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Effect of Supplementing Different Levels of Peppermint Powder on Production Performance of Broilers

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A B S T R A C T

Different strategies are being followed to enhance the body growth and economize the poultry feed. Use of peppermint powder is one such approach. This research work consisted of a total number of 160 day-old broiler chickens (*Gallus gallusdomesticus*) of vencobb strain were taken and the experimental birds divided into 4 treatment groups viz. T_1 (control), T_2, T_3 and T_4 with two replicate in each treatment group, having 20 broiler chickens in every replicate in a complete randomized design. Birds supplemented with peppermint leaf powder showed higher body weight and FCR as compared to control group. The birds supplemented with 0.5% of peppermint leaf powder had the best FCR and was found to be economical.

Introduction

India is world's fifth largest egg producer and the eighteenth largest producer of broilers. Driving this kind of expansion the contributing factors are - growth in per capita income, a growing urban population and falling poultry prices. The use of phytogenics as feed additives is gaining importance due to their antimicrobial and stimulatory effects on digestive system (Jamroz *et al.*, 2005; Jang *et al.*, 2004). They include herbs, spices or plants that are used to keep the gut microflora of poultry normal, which is a prerequisite for cost efficient and ecofriendly poultry production (Windisch and Kroismayr, 2008.

Mentha piperita (Lamiaceae), the peppermint (mint) plant is an aromatic perennial herb cultivated in most part of the world, have traditionally been used in folk medicine. Peppermint (*Mentha piperita* L.) is widely used in herbal medicine and is believed to be particularly beneficial in building the immune

system, and for its antimicrobial and strong antioxidant properties, as well as in its ability to enhance appetite, mainly due to its active components (Dorman *et al.*, 2003). Feeding of Fish silage at 5% level proves to be economical for growth of broiler Japanese quail (Mohanty *et al., 2020*). Durrani *et al.*, (2008) conducted a research in broiler by supplementation of Habek mint in feed at the rate of 5 (group A), 10 (B) and 15 g/kg(c) and group D was kept control and concluded that feeding habek mint @ 15g/kg feed, highest gross return of the broilers.

Materials and Methods

This research work was carried out at Instructional Livestock Farm Complex and Department of Livestock Production and Management, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar, Odisha.

A total number of 160 day-old broiler chickens (*Gallus gallusdomesticus*) of vencobb strain were taken and the experimental birds divided into 4 treatment groups viz. T_1 (control), T_2, T_3 and T_4 with two replicate in each treatment group, having 20 broiler chickens in every replicate in a complete randomized design. The dietary management were as follows:

Table.1 Experimental design

Groups	Dietary treatment
T_1 (Control):	**Basal diet**
T_2:	**Basal Diet+0.1% peppermint powder**
T_3:	**Basal Diet+0.3% peppermint powder**
T_4:	**Basal Diet+0.5% peppermint powder**

Processing of experimental peppermint powder

Purchase of Fresh peppermint herbs from local market

↓

Washed and dried under sun for 4-5 days

↓

Collection of only the dried peppermint leaves

↓

Dried leaves ground to powder

↓

Peppermint powder packaged for use

The chickens were weighed group wise by top pan electronic weighing balance nearest to 1 g accuracy in each week up to the end of 5th week were recorded. Daily feed offered to the birds were recorded group wise. The group average feed consumption was calculated by

subtracting the left over feed at the end of each week from the total feed supplied to the birds during the said weeks. Cumulative feed consumption was calculated by adding the feed consumption from 1st week up to the desired week.

$$\text{Feed conversion ratio} = \frac{\text{Feed consumption in gram up to a particular week}}{\text{Body weight gain in gram up to that week}}$$

All the data generated in the above experiments were statistically analysed using IBM SPSS 22.0computer package. For comparison of groups, Generalized Linear Model, ANOVA procedure and Duncan's multiple range tests were used.

Results and Discussion

The effect of feeding different levels of dried peppermint leaves powder on the body weight of the experimental birds is presented in Table 2.

Table.2 Average weekly body weight (g) of the experimental broiler birds under different dietary treatments

Age	T_1	T_2 (0.1%)	T_3 (0.3%)	T_4 (0.5%)
0 day	42.50 ± 1.41	43.00 ± 2.23	43.50 ± 1.58	42.50 ± 1.68
7th day	143.66 ± 3.12	149.33 ± 2.56	152.16 ± 2.18	154.11 ± 1.99
14th day	424.00^{a} ± 6.47	442.50^{a} ± 8.37	448.66^{ab} ± 9.53	462.72^{b} ± 7.12
21st day	783.50^{a} ± 13.35	809.50^{a} ± 11.88	842.32^{ab} ± 13.25	868.66^{b} ± 13.56
28th day	1379.11^{a} ± 17.89	1444.33^{b} ±19.97	1496.50^{c} ± 18.15	1517.79^{c} ± 16.98
35th day	1918.55^{a} ± 25.03	1993.46^{b} ± 21.01	2059.55^{c} ± 21.68	2141.15^{d} ± 22.35

*Means bearing different superscripts differ significantly along the rows

There was no significant variation ($p>0.05$) with respect to the mean day-old body weight and mean body weight on 7th and 14th day. The day-old body weight ranged from 42.50 ± 1.41 g in T_1 to 43.50± 1.58 g in T_3. On both 7th and 14th day, T_4 birds had the highest body weight 154.11 ± 1.99 g and 462.72 ± 7.12 g, respectively, though there was no statistical superiority.

Table.3 Average weekly body weight gain (g) of the experimental birds under different dietary treatments

Week	T_1	T_2	T_3	T_4
1st week	101.16± 4.67	106.33± 3.73	108.66 ± 3.69	111.61 ± 2.98
2nd week	280.34 ± 4.31	293.17 ± 3.78	296.50 ± 3.04	308.61 ± 3.99
3rd week	359.50± 3.77	367.00 ± 4.23	393.66 ± 4.33	405.94 ± 4.76
4th week	595.61 ± 3.65	634.83 ± 4.12	654.18 ± 3.59	649.13 ± 4. 98
5th week	539.44 ± 4.92	549.13 ± 3.37	563.05 ± 3.86	623.36 ± 4.71

*Means bearing different superscripts differ significantly along the rows

On 21st day, the birds under T_4 showed the highest body weight (868.66± 13.56 g), which was statistically significant ($p>0.05$) as compared to T_1 (783.50± 13.35 g), T_2 (809.50 ± 11.88 g) and T_3 (842.32 ± 13.25 g). When the experimental birds attained 28th day, the

body weight of birds in T_4 exhibited the highest body weight (1517.79^{c}± 16.98 g), which was significantly higher than the rest. Body weight of the birds under T_2 and T_3 were statistically comparable at 28th day age (1444.33 ± 19.97 *vs*. 1496.50 ± 18.15 g). At the end of the experiment on 35th day, the birds from T_4 had the highest body weight (2141.15± 22.35 g), which was significantly higher ($p>0.05$) than T_1, T_2 and T_3. At this age, the body weights of the experimental birds under T_2 and T_3 did not significantly (1993.46 ± 21.01 g *vs*.2059.55 ± 21.68 g).

The effect of feeding different levels of dried peppermint leaves powder on the weekly body weight gain of the experimental birds is presented in Table 3.

In the first week, the average body weight gain in all the treatment groups were statistically comparable ($p>0.05$) ranging from 101.16 ± 4.67 g in T_1 to 111.61 ± 2.98 g in T_4. During the second week of the experiment, birds from T_4 group had the highest body weight gain which was statistically superior ($p>0.05$) to the T_1 i.e. control group. Though the body weight gain in T_4 group was numerically better than T_2 and T_3, there was no statistical significance.

During the third week of experiment, birds from T_4 group showed statistically higher body weight gain (405.94 ± 4.76 g) than rest three treatment groups. There was no statistically significant variation in the body weight gain of the birds under T_1, T_2 and T_3 groups. In the fourth week, a statistically higher ($p>0.05$) body weight gain was observed in the birds from T_3 group (654.18 ± 3.59 g) as compared to T_1 (595.61 ± 3.65 g), T_2 (634.83 ± 4.12 g) and T_4 (649.13 ± 4.98 g). The difference in the body weight gain of the birds under T_3 and T_4 birds was not statistically significant ($p>0.05$), where the birds from T_2 group had significantly higher ($p>0.05$) body weight gain than T_1.

During the final i.e. fifth week of the experiment, the T_1 birds had the lowest body weight gain (539.44 ± 4.92 g) as compared the rest of the treatment groups, which was comparable to T_2 (549.13 ± 3.37 g) and T_3 (563.05 ± 3.86 g) birds ($p>0.05$). During this period, the performance of the experimental birds under T_4 group (623.36 ± 4.71 g) was significantly higher ($p>0.05$) than T_1 birds (539.44 ± 4.92 g). The cumulative body weight gains of the experimental birds under different dietary treatments have been depicted in the Table 4.

Table.4 Average cumulative body weight gain (g) of the experimental birds under different dietary treatments

Week	T_1	T_2	T_3	T_4
0-1	101.16 ± 3.42	106.33 ± 4.03	108.66 ± 3.65	111.61 ± 4.67
0-2	381.50^{a} ± 4.91	399.50^{b} ± 5.53	405.16^{b} ± 5.86	420.22^{c} ± 6.23
0-3	741.00^{a} ± 7.65	766.50^{b} ± 8.66	798.82^{c} ± 9.08	826.16^{d} ± 10.31
0-4	1336.61^{a} ± 11.21	1401.33^{b} ± 13.34	1453.00^{c} ± 12.75	1475.29^{c} ± 13.24
0-5	1876.05^{a} ± 15.26	1950.46^{b} ± 17.73	2016.05^{c} ± 16.33	2098.65^{d} ± 17.71

*Means bearing different superscripts differ significantly along the rows.

The cumulative body weight gain up to second week (0-2 weeks) was significantly higher ($p>0.05$) in T_4 (420.22 ± 6.23 g) and T_3 (405.16 ± 5.86 g) as compared to T_1 (381.50 ± 4.91) and T_2 (399.50 ± 5.53 g) birds. The experimental birds under T_4 group had significantly higher ($p>0.05$) cumulative body weight gain up to third week (826.16 ±

10.31 g) as compared to rest three treatment groups. Similar result was also observed for the cumulative body weight up to fourth week, where it was significantly maximum (p>0.05) in T_4 birds (1475.29 ± 13.24 g), followed by T_3 birds (1453.00 ± 12.75 g), T_2 (1401.33 ± 13.34 g) and lastly T_1 (1336.61 ± 11.21 g). The highest cumulative body weight up to fifth week observed in T_4 treatment group (2098.65 ± 17.71 g), which was significantly higher (p>0.05) than rest three groups. The effect of supplementation of dried peppermint leaves powder on the weekly feed intake of the experimental birds under different treatment groups has been presented in Table 5.

Table.5 Average weekly feed intake (g) of the experimental broiler birds under different dietary treatments

Week	T_1	T_2	T_3	T_4
1st week	331.85 ± 11.21	337.49 ± 9.53	339.32 ± 10.23	334.42 ± 9.78
2nd week	592.47 ± 12.98	609.46 ± 12.99	584.92 ± 13.38	641.92 ± 12.11
3rd week	619.18^{a} ± 15.23	761.10^{c} ± 16.31	726.71^{b} ± 15.88	778.35^{c} ± 16.83
4th week	1063.02^{a} ± 18.15	1079.51^{a} ± 17.18	1177.44^{b} ± 18.21	1083.57^{a} ± 17.23
5th week	1153.84^{d} ± 13.12	980.08^{c} ± 14.99	920.00^{b} ± 16.95	865.92^{a} ± 15.65

*Means bearing different superscripts differ significantly along the rows.

The weekly feed for the first week was comparable (p>0.05) in all the treatment groups ranging from 331.85 ± 11.21 g (T_1) to 339.32 ± 10.23 g (T_3). During the second week, birds from T_4 group consumed significantly higher (p>0.05) feed when compared to T_3 and T_1 birds (641.92 ± 12.11 *vs*. 584.92 ± 13.38 g and 592.47 ± 12.98 respectively), but was not statistically different from T_2 (609.46 ± 12.99 g) birds. During the third week of experiment, birds from T_4 group showed significantly higher (p>0.05) feed consumption (778.35 ± 16.83 g) as compared to rest three treatment groups. During fourth week, T_3 birds had significantly higher (p>0.05) feed consumption (1177.44 ± 18.21g) followed by T_4 and T_2 (1083.57 ± 17.23 g and 1079.51^{b} ± 17.18 g, respectively) and lastly the T_1 birds (1063.02 ± 18.15 g). During the final week of the experiment i.e. the fifth week, the T_1 birds had significantly higher (p>0.05) feed consumption (1153.84 ± 13.12 g) which was distinctly higher (p>0.05) than T_2 (980.08 ± 14.99), T_3 (920.00^{a} ± 16.53 g) and T_4 (865.92^{a} ± 15.65g) birds.Results are also in agreement with Athina *et al.,* (2017) who recorded improved broiler chickens performance with the combined dietary supplementation with oregano, attapulgite and benzoic acid.

Table.6 Cumulative feed intake (g) of the experimental broiler birds under different dietary treatments

Week	T_1	T_2	T_3	T_4
0-1	331.85 ±9.88	337.49 ± 9.25	339.32 ±12.34	334.42 ±9.22
0-2	924.32 ±13.86	946.95 ±11.15	924.24 ±15.12	976.34 ±11.58
0-3	1543.50^{a} ±20.34	1708.05^{c} ±17.92	1650.95^{b} ±18.58	1754.69^{c} ±16.83
0-4	2606.52^{a} ±24.35	2787.56^{b} ±19.97	2828.39^{bc} ±17.87	2838.27^{c} ±18.01
0-5	3760.36 ±27.18	3767.64 ±21.27	3748.38 ±20.11	3704.19 ±20.56

*Means bearing different superscripts differ significantly along the rows.

Cumulative feed intake of the experimental birds after supplementation of dried peppermint leaves powder at different levels is illustrated in Table 6.

Up to second week of the experimentation, cumulative feed intake was significantly higher ($p>0.05$) in T_4 birds (976.34 ± 11.58 g), as compared to T_1 (924.32 ± 13.86 g) and T_3 (924.24 ± 15.12) which are lower than T_2 (946.95 ± 11.15 g). The cumulative feed intake up to third week also showed significantly maximum intake by the T_4 birds (1754.69 ± 16.83 g) with respect to other three experimental groups. The trend continued for the cumulative feed intake up to fourth week, where the birds under T_4 (2838.27 ± 28.01 g) had distinctly higher feed intake in comparison to rest three treatment groups. But at the end of the experiment, the birds from T_2 (3767.64 ± 21.27 g) and T_1 (3760.36 ± 27.18 g) had significantly higher cumulative feed intake as compared to T_3 (3748.38 ± 20.11 g) and T_4 (3704.19 ± 20.56 g) birds.Alaeldein *et al.,* (2013) also observed that feed intake was not significantly different among all treatments, with the addition of commercial essential oil blend, as an alternative to antibiotic in-feed. Cumulative FCR of the experimental birds in response to the supplementation of dried peppermint leaves powder at different level of inclusion has been depicted in Table 7.

Table.7 Cumulative Feed Conversion Ratio (FCR) of the experimental broiler birds under different dietary treatments

Week	T_1	T_2	T_3	T_4
0-1	2.31 ±0.06	2.26 ±0.04	2.23 ±0.05	2.17 ±0.07
0-2	2.18 ±0.05	2.14 ±0.03	2.06 ±0.01	2.11 ±0.04
0-3	1.97^{a} ±0.02	2.11^{b} ±0.07	1.96^{a} ±0.04	2.02^{ab} ±0.06
0-4	1.89 ±0.08	1.93 ±0.06	1.89 ±0.03	1.87 ±0.05
0-5	1.96^{c} ±0.04	1.89^{b} ±0.05	1.82^{ab} ±0.07	1.73^{a} ±0.02

*Means bearing different superscripts differ significantly along the rows.

Up to fourth week, FCR did not vary significantly among all the treatment groups, whereas at the end of the experiment FCR of T_4 birds was found to be significantly superior compared to T_1 birds (1.73 ± 0.02 vs. 1.96 ± 0.04). The performance of the birds under T_2 and T_3 birds did not vary statistically in comparison to either T_1 or T_4 groups.These results are also in agreement with Adil *et al.,* (2011) who observed that birds fed with diet supplemented with organic acids showed a significant improvement in the FCR as compared to birds fed the control diet.

The economics of the experimental birds under different treatment groups up to fifth week of age are presented in Table 8. After the end of the experiment, all the birds were sold in the market with a sale price of Rs. 94.00 per live weight. Birds in the T_4 group by virtue of its higher body weight and superior FCR had the highest profit of Rs. 19.51 per bird followed by T_3 (Rs. 15.23), T_2 (Rs. 13.33) and lastly the control T_1 (Rs. 9.01). All the supplemented birds showed higher profit margin than the control birds.

Table.8 Economics of the experimental birds' production under different dietary treatments

Attributes	T_1	T_2	T_3	T_4
Chick cost (Rs.)	41.00	41.00	41.00	41.00
Feed consumed per bird (g)	3760.36	3767.64	3748.38	3704.19
Feed cost @ Rs. 32/kg	120.33	120.56	119.95	118.53
Peppermint leaf powder supplementation (g)	-	3.77	11.25	18.52
Cost of Peppermint leaf powder @ Rs. 660/kg	-	2.49	7.42	12.22
Miscellaneous cost (Rs.)	10.00	10.00	10.00	10.00
Total cost (Rs.)	171.33	174.05	178.37	181.76
Average weight (kg)	1918.55	1993.46	2059.55	2141.15
Sale (Rs.)	180.34	187.39	193.60	201.27
Profit (Rs.)	9.01	13.33	15.23	19.51

Birds supplemented with peppermint leaf powder significantly enhanced the body weight and FCR as compared to control group. The birds supplemented with 0.5% of peppermint leaf powder had the best FCR and was found to be economical. Thus, this can be used in broiler feeds to enhance its growth and make the feed economical.

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