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The Effect of *Curcuma longa* (Tumeric) on Overall Performance of Broiler Chickens

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Abstract: The effect of *Curcuma longa* (tumeric) feed additive on overall performance of broiler chickens was investigated. The implication of different diet inclusion levels (0.25, 0.5 and 1.0%) of tumeric on body weight gain, feed conversion, carcass analysis, lymphoid organ weight index and blood cell count of broilers were tested comparing to untreated control birds. It had been found that the higher body weight gain (1344.5 g) was observed in birds fed diet contained tumeric at level of 0.5% followed by birds received o.25% (1329.8), 1% (1306) and control (1268.2). Moreover, the feed conversion of birds received 0.5% tumeric in their diets were the best (2.08) as compared to controls (2.47) and other treated groups (2.27 and 2.31). Regarding carcass analysis, the protein percent of breast and thigh muscles of birds in different treated and control groups were found nearly the same. The lower fat percentage (1.0%) were recorded in carcasses of birds received 1.0% tumeric followed by 0.5, control and 0.25%. On the other hand, the higher bursa and thymus weight indices were detected in birds received diet containing 0.5% tumeric, while the higher spleen weight index was observed in birds received feed contained 1.0% tumeric. The results of organo-leptic test revealed that tumeric did not induce any abnormal flavor, color or smell. The higher levels of tumeric inclusion (0.5 and 1.0%) increased both erythrocytic and total leukocytic count. It could be concluded that the use of tumeric as feed additive at level of 0.5% enhance overall performance of broiler chickens and cost effectiveness study should be conducted.

Key words: Chicken, turmeric (*Curcuma longa*), organo-leptic test

Introduction

Curcuma longa, a perennial herb which is known as tumeric, is a member of the *Zingiberaceae*. The plant grows to a height of three to five feet and has oblong pointed leaves with bears funnel-shaped yellow flowers. The rhizome is the portion of the plant used medicinally; it is usually boiled, cleaned, and dried, yielding a yellow powder, turmeric, the ingredient that gives curry powder its characteristic yellow color. The active ingredients are tetrahydrocurcuminoids (Osawa *et al*.,1995), curcumin, demethoxycurcumin and bisdemethoxycutcumin (Wuthi-udomler *et al*., 2000).

Curcuma longa or turmeric is a medicinal plant widely used and cultivated in tropical regions. Plant extracts were found to have antifungal (Wuthi-udomler *et al*., 2000), imunomodulatory (Antony *et al*., 1999), antioxidative (Osawa *et al*., 1995) and antimutagenic (Soni *et al*., 1997) activities. Some of pharmacological activities of *Curcuma longa* as nematocidal (Kiuchi *et al*., 1993) and anti-inflammatory (Ammon *et al*., 1993) were demonstrated. Furthermore, the plant were used predominantly for endoparasites as well as internal and external injuries (Lans and Brown, 1998). Moreover, Soni *et al*. (1997) proved the protective effect of *Curcuma longa* food additives on aflatoxin-induced mutagenicity and hepatocarcinogenicity.

The presented paper was designed to investigate the possible effect of *Curcuma longa* feed additive on the overall performance of broiler chickens.

Materials and Methods

Experimental birds: Two hundreds day-old commercial broiler chicks were used in the study. They kept on the floor of isolated pens and received food and water.

Diets: The experimental birds fed commercial broiler starter basal diet alone or with tumeric powder added with different levels and assigned as treated diet. The chemical analysis of basal and treated diets were illustrated in Table 1.

Chemical analysis of diets and muscles of breast and thigh: Chemical analysis of experimental diets as well as muscles of breast and thigh of different treated and control group were carried out according to methodology described by AOAC (1984).

Experimental design: The experimental chicks were divided at age of day-old into 4 groups, each consisted of 50 chicks and assigned as groups 1-4. Each group was divided into two replicates. Birds group 1 were fed basal diet, while groups 2, 3 and 4 were fed basal diet supplemented with 0.25, 0.5 and 1% tumeric respectively during a five-weeks experimental period.

Table 1: Chemical analysis of both basal and tumeric treated diets

Aspect	Basal Diet	Treated Diet 1	Treated diet 2	Treated diet 3
Tumeric added	0.0 %	0.25 %	0.5 %	1%
Dry matter %	88.3	88.2	88.4	88.3
Crude protein %	21.5	21.6	21.4	21.1
Crude fiber %	3.28	3.23	3.31	3.33
Ether extract %	3.30	3.31	3.35	3.38
Ash %	6.9	7.02	7.1	6.53

Table 1a: Effect of different levels of tumeric feed additive on body weight development (g) of broiler chickens

Age in weeks	Control	0.25%*	0.5%*	1%*
0	43.3	42.4	44.2	41.8
1	136.4	128.2	133.5	129.2
2	335.1	329.6	343.7	349.5
3	664.7	678.4	683.2	669.9
4	961.9	1014.1	1123.8	987.4
5	1268.2	1329.8	1388.7	1306.9*

Levels of tumeric powder added to the basal diet.

Table 2: Effect of tumeric feed additive in different levels on overall performance of broiler chickens

Aspect	Control	0.25%*	0.5%	1.0%
Gain (g)	1224.9	1287.4	1344.5	1265.1
Food intake (g)	3025.5	3018.6	2888.5	3018.9
Feed conversion	2.47	2.27	2.08	2.31

Table 3: Crude protein and ether extract percentages in breast and thigh muscles of birds received different levels of tumeric as compared with controls

Organ	Content	Control	0.25%	0.5%	1%
Breast	Fat%	0.55	0.87	0.94	0.62
	Protein%	22.0	21.07	21.0	20.9
Thigh	Fat%	2.7	2.1	2.1	2.39
	Protein%	19.6	18.8	18	18.2

Table 4: Average fat percentage, liver and gall bladder weight as well as lymphoid organ weight indices of different groups at the end of experimental period as conducted on two cases of each group

Group	Fat%	Liver (g)	Gall bladder (g)	Spleen weight index	Bursa weight index	Thymus weight index
Control	3.0	26.04	2.41	1.03	1.98	2.33
0.25%*	3.4	30.45	2.10	1.53	2.43	2.73
0.5%*	2.0	33.55	1.80	1.67	2.66	2.79
1.0%*	1.0	29.20	1.50	1.76	2.37	2.53

* Levels of tumeric powder added to the basal diet.

Table 5: Results of organo-leptic test carried out on birds from each group

Aspect	Control	0.25%*	0.5%*	1%*
Smell	B**	B	A	A
Flavor	B	C	A	B
Color	A	C	B	B
Tender	C	A	A	A

* Levels of tumeric powder added to the basal diet. ** A = excellent, B = very good, C = good, D = expected, F = Fair

Table 6: Mean erythrocytic and leukocytic count for different groups

	Control	0.25%*	0.5%*	1%*
Mean erythrocytic count	245,000	248,000	264,000	268,000
Mean leukocytic count**	3,000,050	3,000,000	3,000,100	3,000,200

* Levels of tumeric powder added to the basal diet. ** The normal leukocytic count of poultry about 3,000,000

Weekly feed consumption for each group was determined. Mean initial and weekly body weight of birds for each group was determined, then body weight development was calculated.

By the end of the experimental period, all birds in each group were slaughtered, dressed and coded. Visual examination of carcasses of birds in groups 2, 3 and 4 were conducted to detect any abnormal color developed due to addition of tumeric as compared with control birds of group 1. Five birds from each replicate group were selected and weighed individually before slaughtering, then Liver, spleen, bursa as well as thymus were collected from those birds and weighed individually. Spleen, bursa and thymus weight indices were calculated according the following formula:

Organ weight index = (organ weight/live body weight) X 1000.

Four random breast and thigh samples were collected from the slaughtered chicks of each replicate group, two of them were subjected immediately for organo-leptic examination while the other two samples were analyzed chemically for their protein and fat percentage.

Results and Discussion

It had been found that the higher body gain (1344.5 g) was observed in birds fed diet contained tumeric at level of 0.5% followed by birds received o.25% (1329.8), 1% (1306) and control (1268.2). Moreover, the feed conversion of birds received 0.5% tumeric in their diets were the best (2.08) as compared to controls (2.47) and other treated groups (2.27 and 2.31). The increased body weight gain is due to the antioxidant activity of tumeric (Osawa *et al*., 1995) that stimulate protein synthesis by bird enzymatic system.

Regarding carcass analysis, the protein percent of breast and thigh muscles of birds in different treated and control groups were found nearly the same. The lower fat percentage (1.0%) were recorded in carcasses of birds received 1.0% tumeric followed by 0.5, control and 0.25%. That also could be explained according to previous observations of Osawa *et al*. (1995).

On the other hand, the higher bursa and thymus weight indices were detected in birds received diet containing 0.5% tumeric, while the higher spleen weight index was observed in birds received feed contained 1.0% tumeric. That could be explained according to the observations of Antony *et al*., 1999 who indicated the immunostimulatory activity of Curcumin which is the active ingredient extracted from *Curcuma longa*.

The results of organo-leptic test revealed that tumeric did not induce any abnormal flavor, color or smell.

The higher levels of tumeric inclusion (0.5 and 1.0%) increased both erythrocytic and total leukocytic count. Antony *et al*. (1999) proved that *Curcuma longa* extract administration was found to increase the total WRC count in Balb/c mice due to its immunostimulatory activity of Curcumin.

It could be concluded that the use of *Curcuma longa*, tumeric, as feed additive at level of 0.5% enhance overall performance of broiler chickens and cost effectiveness study should be conducted.

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