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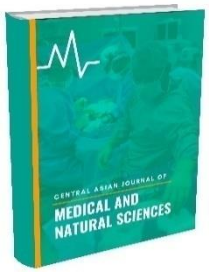

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Growth Promotiive and Feed Consumption Effect of Turmeric (*Curcuma Longa)* Powder in Broiler Chickens Raised in Sokoto

1. **Abubakar Ahmadu**
2. **Sirajo Garba**
3. **Ali Jiddah Adam**
4. **Samuel Ndakotsu Gana**
5. **Benjamin Emikpe Obukowho**
6. **Oyelowo Dayo Dorcas**

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[1,2,3,4] Department of Veterinary Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University

[5,6] Faculty of Veterinary Medicine, University of Ibadan

ABSTRACT: The use of antibiotics at sub therapeutic doses in poultry feed as growth promoters to enhance growth, performance and production has led to the survival of resistant microorganism, which in turn contributes to the menace of antimicrobial resistance (AMR). This experiment was carried out at Aliyu Jodi Veterinary Clinic Sokoto, Sokoto State. The study aimed to determine the effect of different inclusion levels of turmeric (*Curcuma longa*) powder on the growth performance and feed consumption of broiler chickens. 120-day-old mixed-sex broiler chicks (Cobb 500) fed for 6 weeks were used for the experiment. The birds were assigned to four experimental group (30 chicks per group) designated as T_C, T_1, T_2 and T_3 having 0g, 50g, 100g and 150g Turmeric (*Curcuma longa*) powder per 25kg of feed respectively. Each group divided further into 3 replicates of 10 chicks each in completely randomized design. The mean body weight gain and average feed consumption rate recorded throughout the period of the experiment. The mean body weight gain and average feed consumption were not significantly increased ($P>0.05$) by turmeric supplemented feed compared to the control group. The results from this study suggest that the use of turmeric (*Curcuma longa*) powder supplemented at different levels has no significant effect on body weight gain and feed consumption rate of broilers.

Keywords: Turmeric (*Curcuma long*), Growth Performance, Feed Consumption, Broilers, Sokoto.

INTRODUCTION

The poultry industry has made tremendous adjustments to meet the increasing demand for inexpensive and safe supply of meat and eggs over recent decades and at the same time growing at more than 5% per annum (compared to 3% for pork and 1.5% for beef) for the past three decades. Moreover, its share in world meat production increased from 15% three decades ago to 30% currently (Gerber *et al.*, 2007).

The goal of poultry production is to optimize growth performance through better growth rate and improved feed conversion efficiency. This goal mostly depend on the genetic potential of bird, quality of feed, environmental conditions and disease outbreaks (Arslan *et al*., 2017). The removal of antibiotic growth promoters (AGPs) was problematic for growth performance and led to an increase in the incidence of certain poultry disease, especially sub-clinical necrotic enteritis. This led to discovery of alternatives to AGPs (Sugiharto, 2016). There is a modern trend to replace AGPs with natural growth promoters. Because of that, different natural growth promoters used worldwide includes; Probiotics, prebiotics, antioxidants, enzymes, organic acids, and herbs are good antibiotic alternatives. The variety and beneficial activities of herbs and their extracts makes them a good alternatives (Arslan *et al*., 2017).

The use of antibiotics at sub therapeutic doses in animal feed as growth promoters to enhance animal growth performance and production has led to the survival of resistant microorganism and animal products with an antibiotic resistant population hazardous to the consumers (Nouzarian *et al*., 2011). A variety of feed additives are being included in poultry diet to derive maximum growth of broiler chickens. Use of in-feed-antibiotics and hormones not only increases the cost of production but also leads to residues in meat and eggs which when consumed develops antibiotic resistance in microbes (Abd Al-Jaleel, 2012). The rising cost of antibiotics and other drugs coupled with their residual effects has demand the need to research into natural herbal plants that could be inexpensive and good alternative to commercial (synthetic) antibiotics (Olayemi *et al*., 2016).

The European Union (EU) has banned application of antibiotics as growth promoters in the animal feed since 2006 because of its residual effects in animal tissues and subsequently leading to antimicrobial resistance in human beings, this ban in EU has results in increasing pressure on livestock producers in other parts of the world (Nouzarian *et al*., 2011). This lead to the investigation of alternative substances and strategies for animal growth promotion and disease prevention, among which phytogenic and herbal products have received increased attention since they have acquired more acceptability among consumers as natural additives (Nouzarian *et al*., 2011). Recently, the National Agency for Food and Drug Administration and Control (NAFDAC) has issued a ban on the use of antibiotics (growth promoters and mould inhibitor) in animal feed due to concerns about food-related diseases and death in Nigeria (Euromeat News, 2023). The World Health Organization (WHO) has declared turmeric a safe dietary product to be use in the human diet and animal feed (Mahesh and Prabhakar, 2018).

Turmeric (*curcuma longa*) is a tropical plant native to southern and southeastern tropical Asia (Wang *et al*., 2015). The active ingredients found in turmeric are curcumin, demethoxycurcumin, bisdemethoxycurcumin and tetrahydrocurcuminoids (Kafi *et al*., 2017). Curcumin isolated from the rhizomes of turmeric is the main bioactive ingredient of *C. longa* which was found to convey antioxidant, antiviral and antibacterial activities (Wang *et al*., 2015). Curcumin (diferuloylmethane) the most bioactive ingredient of turmeric represents 3-5 % of the curcuminoids in turmeric rhizomes and is a strong phenolic antioxidant (Qasem *et al*., 2016). Turmeric has good pharmacological properties and it is a useful natural growth promoter and safe alternative to antibiotics (Zeinali *et al*., 2011), turmeric also has other pharmacological activities that include hepatoprotective, immunostimulant, and anticancer (Sun *et al*., 2012). The immunomodulatory effects of turmeric

extensively boost the ability of immune system which provides instant natural antibiotic capability against invading pathogens. Turmeric can specifically regulate inflammation which is very important in preventing the progression of inflammation induced pathology in poultry (Kurkure *et al*., 2000).

Bioactive plant substances have beneficial effects in animal nutrition which include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses, antiviral, antibacterial, and antioxidant actions (Toghyani *et al*., 2011). Because of the significant biological properties of turmeric powder, it is a potential substitute for in-feed antibiotics in livestock diets.

Keeping in view the medicinal attributions of *Curcuma longa*, this study was designed to determine the effects of increasing levels of turmeric powder on growth performance and feed consumption rate in broiler chickens.

MATERIALS AND METHODS

Experimental Location

This research study was conducted in Sokoto, the state capital of Sokoto state, Nigeria. Sokoto is located in the extreme northwest of the country on the national border with the Republic of Niger. It is located near to the confluence of the Sokoto river and the Rima river with the coordinates 13° 5^{1} 0^{11} N and 5° 15^{1} 0^{11} E (Anon.[1]). The climate has a distinct wet and dry season. The dry season is characteristically long and severe, lasting from October to April while the wet season is short but intensive lasting from May to September. Sokoto is one of the warmest regions in Nigeria with an average daily temperature of 37 degree centigrade. During the cool harmattan season from October to February, the temperature is low, about 15.5 degrees centigrade (Anon.[1]).

Experimental Site

The experiment was conducted at the poultry unit of Sokoto North Zonal Veterinary Clinic along Aliyu Jodi Road, Sokoto North Local Government Area, Sokoto State.

Source of Dietary Sample

The turmeric powder was obtained commercially from Sokoto central market.

Feed Ingredients

Maize, wheat offal, and salt were bought from Sokoto central market. The maize was grinded into smaller size units suitable for consumption by the birds. Wheat offal was used in the same state. Soya bean, groundnut cake, bone meal, premix, methionine, limestone and lysine were obtained from the Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto.

Experimental Diet Formulation (Basal diet)

The experimental diet composition is has shown in (Table 1). Turmeric powder was incorporated at different levels of 0g, 50g, 100g and 150g per 25kg of feed for T_C, T_1, T_2 and T_3 respectively. The prepared diets (25kg) were packed into a bag labeled according to the treatment and kept in the pen.

Table 1: Composition of experimental broiler starter and finisher diet for 25kg

Ingredients	Starter (kg)	Finisher (kg)
Maize	12.50	12.25
Soya bean	4.50	5.50
Groundnut cake	5.00	3.00
Wheat offal	2.00	3.25
Limestone	0.38	0.13
Bone meal	0.38	0.63
Premix	0.06	0.06
Lysine	0.06	0.06
Methionine	0.06	0.06
Salt	0.06	0.06

Experimental Design

The birds were brooded for two (2) weeks in four (4) treatments with thirty (30) birds each, after which the birds were divided in a completely randomized design into three (3) replicates per treatment with ten (10) birds each. The birds were fed for six (6) weeks before the experiment was terminated.

Table 2: Experimental design

Group	Treatments	Replicates	Total no. of birds
T_C	Basal diet (control)	3	30
T_1	Basal diet + Turmeric powder 50g	3	30
T_2	Basal diet + Turmeric powder 100g	3	30
T_3	Basal diet + Turmeric powder 150g	3	30

Experimental Stock

The experimental birds were purchased commercially from Olam Nigeria Limited, Kaduna, Nigeria at one-day-old. One hundred and twenty (120) day-old mixed-sex broiler chicks (Cobb 500) were used for the experiment, the initial weight was recorded before the experiment.

Housing and Feeding

Before the arrival of the experimental chicks, the brooding pen was cleaned, washed, disinfected and left to dry for three (3) days. Four demarcated brooding pen (T_C, T_1, T_2 and T_3) were selected for the experiment. Thirty (30) birds were randomly selected into each pen with two (2) feeders and drinkers each. The experimental broiler starter diet was fed to the birds for two (2) weeks. Each treatment divided further into three replicas with ten (10) birds each: one drinker and one feeder were allotted to each replica. The experimental broiler finisher diet was fed to the birds for four (4) weeks. The pen was constructed in such a way that the birds can have enough ventilation by using wire net at the front and side of the pen. The pen's floor cemented and was covered with wood shaving to prevent the birds from contracting disease and to ease cleaning of the pen. The pen was been monitored every morning and evening throughout the period of the experiment, feed and water were supplied ad-libitum after the feed was weighed first day of the week and the remnant was also weighed at the end of the week. The drinker in each pen was cleaned daily and refilled with fresh cool water.

Health Management

Before the arrival of the chicks, the pen was cleaned, washed and disinfected with Izal® solution, formalin, and potassium per manganese. The feeders and drinkers were also washed and disinfected. The birds were given intra-ocular vaccine against Newcastle disease at day-old at the hatchery center. The first Gumboro vaccine was administered to the birds via drinking water at ten days old. At third week Newcastle vaccine (Lasota) was administered via drinking water. Prior to vaccination exercise, water was withdrawn from them for about 12hours, this was to ensure that the birds become thirty enough to drink the vaccine. After every vaccination, anti-stress (vitalyte®) was administered for three days. At five weeks of age, some of the birds show respiratory sign such as gasping and coughing: medications (Maxicocc® and V-OX®) were administered via drinking water. Maxicocc® is a drug combination of antibiotics and anticoccidials while the V-OX® is an ultimate virucide.

Data Collection

The birds and the feed were weighed on weekly basis throughout the duration of the experiment. There were twelve replicates each containing ten birds. Each replicate was weighed collectively and divided by the total number of the birds in the pen to determine the average weight per bird for the week, which was recorded.

RESULT

During this study, the data obtained was accessed using Excel sheet and Graph Pad Prism 9.1.2 to perform the statistical analysis (ANOVA) and to obtain the P-value ($P<0.05$) which indicate the statistical difference of the mean and standard deviation of the data.

Table 3: Effect of turmeric (*Curcuma longa)* powder on the growth performance of broilers

Weeks	T_C	T_1	T_2	T_3
Week 1 (kg)	0.1	0.1	0.1	0.1
Week 2 (kg)	0.2	0.2	0.21	0.2
Week 3 (kg)	0.38	0.35	0.35	0.37
Week 4 (kg)	0.55	0.52	0.53	0.53
Week 5 (kg)	0.84	0.87	0.8	0.87
Week 6 (kg)	1.11	1.1	1.14	1.09
M	0.53	0.52	0.52	0.53
SD	0.39	0.39	0.39	0.39

^{a,b,c,d} M±SD with different superscript in the same row are significantly different from each other ($P<0.05$)

Keys

T_C: Basal diet (control), T_1: Basal diet + Turmeric powder 50g

T_2: Basal diet + Turmeric powder 100g, T_3: Basal diet + Turmeric powder 150g

M: Mean, SD: Standard deviation

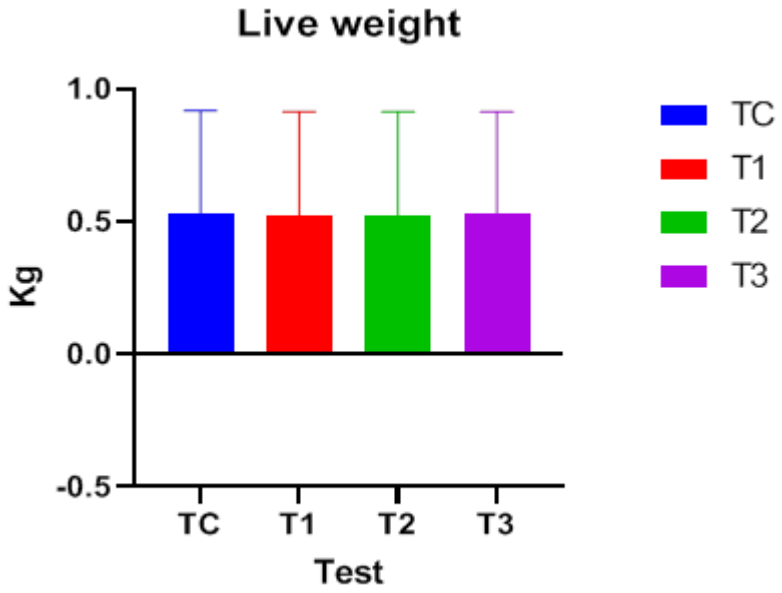

Figure 1: Graph showing effect of turmeric (*Curcuma longa)* powder on the growth performance of broilers.

Keys

T_C: Basal diet (control), T_1: Basal diet + Turmeric powder 50g

T_2: Basal diet + Turmeric powder 100g, T_3: Basal diet + Turmeric powder 150g

Table 4: Effect of turmeric (*Curcuma longa)* powder on the feed consumption rate of broilers

Weeks	T_C	T_1	T_2	T_3
Week 1 (kg)	2.6	2.8	2.9	2.5
Week 2 (kg)	5.4	5.5	5.5	5.2
Week 3 (kg)	8.3	7.85	9.0	8.5
Week 4 (kg)	11.0	11.0	12.0	11.0
Week 5 (kg)	15.95	16.2	18.1	16.3
Week 6 (kg)	15.6	12.9	17.8	14.4
M	9.81	9.38	10.88	9.65
SD	5.41	4.94	6.28	5.31

Keys:

T_C: Basal diet (control), T_1: Basal diet + Turmeric powder 50g

T_2: Basal diet + Turmeric powder 100g, T_3: Basal diet + Turmeric powder 150g

M: Mean, SD: Standard deviation

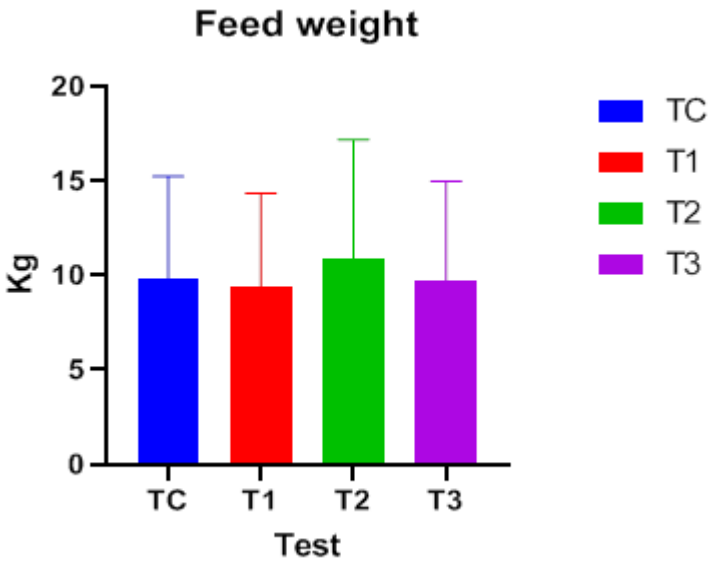

Figure 2: Graph showing effect of turmeric (*Curcuma longa)* powder on the feed consumption rate of broilers.

Keys

T_C: Basal diet (control), T_1: Basal diet + Turmeric powder 50g

T_2: Basal diet + Turmeric powder 100g, T_3: Basal diet + Turmeric powder 150g

DISCUSSION

In this study, weight gain was not significantly (P>0.05) affected by the supplementation of turmeric powder into the diet. This is in agreement with the study by (Emadi and Kermanshahi, 2006) which reported that, weight gain and feed intake were not significantly affected by adding turmeric rhizome powder into the diets of broiler birds. Although our findings contradict the studies by (Eko *et al.*, 2020) which stated that there were significant differences (P<0.05) observed for all the parameters measured: daily and final feed intake, and initial, final and daily weight gain. The body weight for birds fed diets with 1.5% turmeric powder and those on control diet significantly decreased and increased for birds fed diets with 3.0% and 4.5% of dietary turmeric powder. (Al-Sultan, 2003) also reported that higher weight gain was observed in birds fed diet containing turmeric at level of 0.5% followed by birds that received 0.25%, 1% and the control group. (Abd Al-Jaleel, 2012) reported that the body weight gain was higher in treatment groups with turmeric inclusion level of 0.50% (500g/100kg of feed) followed by birds fed turmeric inclusion level of 1.5% (1500g/100kg of feed) and 1.0% (1000g/100kg of feed) when compared to birds fed control diet and 0.25% of turmeric.

In addition, (Arslan *et al*., 2017) reported that turmeric supplementation at the dose of 1.0% and 1.5% improved body weight gains and showed best-feed conversion rate results. A study by Mondal *et al.*, indicated that the body weight gain in birds fed diet containing turmeric powder at level of 0.5% was significantly higher (P<0.01) followed by birds that received 1.5%, 1% and 0% turmeric powder (Mondal *et al.*, 2015). The significant increase in body weight might be due to the presence of

curcumin in turmeric (*Curcuma longa*): curcumin is a natural antioxidant that stimulates protein synthesis in birds' enzymatic system (Eko *et al.*, 2020).

Feed intake as shown in table 4, birds in group T_2 had a higher rate in feed consumption compare to the other groups, although the result was not statistically (P>0.05) significant. In addition, birds in group T_2 had a slight increase in growth performance when compare to the other group, the result was also not statistically (P>0.05) significant, the above results are in agreement with the study by (Nouzarian *et al*., 2011) which state that feed intake did not differ significantly (P>0.05) between the groups. (Emadi and Kermanshahi, 2006) also reported that feed intake was not significantly affected by adding turmeric rhizome powder into the diets of broiler birds and (Mondal *et al.*, 2015) also reported that during certain days of age among groups of experimental periods was almost statistically similar and the differences were non-significant (P>0.05). Our finding contradict the study by (Arslan *et al*., 2017) which reported that the supplementation of turmeric at the rate of 0.5% showed better feed conversion rate and decreased feed consumption, but did not affect body weight gain. A study by (Abd Al-Jaleel, 2012) also reported that feed intake showed a higher increase in the treatment group with 0.05% inclusion level when compared to the other groups (0.00, 0.25, 0.75 and 1.0%). The variations between these present study and previous findings might be due to some factors which include; different levels of turmeric inclusion, environmental factors, breed of birds, different bioactive ingredients of turmeric (*Curcuma longa*) used in these studies which largely depend on the plant species, type of soil, harvest season and process of preparation (Gana *et al.* 2023).

CONCLUSION

Based on the results of this study, it was concluded that turmeric powder supplemented at different levels of up to 6% has no significant effect on body weight gain and feed consumption of broilers. Base on the promising status of turmeric as a potential alternative to antibiotics in poultry production and in addition to it non-toxic nature, further research should be conducted to determine the effect of turmeric at different inclusion level in broiler chickens and in other avian species.

REFERENCES

1. Abd Al-Jaleel, R. A. (2012). Use of Turmeric (*Curcuma longa*) on the Performance and Some Physiological Traits on the Broiler Diets. *The Iraqi Journal of Veterinary Medicine,* 36(1), 51-57.
2. Anonymous[1] (2021). Sokoto State. https://en.m.wikipedia.org/wiki/sokoto-state Accessed on July 13. 2021.
3. Al-Sultan, S. I. (2003). The Effect of *Curcuma longa* (Turmeric) on Overall Performance of Broiler Chickens. *International Journal of Poultry Science,* 2(5), 351-353
4. Arslan, M., ul Haq, A., Ashraf, M., Iqbal, J. & Mund, M. D. (2017). Effect of Turmeric (*Curcuma longa*) supplementation on growth performance, immune response, carcass characteristics and cholesterol profile in broilers. *Veterinaria*, *66*(1).
5. Eko, P. M., Afolabi, K. D. & Enyenihi, G. E. (2020). Growth Performance, Carcass Quality, Organ Weights and Haematology of Broilers Fed Graded Levels of Turmeric (*Curcuma longa L.*) Powder as Feed Additive. *environment,* 8(3): 65-70
6. Emadi, M. & Kermanshahi, H. (2006). Effect of turmeric rhizome powder on performance and

carcass characteristics of broiler chickens. *International Journal of Poultry Science*, *5*(11), 1069–1072. https://doi.org/10.3923/ijps.2006.1069.1072

7. Euromeat News (2023). Nigeria bans the use of antibiotics in animal feed. https://euromeatnews.com/Article-Nigeria-bans-the-use-of-antibiotics-in-animal-feed/2409 Accessed on January 13. 2023.
8. Gana, S. N., Garba, S., Jiddah, A. A. & Abubakar, A. (2023). The effect of Turmeric (*Curcuma longa*) powder on serum biochemical parameters of broilers. *Journal of Applied Veterinary Sciences,* 8 (1): 65-71. https://dx.doi.org/10.21608/JAVS.2022.171742.1187
9. Gerber, P., Opio, C. & Steinfeld, H. (2007). Poultry production and the environment – a review. Animal production and health division, Food and Agricultural Organization of the United Nation, *Viale delle Terme di Caracalla*, 153.
10. Kafi, A., Uddin, M. N., Uddin, M. J., Khan, M. M. H. & Haque, M. E. (2017). Effect of dietary supplementation of turmeric (*Curcuma Longa*), ginger (*Zingiber Officinale*) and their combination as feed additives on feed intake, growth performance and economics of broiler. *International Journal of Poultry Science*, *16*(7), 257–265. https://doi.org/10.3923/ijps.2017.257.265
11. Kurkure, N. V., Pawar, S. P., Kognole, S. M., Bhandarkar, A. G., Ganorkar, A. G. & Kalorey, D. R. (2000). Ameliorative effect of turmeric (*Curcuma longa*) in induced aflatoxicosis in cockerels. *Indian Journal of Veterinary Pathology* 24:26-28.
12. Mahesh, M. G. & Prabhakar, B. Y. (2018). Natural antibiotic effect of turmeric in poultry management. *International Journal of Poultry and Fisheries Sciences 2*(2):1-2. DOI: 10.15226/2578-1898/2/2/00109
13. Montal, M. A., Yeasmin, T., Karim, R., Siddiqui, M. N., Nabi, S. R., Sayed, M. A. & Siddiky, M. N. A. (2015). Effect of dietary supplementation of turmeric (*Curcuma longa*) powder on the growth performance and carcass traits of broiler chicks. *SAARC Journal Agriculture,* 13(1), 188-199.
14. Nouzarian, R., Tabeidian, S. A., Toghyani, M. & Ghalamkari, G. (2011). Effect of turmeric powder on performance, carcass traits, humoral immune responses, and serum metabolites in broiler chickens. *Journal of Animal Feed Science*, 389–400.
15. Olayemi, W., Oso, A., Akapo, O., Obadire, F. & Mafimidiwo, A. (2016). Haematological Indices and Serum Metabolites of Broiler Chickens Fed Zysygium aromaticum, Xylopia aethiopica and Morinda lucida as Phytogenic Plants. *Journal of Experimental Agriculture International*, *14*(2), 1–8. https://doi.org/10.9734/jeai/2016/27745
16. Qasem, M. A. A., Alhajj, M. S., Jer El Nabi, A. R. & Al-Mufarrej, S. I. (2016). Effects of dietary supplement of turmeric powder (*Curcuma longa*) on blood biochemistry parameters and antioxidant activity in chickens. *South African Journal of Animal Sciences*, 46(2), 204–213. https://doi.org/10.4314/sajas.v46i2.12
17. Sugiharto, S. (2016). Role of nutraceuticals in gut health and growth performance of poultry. *Journal of the Saudi Society of Agricultural Sciences*, 15(2), 99-111.

18. Sun, M., Su, X., Ding, B., He, X., Liu, X., Yu, A., Lou, H. & Zhai, G. (2012). Advances in Nanotechnology – Based Delivery Systems for Curcumin. Nano medicine, 7, 1085- 1100 https://doi.or/10.2217/nnm.12.80

19. Toghyani, M., Toghyani, M., Gheisari, A., Ghalamkari, G. & Eghbalsaied, S. (2011). Evaluation of cinnamon and garlic as antibiotic growth promoter substitutions on performance, immune responses, serum biochemical and haematological parameters in broiler chicks. *Livestock Science*, 138(1–3), 167–173. https://doi.org/10.1016/j.livsci.2010.12.018

20. Wang, D., Huang, H., Zhou, L., Li, W., Zhou, H., Hou, G., Liu, J. & Hu, L. (2015). Effects of dietary supplementation with turmeric rhizome extract on growth performance, carcass characteristics, antioxidant capability and meat quality of wenchang broiler chickens. *Italian Journal of Animal Science*, 14(3), 344-349. *https://doi.org/10.4081/ijas.2015.3870*

21. Zeinali, A., Kermanshahi, H., Riasi, A., Farhangfar, H., Sarir, H. & Ziaie, H. (2011). Effects of sodium selenite and turmeric powder on thyroid hormones and plasma lipids of broiler chickens reared under heat stress condition. *Global Veterinary* 6(3): 237-240.