Futo Journal Series (FUTOJNLS)
e-ISSN : 2476-8456 p-ISSN : 2467-8325
Volume-3, Issue-2, pp- 1 - 8
www.futojnls.org

Research Paper December 2017

Comparative Evaluation of Raw and Cooked Turmeric Rhizome (*Curcuma Longa*) on Performance of Finisher Broiler Chickens.

Esonu, B.O, Obionwu, D.C, Emenalom, O.O, Eze, B. and Adebanjo, A.S.

Department of Animal Science and Technology, Federal University of Technology, Owerri, Nigeria.

Corresponding author email: babsesonu@icloud.com

Abstract

This study was carried out to evaluate the effect of different levels of raw and cooked turmeric rhizome (*Curcuma longa*) on the performance of finisher broiler chicken in a complete randomized design. Turmeric rhizome was divided into two batches of 25 kg each. The first batch was crushed, sun dried for 3 days. The second batch was cooked for an hour, crushed and sun dried for 3 days. Both raw and cooked sun dried turmeric rhizomes were ground in hammer mill to produce raw and cooked turmeric rhizome meal. Seven broiler finisher diets were formulated to contain raw or cooked turmeric rhizome meal at 0%, 1.0%, 1.5% and 2.0% levels, respectively. The diets were offered to 189 Cobb broilers which were randomly divided into 7 dietary treatment groups, each containing 3 replicates of 9 birds per replicate. The experiment lasted 21 days. Routine management practices were observed. Weight gain, feed intake, mortality, feed conversion ratio, dressing percentage, liver, heart, gizzard, and kidney weights were used as criteria of response. The results indicated that turmeric rhizome meal has non significant (P>0.05) effect on weight gain, feed intake, mortality and feed conversion ratio, dressing percentage, carcass and organ weights compared with the common control. The different processing methods had no effect on broiler performance based on the results obtained in this study and within the circumstances of the experiments. It is concluded that sun-dried raw and cooked turmeric rhizome meal did not significantly affect broiler performance.

Keywords: Raw turmeric rhizome meal, Broiler chicks, Processing method, Growth Performance, Carcass analysis.

1. Introduction

The demand for livestock and poultry products by humans to satisfy their protein needs is increasing in many parts of the world. Poultry meat and eggs play very useful roles in bridging the animal protein intake gap in Nigeria. They are rich in protein, palatable and readily available. Its acceptability cuts across nearly all cultural and religious boundaries in Nigeria.

However, the poultry industry in Nigeria is facing serious challenges of high feed cost resulting from high cost of feed ingredients. In order to reduce the feed cost and improve the utilization of feed by poultry, series of research and production strategies have been adopted

using feed materials ranging from conventional feedstuffs to unconventional feedstuffs and their by-products and growth promoters which have been used in poultry feed formulations to enhance growth rate and improve feed efficiency and utilization (Abbas & Ahmed, 2010; Raeesi, Hoseini-Aliabad, Riofchaee, Shahneh & Pirali 2010). Moreover, consistent use of antibiotic will not only lead to various health issues, but could be a major contributor to higher feed cost. Thus, it is imperative to sort out alternatives that could effectively and economically substitute antibiotics (Toghyani, Gheisari, Ghalamkari & Mohammedrezaei, 2011).

Emphatically herbs and plant extracts used in animal feed are referred to as phytogenic feed additives (PFA), and are defined as compounds of plant origin incorporated into animal feed to enhance livestock productivity through the improvement of digestibility, nutrient absorption and elimination of pathogens resident in the animal gut (Kamel, 2011; Balunas & Kinghorn, 2005, Athanasiadou, Githiori & Kyriazakis, 2007). Herbs and spices are currently in use in livestock production because of their positive properties including anti-inflammatory, antiseptic, sedative, and anti-fungal activities, the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses and antibacterial, antiviral, and antioxidant actions (Toghyani, Gheisari, Ghalamkari & Mohammedrezaei, 2010, 2011). A variety of these herbs and spices including turmeric have been widely used as alternatives to synthetic antimicrobial growth promoter in livestock and poultry production.

Turmeric (Curcuma longa) is one of such spices used mainly for their nutritional and medicinal potentials. Turmeric spice which is a rhizomatous herbaceous perennial plant of the *Zingiberaceae* family has the native origin to the South Eastern India. Turmeric is a highly branched yellow to orange cylindrical aromatic rhizome with brown skin. The leaves are alternate and arranged in rows. They are divided into two leaf sheath; petiole (50-115 cm long) and leaf blade (76-115 cm long).The rhizome is usually cleaned, boiled, and dried or milled in the fresh raw form to yield a yellow powder called turmeric. The most important chemical compounds in turmeric are a group of compounds called curcuminoids which include curcumin (diferuloylmethane), demethoxycurcumin and bisdemethoxycurcumin (Osawa, Sugiyama, Inayoslii & Kawakishi, 1995) as well as volatile oils (turmerone, alantone, and zingiberone). Curcumin is the major essential oil and is responsible for the yellow colour of turmeric (Osawa *et al*., 1995).Turmeric has been reported to have antimicrobial, antioxidative and medicinal properties (Kamel, 2011). It has been reported to be used to prevent endoparasites and used for the treatment of internal and external injuries in ruminants. (Balunas & Kinghorn, 2005). The use of feed additives on livestock ration has been widely recognized. With the restriction of use or ban of synthetic antibiotics as feed additives in livestock ration, one expects an increase in the use of natural plants as alternatives. Turmeric has been shown to have several biological effects, exhibiting anti-inflammatory (Holt, Kats & kirshoff, 2005), anti-oxidant (Iqbal, Sharma, Okazaki, Fujisawa & Okada, 2003) and hypolipidaemic (Ramirez-Tortosa, Mesa, Aguilera, Quiles & Baro, 1999) activities. It has also been suggested that turmeric possesses hepato-protective, antitumor, antiviral and anticancer activities (Polasa, Raghuram & Krishna, 1999). Reports exists indicating that it has been used in gastrointestinal and respiratory disorders (Anwarul, Abdul, Muhammed & Kashifu, 2006). Keeping in view the significant importance of Turmeric *(Curcuma longa),* this study was conducted to evaluate the effect of raw and cooked Turmeric *(Curcuma longa*) rhizome meal on the performance of the broiler chickens.

2.0 Materials and Methods

2.1 Experimental Site:

The experiment was carried out in the Poultry Unit of Teaching and Research Farm and the Animal Science Laboratory in the School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri, Imo State, Nigeria.

2.2 Processing of Turmeric Rhizome:

Fresh turmeric rhizomes were procured from the Department of Minor Root Crops, National Root Crops Research Institute, Umudike, Umuahia, Abia State, Nigeria. The turmeric rhizomes were washed with tap water and divided into two batches of 20 kg each. One batch was processed raw and the other batch was cooked. The first batch (processed raw) was crushed and sun-dried for 3 days. The second batch was cooked (poured into boiling water and was allowed to boil) for 1hr, the water drained off, crushed and sun-dried for 3 days. The raw and cooked sun-dried turmeric were then ground using a hammer mill to produce raw and cooked sundried turmeric rhizome meals (Table 1).

2.3 Experimental Diets:

Seven experimental broiler finisher diets were formulated incorporating the turmeric meal at seven dietary levels of 0.00, 1.00, 1.50, and 2.00 % raw turmeric and cooked turmeric meals, respectively (Table 2).

Table 1 Proximate Composition of Raw and Cooked Turmeric Meal

Composition (%)	Raw turmeric	Cooked turmeric
Moisture Content	12.0	7.0
Ether extract	5.0	4.47
Ash	6.0	5.53
Crude fiber	12.0	10.0
Crude protein	14.54	13.72
Nitrogen free extract	50.46	59.28
	100.00	100.00

2.4 Feeding Trail

The processed turmeric rhizome powder milled into the broiler maize-based diets in a feeding trial using a total of 189 (one hundred and eighty nine) five weeks old unsexed broiler chicks of Cobb-strain were used in the study. The birds were divided into 7 groups of 27 birds each. Each group was further subdivided (replicated) into 3 groups of 9 birds each and randomly assigned to one of the 7 experimental diets of 0.00 % common control, 1.00, 1.50 and 2.00 % of raw and cooked turmeric respectively, during experimental period (Table 2)

2.5 Management of Experimental Birds

The birds were housed in a 1.4 x 1.4m pen with wood shavings of 2cm height as litter material. Feed and water were provided *ad-libitum* for all treatment groups throughout the experimental period. Also adequate prophylactic medications and vaccinations were administered. The birds were weighed at the beginning of the experiment and weekly

thereafter. Daily feed intake was recorded as the difference between weight of feed offered and the left over the next morning.

The study data collected included initial body weight, final body weight, weekly body weight, daily feed intake, weight gain, feed conversion ratio (g feed/g gain). (Table 3). The feeding trial lasted 21 days

Table 2. Ingredient and Nutrient Composition of the Experimental Broiler Finisher Diets

		Dietary levels of Turmeric (%)					
		Raw			Cooked		
Ingredients (%)	0.00	1.00	1.50	2.00	1.00	1.50	2.00
Maize	55.00	55.00	55.00	55.00	55.00	55.00	55.00
SBM	25.00	25.00	25.00	25.00	25.00	25.00	25.00
PKC	5.00	4.00	3.50	3.00	4.00	3.50	3.00
Turmeric	0.00	1.00	1.50	2.00	1.00	1.50	2.00
BDG	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Fish meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Wheat Offal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25.	0.25	0.25	0.25	0.25
Vit/minpremix	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Nutrient	**Composition**	(%)					
CP	20.06	20.09	20.04	20.06	20.43	20.11	20.24
CF	5.30	5.34	5.50	5.80	5.40	5.80	5.60
EE	4.37	6.75	6.77	7.05	6.76	6.79	7.1
Ca	1.31	1.4	1.41	1.43	1.4	1.41	1.43
P	1.03	1.1	1.11	1.13	1.1	1.11	1.13
NFE	67.54	63.91	64.56	62.60	63.17	63.09	62.36
*ME (Kcal/kg)	2957.85	2959.70	2961.00	2965.20	2945.80	2940.91	2941.35

2.6. Carcass and Organ Weight Determination

At the end of the feeding trial, five birds were randomly selected from each treatment, starved overnight of feed but not water, weighed and slaughtered by severing their neck and eviscerated for carcass and organ analysis. The weight of heart, liver, kidney and gizzard were measured and expressed as percentage of live weight. (Table 4).

2.7 Experimental Design

The experiment was conducted in a Completely Randomized Design and all data collected were subjected to Analysis of Variance (ANOVA) as outlined by Snedecor and

Cochran (1978). Where significant differences were observed, treatment means were compared using Duncan's Multiple Range Test as outlined by Obi (1990).

3.0 Results and Discussion

Data on the performance of the finisher broiler fed raw and cooked turmeric meal is presented in table 3. The body weight gain recorded the following values in the result obtained from analysis, 1020.14 , 1045.40, 906.16, 986.30, 1036.70, 1064.44 and 1046.30 g for 0.00, 1.0, 1.5 and 2.0 % raw turmeric rhizome meal and 1.0, 1.5, and 2.0 % cooked turmeric meal respectively. The daily body weight gain had 48.60, 49.80, 48.00, 47.00, 49.40, 51.00 and 49.82 g respectively. The daily feed intake yielded 164.70, 155.40, 156.10, 154.07, 150.50, 146.00 and 159.00 g respectively. The feed conversion ratio yielded 3.38, 3.12, 3.25, 3.28, 3.09, 2.86 and 3.20 respectively. The percentage mortality had 7.41, 3.90, 3.90, 0.00, 0.00, 0.00 and 0.00 % respectively. The body weight gain, daily feed intake, feed conversion ratio and percentage mortality showed non-significant ($p>0.05$) effects among the treatment groups as compared with the common control. Although treatment containing 1.5 % cooked turmeric rhizome meals performed better than control and all other treatment groups with body weight gain of 1064.4 g, daily weight gain of 51.0 g, daily feed intake of 146.0 g, feed conversion ratio of 2.86 and percentage mortality of 0.00 %. The results is in line with that reported by Namagirilakshmi (2005) who stated that broilers fed with turmeric at 0.25, 0.50, 0.75 and 1 % levels did not significantly differ in body weight gain. Also, previous reports indicated that dietary supplementation of turmeric rhizome meal promoted nutrient digestibility due to its photochemical properties which included the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune response and antibacterial, antiviral, antifungal and antioxidant actions (Toghyani *et al* 2010, 2011).

Table 3: Performance of Broiler Finisher Fed Diets Containing Graded Level of Raw and Cooked Turmeric Meals

	Dietary levels of Turmeric (%)							
	Raw				Cooked			
Parameters	0.0	1.0	1.5	2.0	1.0	1.5	2.0	SEM
Initial body weight (g/bird)	1100.00	1167.00	1213.33	1210.00	1167.00	1080.00	1100.00	91.57
Final body weight (g/bird)	2120.14	2212.04	2119.49	2196.29	2203.70	2144.44	2146.29	13.47
Body weight gain (g/bird)	1020.14	1045.04	906.16	986.30	1036.70	1064.44	1046.30	120.75
Daily body weight gain (g/bird)	48.60	49.80	43.15	47.00	49.37	51.00	49.82	5.75
Daily feed intake	164.70	155.40	156.10	154.07	150.50	146.00	159.00	8.94
Feed conversion ratio	3.38	3.12	3.25	3.28	3.09	2.86	3.20	0.39
Mortality (%)	7.41	3.90	3.90	0.00	0.00	0.00	0.00	2.91

However, in the present study, significant effects due to dietary inclusion of turmeric were not observed. The result obtained for mortality showed numerically a reduced group on the control due to higher mortality (7.41 %). However, 2.0 % raw and 1.0, 1.5 and 2.0 cooked turmeric rhizome meal groups recorded zero mortality. This may be attributed to health protective effect of compounds in turmeric such as the antioxidants, antimicrobial, ant mutagenic, etc. that kept birds in good health condition.

Carcass and internal organ weights of the experimental finisher broilers fed graded levels of raw and cooked turmeric meals are presented in Table 4 below.

The dressing percentage and percentage of the liver, heart, gizzard, and kidney were not affected by the treatments. Mehala and Moorthy (2008) failed to observe any significant impact of turmeric powder (up to 10 g/kg of diet) on carcass percentage of broiler chicken reared to six weeks of age. On the contrary, Durrani, Ismail, Sultan, Suhail, Chand & Durrani, (2006) reported higher dressing percentage, and higher breast, thigh and giblet weight in broilers fed diet containing 5g/kg turmeric powder. Soni, Lahiri & Chakradeo, (1997) reported that curcuminiods also protect the heart from cancer and mutagenicity. Durrani (2006) observed no effect on heart, liver and gizzard while Lal and Kapoor (1991) observed no improvement in liver and gizzard by dietary application of turmeric. Liver is a strategic organ involved in nutrient metabolism (Udedibie & Omekam 2001). Since there were no increases in weight of the liver among the treatment groups, it would appear that dietary inclusion of turmeric at the levels used in this study has no adverse effects on metabolism.

Table 4: Carcass and Internal Organ Weights of the Experimental Finisher Broilers Fed Graded Levels of Raw and Cooked Turmeric Meals.

	Dietary levels of Turmeric (%)							
	Raw				Cooked			
Parameters	0.0	1.0	1.5	2.0	1.0	1.5	2.0	SEM
Live weight (g)	2075.00	2400.0	2200.0	2350.0	2125.0	2225.0	2000.0	106.07
Dressed weight (g)	1587.50	1862.5	1712.5	1700.0	1550.0	1675.0	1500.0	96.13
Dressing percentage (%)	76.51	77.60	77.84	72.34	72.94	75.28	75.00	31.34
Gizzard (%)	3.48	2.59	3.18	3.78	3.02	3.59	3.34	11.05
Liver (%)	1.99	2.12	2.36	1.92	2.28	2.17	2.06	4.72
Kidney (%)	0.17	0.10	0.10	0.10	0.10	0.10	0.12	0.83
Heart (%)	0.42	0.44	0.55	0.45	0.58	0.53	0.46	2.37

Conclusion

Interestingly, some authors did not find beneficial effects of supplementing diets with turmeric meal at the rate of 1.0g/kg (Akbaria *et al.,* 2012) or 2.0g/kg (Mehala & Moorthy, 2008). These reports, including the present study suggested that a lot is yet to be

understood on the exact effect and mechanism of turmeric on poultry performance. It was evident that the different processing methods and the dietary levels used in this study had no effect on broiler performance based on the results obtained in this study and within the circumstances of the experiments. It can be concluded that sun-dried raw and cooked turmeric rhizome meal did not significantly affect broiler performance at the dietary levels used in this study.

References

Abbas, T.E.E. & Ahmed, M.E. (2010). Effects of supplementation of Nigella sativa seeds to broiler chicks diet on the performance and carcass quality. *International Jounal of Science,* 2(2), 09-13.

Anuwarul, H.G., Abdul, J., Muhammed, N. & Kashifu. (2006). Pharmacological basis for the use of turmeric in gastrointestinal and respiratory disorders. *Life Science,* 76, 3089-3105.

Athanasiadou, S., Githiori, J and Kyriazakis, I. (2007). Medicinal plant for helminthes parasites control: Facts and fiction. *Animal,* 1 (9), 1392 -1400.

Balunas, M.S. & Kenghora, A. D. (2005). Drug discovery from medical plants. *Life Science*, 78 (5), 431-441.

Durrani, FR., Ismail, M., Sultan, A., Suhail, S. M., Chand, N. & Durrani *(*2006). Effect of different levels oil seed added turmeric *(Curcuma!nnga)* on the performance of broiler chicks. *Journal of Agric and Biol Set.,* 1, 9-1148-51.

Holt, P.R., Kats, S. & Kirshoff, R. (2005). Curcumin Therapy in inflammatory bowel disease: A pilot study*, Digest. Dis. Sci.,* 50, 2191-2103.

Iqbal., Sharma, S.D., Okazaki, Y., Fujisawa, M. & Okada, S., (2003). Dietary influence of turmeric rhizome and black pepper on blood constituents and performance of broiler chickens. *Afr J Biotechnol*., 11, 8606-8611

Kamel, C. (2011). Natural plant extracts classical remedies brings modern animal production solutions. Feed manufacturing in the mediteranean B region. Improving safety: From feed to food. In: *Brufau J. (Ed) Zaragoza*: CIHEAM-IAM2, 31-38.

Lal B., Kapoor A.K. & Asthana O.P. (1999). Efficiency of Curcumin in the management of chronic anterio-uveitis. Phytother Res. 13(4), 318-322.

Mehala, C. & Moorthy, M. (2008). Production Performance of broilers fed with aloe vera and curcuma longa (Turmeric). Modification of productive performance and physiological aspects of broilers on the addition of a mixture of cumin and turmeric to the diet. *Int.J. Poult. Sci*., 7 (9), 852-856.

Namagirilakshmi, S. (2005). Turmeric *curcuma longa* as nutraceutical to improve broiler performance. Msc Thesis Submitted to Tamil Nadu Vertinary and Animal Sciences University, Chennai, India.

Obi I.U. (1990). Statistical method of detecting diff between treatments means 2nd Snaap press, Enugu, Nigeria.

Olojede, A.O. (2000). IITA/NRCRI collaborative Germplasm and Data Collection on root and tuber crops in Nigeria, NRCRI Animal Report. 2000.

Osawa*,* T., Sugiyama, Y., Inayoslii, M. & Kawakishi, S. (1995). Antioxidative activity of tetrahydtocurcuminoids. *BiosciBiotechnolBiochem,* 59, 1609-1612.

Polasa, K., Raghuram, T.C. & Krishna, T.P. (1991). Turmeric (Curcuma Longa L.) induced reduction in urinary mutagens. *Food chem. Toxicol.,* 29, 699-706.

Raeesi, M., Hoseini-Aliabad, S. A., Riofchaee, A., Shahneh, A. Z. V. & Pirali, S. (2010). Effects of periodical use of garlic (Allium Sativum) powder on performance and

carcass characteristics in broiler chickens. *World Acad. Sci. Eng. Technol.,* 68, 1213-1219.

Ramirez-Tortosa, M.C., Mesa, M.D., Aguilera, M.C., Quiles, J.L. & Baro, L. (1999). Oral Administration of a turmeric extract inhibits LDL oxidation and has hypocholesterolenic effects in rabbits with experimental atherosclerosis. Altherosclerosis, 147, 371-378.

Snedecor, G.W & Cochran, W.G. (1978). Statistical method, 6th ed., Lowa State University press, Amen, Lowa.

Soni, K.B., Lahiri, M., & Chakradeo, P. (1997). Protective effect of food additives on aflatoxin-induced mutagenicity and hepatocarcinogenicity. Cancer Letters, 115(2),129-133.

Toghyani, M., Gheisari, A.A., Ghalamkari, G. & Mohammedrezaei, M. (2010). Growth performance, serum biochemistry and blood hematology of broiler chicks fed different levels of black seed (*Nigella sativa)* and peppermint *(Mentha piperita). Livest. Sci*., 129, 173-178.

Toghyani, M., Gheisari, A.A., Ghalamkari, G. & Eghbalsaeid S. (2011). Evaluation of cinnamon and garlic as antibiotic growth promoter substitutions on performance, immune responses, serum biochemical and haematological parameters in broiler chicks. *Livest. Sci*., 13, 167-173.

Udedibie A.B.I & Omekam, V. N (2001) nutritional and health implications of dietary inclusions of dried poultry waste (DPW) for broilers. *Agro-science*, 24-29