed additives on haematological, serum indices, and carcass characteristics of broiler chickens. One hundred and twenty (120) day-old unsexed broiler chicks were randomly distributed into four dietary treatments with each treatment replicated three times, with ten (10) birds per replicate in a Completely Randomized Design (CRD). Four experimental diets were formulated as follows: T1: with inclusion of antibiotics (*Oxytetracycline*) 13g/25kg of feed, T2: basal feed + ASP at 50g/25kg of feed, T3: basal feed + *Andrographis paniculata* leaf meal at 50g/25kg of feed, T4: basal feed + *Andrographis paniculata* leaf meal + *Allium sativum* powder (ASP) at 50g each/25kg of feed. The carcass characteristics results revealed T2 had the highest values ($p<0.05$) of dressed weight (85.33%) while T1 had the least value (77.85%). Drum stick weight in T2 and T3 had significantly higher ($p<0.05$) values of 11.93% and 11.18% while T1 and T4 had the least value of 11.07% and 10.50%. Inclusion of *Andrographis paniculata* leaf meal (APLM) and *Allium sativum* powder (ASP) did not affect the blood parameters and positively influenced carcass traits of the broiler chickens.

Keywords: Garlic, King of bitters, carcass characteristics, blood parameters, Broiler, Antibiotics

INTRODUCTION

Poultry production is often regarded as the rearing of domesticated birds mainly for meat and egg production which serves as a source of protein poultry for man. (Oluyemi and Robert, 2010). Antibiotics growth promoters have been an integral part of the poultry industry for more than sixty years (Botsoglou *et al.,* 2002). The use of these substances offered possibilities to improve animal performance and increased economic output per livestock producing units (Chowdhury *et al*., 2002). However, there is the fear that the continuous and sub-

therapeutic use of in-feed antibiotics could lead to the development of antibiotic-resistant bacteria which are harmful to humans (Kim *et al*., 2013). There was a ban on the use of all antibiotics and chemotherapeutic drugs as growth promoters in the European Union (Botsoglou *et al.,* 2002). This ban has caused an increase in the search for alternative growth promoters. Hence possible alternative antibiotics include probiotics, prebiotics, organic acids and phytobiotics (phytogenic feed additives) Antibiotics are medicines that fight bacterial infections. They either kill bacteria (bacteriocidal) or stop them from reproducing (bacteriostatic). They are naturally- occurring synthetic or semi-synthetic compounds with anti-microbial activity. They can be administered orally, parentally or topically. They are used in human and veterinary medicine to treat and prevent diseases and for other purposes including growth promotion in food animals (Steiner, 2009).

Phytogenic additives in animal nutrition have attracted attention for their potential role as alternatives for antibiotics growth promoters (Puvaca *et al.,* 2013) which include oregano, garlic and thyme have been indicated as alternatives to antibiotic growth promoters in broiler production. The herb *Andrographis paniculata* is a bitter plant which possesses antioxidant properties and immunity enhancing properties that stimulate the immune system of the body (Jarukamjorn *et al.,* 2007).

Garlic (*Allium sativum*) is one such potential feed supplement which has recently been reported as having a wide range of beneficial effects on the production performance and physiological biochemistry of broilers and laying hens. Notable beneficial effects have been seen on growth, feed efficiency, egg production and quality, as well as stimulation of immune system and lowering blood cholesterol levels in poultry birds (Kim *et al*., 2013). The results reported vary from author to author probably due to variations in the dose of the product fed, the duration of feeding and processing techniques employed.

The use of antibiotics in poultry feed as growth promoter and for health maintenance can cause drug resistance bacteria and antibiotic residue effects (Wray and Davies, 2000). There is a need to completely avoid usage of antibiotics in poultry feeding due to increasing consumer concern for poultry drug residues in meat and egg (Recoquillay, 2006). Garlic and King of bitters are proven herbal medicine that possess antibacterial, anti-viral, anti-fungal, anti-cancer, anti-oxidant, immunomodulatory, anti-inflammatory, hypoglycemic, hypo-cholesteremic, antimicrobial effects and growth promoting activity, hence, their synergetic effect as alternative to antibiotics needed to be evaluated (Tipakorn, 2002), This study aimed at investigating the use of *Andrographis paniculata* on haematology, serum biochemistry and carcass characteristics of broiler chickens.

MATERIALS AND METHODS

Sourcing and Processing of Test Ingredient

Andrographis paniculata leaves were obtained from a reputable farm at Bakatari, Ibadan, air dried and ground to powder and also *Allium sativum* was gotten from Bodija market; sun-dried and ground to powder, the synthetic additives, Oxytetracycline was gotten from a reputable feed store.

Experimental designs and layout

This study was conducted for 42 days . One hundred and twenty (120) day- old unsexed broiler chickens were purchased from Chi commercial hatchery in Oluyole, Ibadan, Ni-

geria. Before the arrival of birds, the brooder house was properly washed and fumigated with formalin, On arrival, the chicken were fed commercial feeds for 7 day; on the 7th day, they were weighed and randomly distributed into four dietary treatments with each treatment replicated three times, with ten (10) birds per replicate.

Experimental Diet

Four experimental diets were formulated and labelled as T1, T2, T3, T4:

T1: control: basal feed + Oxytetracycline (13g/25kg of feed)

T2: basal feed + *Allium sativum* (50g/25kg of feed)

T3: basal feed + *Andrographis paniculata*at (50g/25kg of feed)

T4: basal feed + *Andrographis paniculata*at (50g/25kg) + *Allium sativum* at (50g/25kg)

Table1: Gross Composition of the Experimental Diet

Ingredients(Kg)	Starter Phase 7-21days	Finisher Phase 22-49 days
Maize	58.00	63.00
Soybean Meal	37.00	32.00
Limestone	2.50	2.50
Di-calcium Phosphate	1.50	1.50
Di-methionine	0.20	0.20
Lysine	0.30	0.30
Mineral Premix	0.25	0.25
Salt	0.25	0.25
Total	100	100
Calculated analysis		
Crude Protein(%)	23.00	20.00
ME (kcal/kg)	3000	3200
Lysine (%)	1.30	1.00
Methionine (%)	0.52	0.38
Calcium (%)	1.00	0.90
Phosphorus (%)	0.80	0.75

Data collections

Serum biochemistry indices

At the end of the feeding trial, two birds were selected randomly from each treatment, bled and 5mls of blood were collected into plain sampling bottles, which were taken into the laboratory for serum test.

Hematological parameters

At the end of the finisher phase, blood samples were randomly collected from each of the replicate, a total of six birds per treatment. The blood samples were collected via the jugular veins after slaughtering. The blood samples for hematological parameters were collected into well-labeled bottles containing ethylene diamine tetra acetic acid (EDTA), as anticoagulants. The samples were investigated for the following hematological parameters – packed cell volume (PCV), red blood cell count (RBC), white blood cell (WBC), hemoglobin. Two birds were randomly selected at the end of the feeding trial, which was bled and the samples were collected into Ethylene Diamine Tetra-Acetic Acid (EDTA) as an anticoagulant which was taken into the laboratory for hematology test.

Carcass characteristics

After eight (6) weeks, two birds were randomly selected from each replicate for slaughter. Feed was withdrawn for 12 hours in preparation for slaughter and the fast body weight of each bird was taken and recorded. Slaughtering was done by cutting off the head at the neck using a sharp knife. After slaughtering, birds were de-feathered immediately after ensuring proper bleeding.

Statistical analysis

The experimental design was completely randomized design (CRD) and data obtained were subjected to one-way Analysis Of Variance using SAS (1999). Significant ($P<0.05$) means among variables were separated using Duncan Multiple Range Test as contained in the SAS (1999) package.

RESULTS AND DISCUSSION

There were no significant differences in the relative weight of the offals (heart, liver, gizzard) and remained comparable among different dietary treatment groups (Table 2). This is in line with the findings of Islam *et al.* (2017) that broilers fed with a garlic-supplemented diet had no significant differences in the weight of the offals. The findings were in contrast with the report of Javandel *et al.* (2008), Amouzmehr *et al.* (2012), and Kharde and Soujanya (2014), who claimed that there was no significant effect on carcass characteristics for broiler chickens fed a diet supplemented with garlic. However, Ashayerizadeh *et al. (2011)* also reported significant ($P<0.05$) increase in dressing percentage on garlic supplementation. In contrast to present findings, Aji *et al. (*2009) reported non-significant effect of garlic supplementation on dressing percentage in broilers.

Table 2: Effect of meal supplement on carcass characteristics of broiler chicken

Parameters	T1	T2	T3	T4	±SEM
Dressing value (%)	77.85^{b}	85.33^{a}	84.12^{ab}	81.08^{ab}	1.18
Thigh (%)	9.38	11.12	9.85	9.43	0.31
Drum Stick (%)	11.07^{b}	11.93^{a}	11.18^{ab}	10.50^{b}	0.16
Breast (%)	18.77	17.93	20.67	17.81	0.65
Back (%)	17.88	15.87	17.15	16.50	0.65
Wing (%)	7.35	8.85	6.33	6.33	0.53
Head (%)	3.37	3.43	3.12	3.07	0.15
Neck (%)	4.27	4.32	3.43	3.63	0.18
Shank (%)	4.78^{a}	3.80^{b}	3.77^{b}	4.08^{ab}	0.15
Gizzard (%)	2.22	2.62	2.03	2.02	0.13
Liver (%)	2.42	1.93	2.07	2.18	0.08
Lungs (%)	0.53	1.00	0.75	0.65	0.10
Heart (%)	0.50	0.53	0.57	0.52	0.03
Visceral (%)	15.35^{a}	14.07^{a}	12.17^{b}	15.38^{a}	0.39

a, b means with different superscripts within the same row are significantly different ($P<0.05$)

T1: control: basal feed + Oxytetracycline (13g/25kg of feed)
T2: basal feed + *Allium sativum* (50g/25kg of feed)
T3: basal feed + *Andrographis paniculata* (50g/25kg of feed)
T4: basal feed + *Andrographis paniculata* (50g/25kg) + *Allium sativum* at (50g/25kg)

There were no significant differences between the treatment groups on haematological parameters of broilers (Table 3). These results are in accordance with the findings of Jimoh *et al.*, (2012) and Elagib *et al.*, (2013) who observed that supplementation of garlic and nilavembu had a non-significant effect on blood hematological parameters. Contrary to the above results, Fadlalla *et al.* (2010) observed that the total WBC count was significantly increased.

Table 3: Effect of meal supplement on hematological parameters of broiler chickens

Parameters	T1	T2	T3	T4	SEM±
PCV (%)	23.83	23.00	25.33	23.00	0.58
HB (g/dl)	6.71	7.43	8.05	7.57	0.28
RBC ($X10^6$/ul)	2.60	1.92	2.59	2.56	0.14
WBC ($X10^3$/dl)	14258.33	13466.67	14758.33	14516.67	275.95
Platelets ($X10^6$/ul)	123000.00	117333.33	120666.67	121666.67	2221.98
Lymphocyte(%)	61.53	60.17	63.00	65.00	1.02
Heterophils (%)	30.83	32.83	30.00	28.83	1.03
Monocytes (%)	2.83	3.33	3.50	3.50	0.19
Eosiniphild (%)	4.17	3.33	3.17	3.00	0.23
Basinophils(%)	0.33	0.50	0.33	0.00	0.09

T1: control: basal feed + Oxytetracycline (13g/25kg of feed)
T2: basal feed + *Allium sativum* (50g/25kg of feed)
T3: basal feed + *Andrographis paniculata* (50g/25kg of feed)
T4: basal feed + *Andrographis paniculata* (50g/25kg) + *Allium sativum* at (50g/25kg)

There were no significant differences ($P>0.05$) between the treatment groups with reference to serum parameters of broiler chickens. This is in line with the report of Anvar *et al.* (2012) that there was no change in total cholesterol and triglyceride levels between the groups that received garlic treatment with reference to table 4. These results are not in line with the report of Jimoh *et al.* (2012) and Puvaca *et al.* (2014) who observed that a supplementation of garlic in the diets of broiler chickens had significant effects on total cholesterol. Toriyali *et al.* (2018) reported that the combination of garlic and nilavembu also resulted in decreased levels of total blood cholesterol and triglycerides which might be due to the fact that garlic contains high levels of bioactive saponin that form insoluble complexes with cholesterol and inhibit intestinal absorption of endogenous and exogenous cholesterol.

Table 4: Effect of Garlic (*Allium sativum*) and King of Bitters (*Andrographis paniculata*) on the Serum Parameters of Broiler Chicken

Parameters	T1	T2	T3	T4	Reference value	±SEM
Glucose (mg/dl)	168.57	191.63	176.42	191.77	200-400	4.80
Cholesterol (mg/dl)	110.01	112.89	113.36	111.24	100-300	3.66
Total Protein (g/dl)	3.05	3.25	3.11	3.22	3.0-5.5	0.08
Albumin (g/dl)	1.45	1.63	1.47	1.33	1.9-3.2	0.04
Globulin (g/dl)	1.61	1.62	1.64	1.69	1.9-4.0	0.07

Reference values Krasnodebska-Depta and Koncicki (2000)
T1: control: basal feed + Oxytetracycline (13g/25kg of feed)
T2: basal feed + *Allium sativum* (50g/25kg of feed)
T3: basal feed + *Andrographis paniculata* (50g/25kg of feed)
T4: basal feed + *Andrographis paniculata* (50g/25kg) + *Allium sativum* at (50g/25kg)

CONCLUSION

It can be concluded that inclusion of *Andrographis paniculata* leaf meal and *Allium sativum* meal to the level of 50g/25kg of feed respectively and collectively does not affect the haematological and serum parameters. *Allium sativum* (50g/25kg of feed) had better dressing value, drum stick and visceral of the broiler chickens. Further research should be conducted to investigate the effect of the levels of inclusion of both leaf meals in broiler diets.

REFERENCES

Aji, S. B., Ignatius, K., Ado, Y. A., Nuhu, J. B., Abdulkarim, A., Aliyu, U., Gambo, M. B., Ibrahim, M. A., Ababakar, H., Bukar, M. M, Imam, H. M, Numan, P. T. 2011. Effects of feeding onion and garlic on some performance characteristics of broiler chickens. *Resource. Journal of Poultry. Science,* 4(2)**:** 22-27.

Ashayerizadeh, A., Dastar, B., Rahmatnejad, E., Shargh, M. S., Ashayerizadeh, O., Hossaini, S. M. R. 2009. Use of garlic (*Allium sativum*), black cumin seeds (*Nigella sativa* L.) and wild mint (*Mentha longifolia*) in broiler chickens diets. *Journal of Animal Veterinary Advances* 8**:** 1860-63.

Amouzmehr, A. Dastar, B., Nejad, J.G., Sung, K.I, Lohakare, J.and Forghani, F. 2012. Effects of garlic and thyme extracts on growth performance and carcass characteristics of broiler chicks. *Journal of Animal Science Technology,* 54(3):185–190.

Botsoglou, N .A.,Florou - Paneri, E., Christaki, E., Fletouris, D. J., Spais B.A. 2002. Effect of dietary oregano essential oil on performance of chickens and on iron - induced lipid oxidation of breast, thigh and abdominal fat tissues. *British Poultry Science.* 43 (2): 223 -230.

Chowdhury, D., Sayeed A., Islam A., Bhuiyan M. S. A., Khan G. R. 2002. Antimicrobial activity and cytotoxicity of *Aervalanata fitoterapia. International Immunopharma-*

cology Journal 73:92–94.

Elagib, H.A.A., El-Amin, Elamin, W.I.A., Malik, H.E.E. 2013. Effect of dietary garlic (*Allium sativum*) supplementation as feed additive on broiler performance and blood profile. *Journal Animal. Science. Advance.* 3(2): 58-64.

Fadlalla, I.M.T., Mohammad, B.H., Bakhiet, A.O. 2010. Effect of feeding garlic on the performance and Immunity of broilers. *Asian Journal of Poultry Science*, 4 (4): 182-189

Jaruchotikamol, A., Jarukamjorn, K., Sirisangtrakul, W., Sakuma, T., Kawasaki, Y. and Nemoto, N. 2007. Strong synergistic induction of CYP1A1 expression by andrographolide plus typical CYP1Ainducers in mouse hepatocytes. *Toxicol. Appl. Pharmacol,* 224, 156–162.

Jaruchotikamol, A., Jarukamjorn, K., Sirisangtrakul, W., Sakuma, T., Kawasaki, Y., Nemoto, N. 2007 Strong synergistic induction of CYP1A1 expression by andrographolide plus typical CYP1A inducers in mouse hepatocytes. Toxicol. Appl. Pharmacol, 224, 156–162.

Jaruchotikamol, A., Jarukamjorn, K., Sirisangtrakul,W., Sakuma, T., Kawasaki, Y., Nemoto, N. 2007. Strong synergistic induction of CYP1A1 expression by andrographolide plus typical CYP1A inducers in mouse hepatocytes. Toxicol. Appl. Pharmacol, 224, 156–162.

Jaruchotikamol, A., Jarukamjorn, K., Sirisangtrakul, W., Sakuma, T., Kawasaki, Y., Nemoto, N. 2008. Strong synergistic induction of CYP1A1 expression by Andrographolide plus typical CYP1A inducers in mouse hepatocytes. *Toxicology and Applied Pharmacology* 224, 156–162.

Javandel, F. Navidshad, B. Seifdavati, J. Pourrahimi, G., Baniyaghoub, S. 2008. The favorite dosage of garlic meal as a feed additive in broiler chickens ratios. *Pakistan Journal of Biological Science*;11(13):1746–1749

Jimoh, A.A., Olorede, B.R., Abubakar, A., Fabiyi, J.P., Ibitoye, E.B., Suleiman, N., Garba, S. 2012. Lipids profile and haematological indices of broiler chickens fed garlic (*Allium sativum*) - supplemented diets. *Journal of Veterinary Science.* 2(10): 474-480

Krasnodebska-Depta A., Koncicki, A., 2000. Physiological values of selected serum biochemical indices in broiler chickens. *Medycyna Weterynaryjna,* 56: 456-460

Kharde, K.R, and Soujanya, S. 2014. Effect of garlic and neem leaf powder supplementation on growth performance and carcass traits in broilers. *Veterinary World,* 7 (10):799–802.

Kim, D.K., Lillehoj, H.S., Lee, S.H., Lillehoj, E.P., Bravo, D. 2013. Improved resistance to *Eimeria acervulina* infection in chickens due to dietary supplementation with garlic metabolites. *British Journal of Nutrition* 109:76-88.

Oluyemi, J. A. and Robert, F. A 2010. Poultry production in warm wet climates, 2nd edition, Pp: 48 -60.

Puvaca, N., Kostadinovic, L.J., Ljubojevic, D.L., Popovic, S.D., Dokmanovc, B., Stanacev, S.V. 2014. Effect of dietary garlic addition on productive performance and blood lipid profile of Broiler Chickens. Institute for Animal Husbandry, Belgrade-

Zwmun, 30(4): 669-676.

Recoquillay, F. 2006. Aktivní rostlinné extrakty – příslib pro drůbežárskou produkci. In Krmivářství, 2006, č.1, s. 23-26. ISSN 1212-9992.

Steiner, T. 2009. Phytogenics in animal nutrition Natural concepts to optimise gut health and performance. Nottingham University Press, 1-169.

Toriyali Arify, Ezhil Valavan S., Manimaran K., Sundaresan A., Varun A. 2018. Effect of Supplementation of Garlic (*Allium sativum*) and Nilavembu (*Andrographis paniculata*) on Hematological and Serum Biochemical Parameters of Commercial Broiler Chicken. *International Journal of Current Microbiological Applied Science 7*(10): 3649-3656

Tipakorn, N., 2002. Effects of *Andrographis-paniculata* (Burm. F.) Nees on performance, mortality and coccidiosis in broiler chickens. Doctoral Dissertation, submitted to Institute of Animal Physiology and Animal Nutrition. Georg-August- University, Gottingen, Germany.

Wray C., Davies R.H 2000. Competitive exclusion-An alternative to antibiotics. *The Veterinary Journal*, 59: 107-108.

(Manuscript received: 18 March, 2023; accepted: 19th July, 2023).