RESEARCH ARTICLE

Effect of Addition of Turmeric (*Curcuma longa*) and Ginger (*Zingiber officinale*) on Feed Intake and Growth Performance in Broilers

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Abstract

The aim of this study was to evaluate the effect of the addition of Turmeric (*Curcuma longa*) and Ginger (*Zingiber officinale*) alone and in combination on feed intake and growth performance in broilers. A total of 180 one-day-old broiler chicks (VENCOBB) were brooded for 2 weeks, then randomly allocated into four treatments with three replicates of 15 birds each. Group T1 Birds were fed on basal diet, T2 and T3 supplemented with turmeric powder and ginger powder @1.5 %, respectively, and T4 group birds were fed 0.75 % turmeric powder and 0.75% ginger powder in combination. All the treatment groups were further divided into three replicates, *viz.*, R_1, R_2, and R_3 (n=15 chick each). Statistical analysis of data revealed that there were no significant differences in the overall average daily feed intake and weekly feed intake but there was a highly significant difference ($p < 0.01$) in the body weight at the end of the 6th week in T2 group as compared to other treatment groups. It was concluded that supplementation of diet with turmeric powder @ 1.5% improved the growth performance in broilers.

Keywords: Broilers, Ginger, Growth performance, Herbal feed additives, Turmeric.

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Introduction

Antibiotic supplementation in diets promotes growth and plays a key role in poultry production, but prolonged antibiotic use may develop antibiotic resistance. Therefore use of antibiotics as growth promoters in poultry feed has been banned by many countries. Recently, there has been an increasing interest in finding alternative substances and strategies to improve the health and production of poultry birds.

Different spices have been used as feed additives all over the world along with the history which has received high attention as nutraceuticals and multifunctional feed supplements for various purposes in poultry production during recent years. Turmeric rhizome (*Curcuma longa*) is an extensively used spice, food preservative, and coloring material that has biological actions and medicinal applications (Burt, 2004). The main component of turmeric is curcumin that is a good antioxidant (Karami *et al*., 2011), possesses antiviral (Liu *et al*., 2013a) and antibacterial activities (Liu *et al*., 2013b) with hypo-cholesterolemic properties. Ginger (*Zingiber officinale*) is a pro-nutrient and widely used as a food condiment. Due to presence of the components gingerol, and gingerdione (Dieumou *et al*., 2009), ginger has antibacterial, anti-inflammatory, antiseptic, anti-parasitic, and immuno-modulatory properties (Onu, 2010).

In view of above facts, the present study was undertaken to assess the effect of herbal feed additive, *viz.*, turmeric and ginger on feed intake and growth performance in broiler birds.

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Materials and Methods

The study was conducted on 180 unsexed, one-day-old 'VENCOBB' broiler chicks for a period of six weeks. The wing bands were applied, and the chicks were weighed individually and distributed randomly into four treatment groups, consisting of 45 chicks in each, and subdivided into three replicates (n-15 chicks each). The chicks were reared in a deep litter system. Standard farm management practices were followed throughout the experimental period. Feed and water was provided *ad libitum*. All the day-old chicks were

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vaccinated against Marek's disease at the time of purchase and New Castle Disease by eye drop on 7th day and against Infectious Bursal Disease on 14th day of age. Strict thorough sanitary measures were adopted, and care was taken not to allow any scavengers in the poultry house to minimize the disease occurrence.

The broiler starter (0-28 days) and broiler finisher (29-42 days) feeds for different treatments were prepared as per the guidelines of BIS (1992). Turmeric and ginger powder were mixed in the feed either alone @ 1.5 % or in combination turmeric @ 0.75% and ginger @ 0.75. Group T_1 Birds were fed on a basal diet, T_2 and T_3 supplemented with turmeric powder and ginger powder @1.5 %, respectively, and T_4 group birds were fed 0.75 % turmeric powder and 0.75% ginger powder in combination. The weekly feed intake and body weight were recorded for each group of treatment from 0-6 weeks. During the experiment, average weekly feed intake was recorded and used for calculation of average total feed intake per bird during starter (0-4 weeks), finisher (5-6 weeks) phase, and for the overall experimental period (0-6 weeks).

The data were subjected to statistical analysis by applying a completely randomized design (Snedecor and Cochran, 1994). Duncan's new multiple range test tested the significance of mean difference.

Results and Discussion

Weekly Average Feed Intake

The average data for weekly feed intake (g) presented in Table 1 shows that during starter phase, there was no significant difference in weekly feed intake between groups T_1 to T_4; however, numerically slightly higher feed intake was observed in T_2 group and lowest in T_3 group. The data for average total feed intake (g) during the finisher phase (5-6 weeks), however, revealed significantly ($p < 0.05$) the lowest value in T_4 group supplemented with a combination of turmeric and ginger powder @ 0.75% each. The highest in T_3 group supplemented with 1.5% ginger powder alone, the values of T_2 (1.5% turmeric) and T_1 (control) groups were intermediate of other two groups. Moreover, the overall average total and daily feed intake (g) during the entire experimental period (0-6 weeks) did not differ significantly between treatment groups T_1, T_2, T_3, and T_4. However, it was numerically higher for T_3 group followed by T_2, T_1, and T_4 groups (Table 1). The inconsistent results obtained might be due to biological variation in the individual bird**.** Similar findings were reported by AL-Sultan (2003), Onu (2010), Rajput *et al.* (2012), and Mondal *et al.* (2015). On the contrary, Reddy *et al.* (2012) and Rafiee *et al.* (2013) reported that there was a significant difference in feed intake among different treatments. A significant decrease in feed intake for group supplemented with 1.5% ginger powder was observed by AL-Jaleel (2012) as compared to control. Further, the results obtained for daily feed intake were in agreement with those of Onu (2010), Mohammed and Yusuf (2011) and Adeyemo *et al.* (2016), while Wang *et al.* (2017) reported a significant difference among the control group in average daily feed intake.

Weekly Average Growth Performance

The average weekly body weight (g) of experimental broiler chicks fed different supplemented diets is presented in Table 2. Statistical analysis of data revealed that there was highly significant difference ($p < 0.05$) in body weight at the starter phase (4th week) as well as finisher phase (5-6th week) in T_2 compared to T_1 and T_3. The value of T_3 group was comparable with T_4 group during starter phase. At the end of 6th week (finisher phase), body weight gain was highest ($p < 0.01$) in T_2 group as compared to other treatment groups. At the same time, the body weight in T_1, T_3, and T_4 were comparable with each other at the end of the experiment. Similar findings were reported by Hussein (2013) and Rajput *et al.* (2013). However, on the contrary, Mehala, and Moorthy (2008), Nouzarian *et al.* (2011) and Wang *et al.* (2017) reported

Table 1: Average weekly feed intake (g/bird) of broiler chicks fed diets supplemented with turmeric and ginger powder alone and in combination

	Treatment group			
Weeks	T_1	T_2	T_3	T_4
1st	104.16 ± 3.38	103.20 ± 2.22	96.86 ± 4.47	96.03 ± 2.27
2nd	359.82 ± 13.23	368.16 ± 14.21	373.56 ± 16.01	378.57 ± 2.18
3rd	641.70 ± 7.34	643.18 ± 5.39	651.05 ± 23.39	648.45 ± 1.52
4th	912.64 ± 41.41	906.81 ± 3.09	841.41 ± 90.83	856.25 ± 45.93
Starter phase	2018.32 ± 43.24	2021.34 ± 9.47	1962.89 ± 103.46	1979.31 ± 46.58
5th	988.02^{bc} ± 64.87	1115.13^{a} ± 19.17	1104.75^{ab} ± 28.78	921.33^{c} ± 25.85
6th	1510.88^{a} ± 29.84	1386.62^{b} ± 15.15	1487.18^{a} ± 33.92	1512.18^{a} ± 32.83
Finisher phase	2498.90^{ab} ± 35.64	2501.74^{ab} ± 8.74	2591.93^{a} ± 44.13	2433.51^{b} ± 13.34
Overall total feed intake	4517.22 ± 47.16	4523.09 ± 10.11	4554.81 ± 32.56	4412.82 ± 35.09
Overall daily feed intake	107.55 ± 2.96	107.69 ± 0.24	108.45 ± 3.12	105.07 ± 0.84

Means with different superscript within the row differ significant ($p < 0.05$)

Table 2: Growth performance of experimental broiler chicks fed different supplemented diet

	Treatment groups			
Weeks	T_1	T_2	T_3	T_4
	Average weekly body weight change (g)			
Initial	55.96 ± 0.35	57.42 ± 0.09	57.31 ± 0.71	56.91 ± 0.21
1st	183.33 ± 0.49	183.66 ± 0.26	183.98 ± 0.37	183.47 ± 0.41
2nd	424.92 ± 7.43	422.85 ± 4.13	412.25 ± 9.43	406.79 ± 9.90
3rd	853.78 ± 11.81	851.31 ± 9.04	827.60 ± 18.43	824.53 ± 18.37
4th	1450.55^{ab} ± 2.53	1466.82^{a} ± 2.24	1423.84^{b} ± 18.80	1425.41^{b} ± 6.44
5th	2040.83^{ab} ± 19.87	2098.30^{a} ± 8.29	2082.26^{a} ± 25.52	2018.76^{b} ± 12.40
6th	2711.62^{b} ± 9.59	2844.51^{a} ± 13.67	2736.84^{b} ± 32.22	2683.94^{b} ± 32.44
	Average weekly body weight gain (g/bird)			
Starter Phase	1394.59^{ab}	1409.40^{a}	1366.53^{b}	1368.50^{b}
Finisher Phase	1261.08^{b}	1386.69^{a}	1313.00^{a}	1258.54^{b}
Entire Period	2655.67^{b}	2796.09^{a}	2679.53^{b}	2627.03^{b}
	Feed Conversion Ratio			
Starter Phase	1.27	1.33	1.34	1.36
Finisher Phase	1.96	1.80	1.85	1.92
Entire Period	1.50	1.49	1.51	1.55

*($p < 0.05$); ** ($p < 0.01$; Means with different superscript within the row differ significant ($p < 0.05$),); NS= Non significant

that there was no significant difference in body weight gain in broiler chicks among different treatment groups during the entire experiment period.

Average weekly body weight gain

The average body weight gain in experimental broiler chicks in different treatment groups during starter phase, finisher phase, and entire period are presented in Table 2. Statistical analysis of data revealed that there was a significant difference ($p < 0.05$) in average body weight gain at starter phase (4th week) whereas highly significant difference ($p < 0.01$) at finisher phase (5-6th week) as well as during entire period in T_2 group as compared to other groups during different stages of growth. Similar findings were reported by Mondal *et al*. (2015), Sethy *et al*. (2016), and Kafi *et al*. (2017). On the contrary, Naderi *et al*. (2014) reported no significant effect of the addition of turmeric powder in diet on body weight gain in broilers.

Feed Conversion Ratio (FCR)

Statistical analysis of data revealed that there was no significant difference in feed conversion ratio (FCR) among different treatment groups in all stages of growth (starter, finisher and entire period). During starter phase, the numerically lowest FCR was observed in T_1 group whereas during finisher phase and entire period, numerically lowest FCR was observed in T_2 group (Table 2). Similar findings were reported by Reddy *et al*. (2012). However, AL-Mashhadani (2015), Kafi *et al*. (2017) and Wang *et al*. (2017) reported significant improvement in FCR in broilers fed different levels of turmeric powder.

Conclusion

It was concluded that incorporation of herbal feed additive, *viz*., Turmeric (*Curcuma longa*) and Ginger (*Zingiber officinale*) alone and in combination in the ratio of broilers had no significant effect on feed intake and feed conversion ratio but supplementation of diet @ 1.5% turmeric powder improved the growth performance in broilers.

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