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IMPACT OF TURMERIC POWDER DIETARY SUPPLEMENTATION ON THE PERFORMANCE OF COMMERCIAL BROILER CHICKENS

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ABSTRACT

A study was undertaken to investigate the effect of dietary supplementation of turmeric (Curcuma longa) powder on the performance of commercial broiler chicken. This experiment was conducted at the Instructional Livestock Farm Complex, HICAST, Kirtipur, Nepal for 42 days from 20th May 2023 to 30th June 2023. A total of 200 day-old commercial broiler chicks comprising 50 chicks in each group with uniform body weight were randomly divided into four groups viz. T0 (diet with 0% Turmeric powder as control), T1 (diet with 0.5% Turmeric powder), T2 (diet with 0.75% Turmeric powder), and T3 (diet with 1% Turmeric powder). Experimental birds were provided adlib starter feed for first 21 days and continued with the finisher feed for another 21 days and had easy access to drinking water. Feed intake was recorded daily and body weight gain was measured at 7-day intervals. The final body weight was significantly higher ($p<0.05$) in the T1 group (2046.89 g) followed by T0 (1807.2 g), T2 (1773.55 g), and T3 (1742.323 g) respectively. With respect to overall FCR, the T1 group showed the best FCR value of 1.58 followed by T2 (1.74), T3 (1.86), and T0 (1.91). This study revealed that increased body weight improved FCR and highest BEPI in chicks fed with 0.50 % Turmeric powder. Thus, it can be recommended that Turmeric powder can be used as a natural feed additive in feed at the level of 0.50% to improve the overall performance of broiler chicken.

Keywords: Cobb 500, Feed Intake, FCR, Turmeric, Weight Gain

INTRODUCTION

Poultry business being one of the major agricultural practices (Osti *et al.*, 2017) is an important occupation of the people in Nepal. Easy rearing, less manpower, and less investment are possible causes for people's attraction to this field. In the world, Nepal stands at 112th in the chicken meat production ranking and 92nd in

the egg production ranking (Shrestha *et al.*, 2014). There is tremendous growth in poultry farming in the last six decades and it creates income generation in urban and periurban areas (Bhattarai, 2005). Poultry farming is extensively increasing in Nepal and has a greater contribution to the National GDP (Gross Domestic Production). Poultry production contributes 4% of the national GDP alone. The poultry population of Nepal is estimated to be 82,598,879 (Statistical-Information-On-Nep… 2023). Typical broilers have white feathers and yellowish skin. Most commercial broilers reach slaughter weight at between five and seven weeks of age, although slower-growing breeds reach slaughter weight at approximately 14 weeks of age (Kruchten, 2002).

Turmeric (*Curcuma longa*) is one of such perennial herbs that contains an active component named curcumin (Mashhadani, 2015) and it ranges from 2 to 5% of the Turmeric (Bagchi, 2012). The therapeutic properties of curcumin included antibacterial, anticoccidial, antioxidant, hypocholesterolemic, hypolipidaemic, immunomodulatory, and hepatoprotective properties (Hussein, 2013, and Qasem *et al.*, 2015). It also possesses anti-inflammatory (Holt *et al.*, 2005). Considering the above facts, the present study was undertaken to determine the dietary supplementation of Turmeric powder on the performance of broiler chicken fed at different levels with feeds.

The general objective of this study is to assess the effects of dietary supplementation of Turmeric powder on the growth performance of broiler chicken. Other specific objectives are to evaluate the body weight gain; feed intake of boiler chicken in different treatment groups; find out the feed conversion ratio (FCR) and Broiler Performance Efficiency Index (BPEI).

As Turmeric is locally available, this study may help to reduce cost production in poultry farming and to uplift their economic status which will be beneficial to the farmer. Thus, the rationale for this thesis lies in addressing the need to explore the potential benefits of Turmeric as a feed additive and consider the economic implications of such supplementation.

MATERIALS AND METHODS

The study was conducted in the Instructional Livestock Farm Complex, HICAST, Kirtipur, Nepal with Cobb 500 broiler chicken from 20th May 2023 to 30th June 2023 for 42 days (6 weeks). Chickens were kept in a deep-litter system of rearing. Two hundred experimental day-old chickens were procured from the Hatchery

and kept in four treatment groups with two replications having 25 birds in each replication by using Complete Randomized Design (CRD). The control treatment group (T0) was fed with basal diet without any turmeric powder supplementation and the treatment group T1, T2 and T3 were supplemented with different levels of Turmeric powder variety of turmeric powder at the rate of 0.5gm/kg, 0.75gm/kg, and 1gm/kg feed respectively. A concentrated mixture was given on a group basis and was provided to the experimental birds twice a day (morning and evening) in adlib amounts for both periods (starter-21 days and finisher-21 days) of the experiment. Drinking water was provided in adequate amounts. The quantity of concentrate mixture was weighed and given to the birds in the group and refusal was weighed the next morning. The body weight gain was measured on a group basis (replication-wise) in seven-day intervals in the morning before feeding. The recorded data were analyzed using Microsoft Excel's One-way Analysis of Variance (ANOVA) in a randomized block design. All statistical analysis was performed using Microsoft Excel. The level of statistical analysis was defined at (5%) level of significance.

RESULTS AND DISCUSSION

Weekly Feed Intake and Total Feed Consumption

The mean weekly feed intake of the present study indicated that during the 1st week of age, the feed intake was higher in the T0 group, and T1, T2, and T3 groups were comparatively slightly lower.

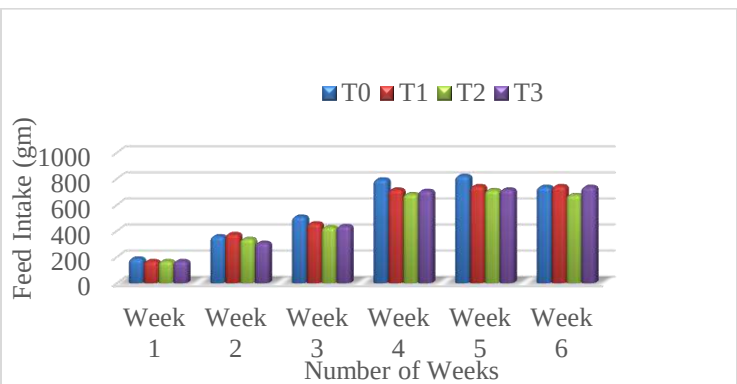

Figure 1. Feed intake gm per chicken

During the 2nd week of age, the highest feed intake was found in the T1 group (1850g) and the lowest in the T3 group (1550 g). During the 6th week of age, similar feed intake was found in the T0, T1, and T3 groups and lowest in the T2 group. Thus, it is proved that, among all weeks, except in the 2nd where T1 is better and 6th where T3 is better T0 revealed higher feed intake compared to other treatment groups. The total feed consumption per broiler for different experimental groups was found to be highest in the T0 group (3418.62 g) and lowest in the T2 group (3015.04 g).

Similar findings with respect to feed intake were observed by several reserchers (Sharma *et al.,* 2015; and Shah, *et. al.,* 2023) where the addition of Turmeric powder does not show improvement in feed intake as compared to control(T0). These findings were supported by Nouzarian *et al*. (2011). Contrary to the present observation, (Ahlawat *et al.,* 2018) reported improved feed efficiency in the treatment group; this might be due to differences in agro-climatic conditions (Mehala and Moorthy, 2008).

Weekly Body Weight and Body Weight Gain

The (Mean± S.E.) weekly body weight of different experimental groups did not differ significantly during the 1st week of age. In the 2nd week, body weight differed significantly ($p<0.05$) among different treatment groups. The T1 group achieved significantly ($p<0.01$) higher body weight (422.40 g) as compared to T0, T2, and T3 groups (395.60, 365.60, and 321.40 g), respectively.

Table 1. (Mean ± S.E.) weekly body weight (g) of broilers under different treatments

Week	Group			
	T0 (Control)	**T1 (TP-0.5%)**	**T2 (TP-0.75%)**	**T3 (TP-1%)**
1st	165.5^{a} ±23.75	156.83^{a} ±7.24	156.16^{a} ±10.22	144.83^{a} ±13.74
2nd	395.6^{ab} ±51.33	422.4^{a} ±44.11	365.6^{b} ±25.35	321.4^{c} ±35.82
3rd	735^{a} ±87.18	748^{a} ±69.24	625^{b} ±101.14	600.5^{b} ±89.83
4th	1148.8^{a} ±82.53	1161.4^{a} ±90.94	1041^{b} ±126.42	1043^{c} ±104.41
5th	1538^{ab} ±99.68	1655.7^{a} ±147.88	1489.2^{b} ±92.89	1484.5^{b} ±122.99
6th	1807.2^{a} ±131.62	2046.89^{b} ±146.33	1773.55^{a} ±161.42	1742.323^{a} ±120.07

Means bearing the same superscripts in a row do not differ significantly

In the 3rd and 4th weeks, body weight differed significantly ($p<0.05$) among the different treatment groups. The T0 and T1 groups achieved significantly ($p<0.01$) higher body weight as compared to T2 and T3 groups. During the 5th and 6th week of age, the body weight of broiler chickens differed significantly ($p<0.01$) among the different experimental groups. The T1 gained significantly ($p<0.01$) higher body weights as compared to the T0, T2, and T3 groups during the 5th and 6th week of age.

The initial body weight of day-old broiler chicks fed on different dietary treatments were similar that is 45.5 g. The mean weekly weight gain of the present study indicates that 1st week weight gain is almost similar in all groups.

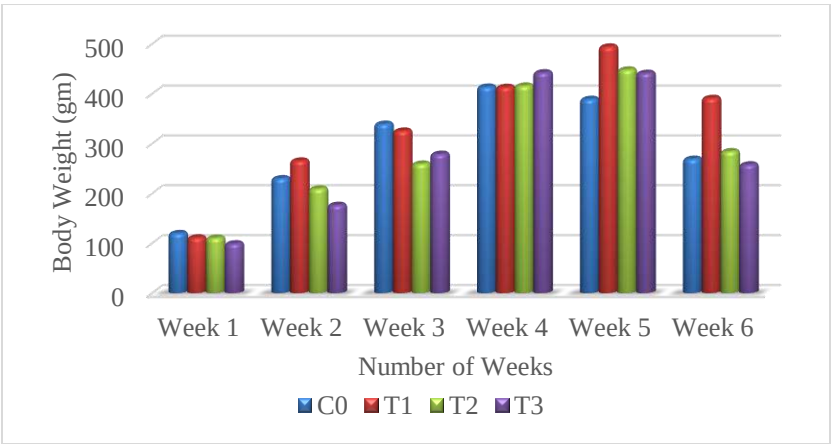

Figure 2. Weekly body weight gain (g/bird) of broilers under different treatment groups

The control group grew the most body weight (120 and 339.4 g) during the 1st and 3rd weeks of age, and the T3 group gained the most (442.50 g) during the 4th week of age. The T1 group experienced the largest body weight gain at the 2nd, 5th, and 6th weeks of age (265.57, 494.3, and 391.19 g). The experimental birds' average mean body weight ranged from 45.5 g at the start to 1842.5 g at the conclusion. The T1 group (2046.89 g) saw the largest increase in total body weight, followed by the T0 (1807.2 g), T2 (1773.55 g), and T3 (1742.32 g) groups, in that order.

The improvement in body weight and body weight gain of the broiler chickens due to supplementation of Turmeric powder in the diets might be due to the increased length of the intestinal villi as well as decreased pH in the intestine (Sieo

et al., 2005). Turmeric decreased the intestinal microbes, population and selectively increased the Lactobacillus count (Sieo *et al.,* 2005; and Namagirilakshmi *et al.,* 2010). This reduction in the microbial load of broiler chickens could be due to the antibacterial effect of Turmeric on intestinal microbiota (Faghani *et al.,* 2014). Turmeric also enhanced the secretion of digestive enzymes and hence improved nutrient absorption, ultimately resulting in improved growth performance (Arslan *et al*., 2017). These findings corroborated well with the reports of Sharma *et al.* (2015).

Feed Conversion Ratio

Among the different experimental groups, the mean weekly feed conversion ratio of the T1 group showed the best FCR values during the 1st (1.523), 2nd (1.422), and 3rd (1.41) weeks of age. In the 4th week, the T3 group showed the best values (1.601) as compared to other groups. In the 5th and 6th weeks, the mean FCR value of the T1 group (1.507 and 1.904)) was the best among all the experimental groups. In the 6th week of age, the T1 group (1.904) showed the best FCR followed by the T2 (2.381), T0 (2.747), and T3 (2.867) groups, respectively.

The overall FCR of the entire period of the experiment was best in the T1 group (1.584) followed by T2 (1.7392), T3 (1.856), and T0 (1.905867) groups, respectively.

Table 1. Mean weekly feed conversion ratio of broilers under different treatment groups

Week	Group			
	T0 (Control)	**T1 (TP-0.5%)**	**T2 (TP-0.75%)**	**T3 (TP-1%)**
1st	1.58	1.52	1.54	1.71
2nd	1.57	1.42	1.62	1.76
3rd	1.50	1.41	1.66	1.57
4th	1.92	1.74	1.64	1.60
5th	2.12	1.51	1.59	1.63
6th	2.75	1.90	2.38	2.87
Overall	1.91	1.58	1.74	1.86

The better feed conversion ratio can be attributed to the antimicrobial properties of Turmeric powder which resulted in better absorption of the nutrients in the gut and finally led to improvement in feed conversion ratio (Ong-ard *et al.,* 2010).

Turmeric could control and limit the growth and colonization of numerous pathogenic and non-pathogenic species of bacteria in chicken's gut resulting in a balanced gut microbial ecosystem that leads to better feed utilization reflected by improved feed conversion ratio (Hussein, 2013). Similar observations were reported by several researchers (Naderi *et al.*, 2014; and Arslan *et al.*, 2017). On the other hand, the addition of Turmeric powder in the broiler ration did not show significant differences in feed conversion ratio according to the findings of Mehala and Moorthy, (2008); and Fallah and Mirzaei, (2016).

Broiler Performance Efficiency Index (BPEI)

Among the different treatment groups**,** the T2 group showed the highest BPEI (129.55) followed by T2 (101.93), T0 (94.62), and T3 (93.67) group.

Table 2. Broiler Performance Efficiency Index (BPEI) of broiler birds in different treatment groups of broiler chicken

Group	**BPEI**
T0	94.62
T1	129.55
T2	101.93
T3	93.67

Similar findings with respect to improvement in efficiency index were observed in previous findings, Attia *et al.* (2017) in broiler chicken. The higher value of BPEI in the T2 group was due to higher average body weight and better feed conversion ratio in broiler chicken during the entire experimental trial. Contrary to the present observation, Choudhury *et al.* (2018) found T3 had the highest efficiency index while T0 had the lowest efficiency index.

CONCLUSION

Based on the results of the present study, it may be concluded that Turmeric powder supplemented at a level of 0.5% Turmeric powder has a significant effect on body weight gain, and FCR, though there were no differences in feed intake. This suggests that the supplementation of Turmeric (*Curcuma longa)* powder at 0.5% level in diets has a high potential for commercial applications for the

production performance of broilers. However, further study should be conducted to validate this finding in the farmer's field for wider dissemination.

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