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Mint Leaves (*Mentha piperita*) as Herbal Dietary Supplement: Effect on Performance and Economics of Broiler Chicken Production

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Abstract: A study was conducted to evaluate the effect of dietary supplementation of Mint leaves (*Mentha piperita*) with or without enzyme treatment on performance and economics of broiler chicken production. To achieve the envisaged objectives, a feeding trail was conducted with 225 day old commercial broiler chicks. The chicks were procured from a reputed source and reared together until 7 days of age. On 8th day, the chicks were individually weighed, distributed randomly into 5 treatment groups of 3 replicates with 15 chicks each. Birds in the control group (T1) were fed diets without additives, whereas in T2 and T3 basal diet was supplemented with raw mint leaves @ 1% (T2) and 2% (T3). In T4 and T5, enzyme treated mint leaves @ 1 and 2% were added to the basal diet, respectively. The body weight, feed consumption and feed conversion ratio were recorded at weekly intervals and economics of feeding was worked out at the end of trial. The results revealed that the birds fed diets supplemented with either raw and enzyme treated mint leaves attained significantly ($p<0.05$) higher live body weight when compared with the control group. A significantly ($p<0.05$) highest improvement in the body weight was observed in T5 when compared with the other groups. No significant ($p>0.05$) difference in the cumulative feed consumption was observed among various treatment groups. The cumulative feed conversion ratio showed a significant ($p<0.05$) improvement in all the treatment groups when compared with the control. A reduction in feed cost/kg live weight gain was observed in the birds fed 1% enzyme treated mint leaves (T4) in the diet. In conclusion, 1% enzyme treated mint leaves were found to be effective in economizing the broiler production.

Key words: Broiler chicken, economics, herb, performance, mint leaves

INTRODUCTION

Following the ban on the use of antibiotics as growth promoters, researchers have looked for alternative natural growth promoters like phytogenics. The use of phytogenics as feed additives is gaining importance due to their antimicrobial and stimulatory effects on digestive system (Jamroz *et al*., 2003; 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, 2006). It has been estimated that there are 250,000-500,000 species of plants on earth (Borris, 1996). Relatively, a small percentage (1-10%) of these is used as food by both humans and other animal species (Cowan, 1999). Compared with synthetic antibiotics or inorganic chemicals, these plants and their derived products have reported to be less toxic, residue free and thus considered as ideal feed additives in animal production (Hashemi and Davoodi, 2010). These herbal plants exert positive effects on growth and health of animals probably by their immuno stimulatory properties (Guo *et al*., 2004).

Kashmir often referred to as paradise on earth is located at the north western tip of Himalayan biodiversity hotspot (Hussian, 2001). The region has a number of phytobiotics which may have the potential to promote production performance in chicken and one amongst them being Mint (*Mentha piperita*), locally known as Pudina. Mint is a member of the Labiatae family and is widely used in herbal medicine and believed to be beneficial in as immunity enhancer (Nanekarani *et al*., 2012). Mint is mostly consumed after a meal because of its ability to reduce indigestion and intestinal spasms by reducing the gastrocholic reflux (Spirling and Daniels, 2001). The main action of its leaves and flowers is due to the presence of abundant menthol which is the main phenolic component having antibacterial activities (Schuhmacher *et al*., 2003). Mint also contains polyphenolic compounds and hence could possess strong antioxidant properties (Dorman *et al*., 2003). Further, the supplementation of enzyme in poultry diets has been reported to improve the performance (Yousuf *et al*., 2012) by degrading non-starchy polysaccharides and improving their digestion;

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having beneficial effect on gut morphology and thus improving absorption of nutrients (Tufarelli *et al*., 2007; Yousuf *et al*., 2011; Qureshi *et al*., 2016). In view of such beneficial effects of mint and enzyme, a study was conducted to evaluate the efficiency of mint leaves, with or without enzyme supplementation on performance and economics of broiler chicken production.

MATERIALS AND METHODS

Experimental site: A feeding trial was conducted to study the effect of supplementation of herb viz. Mint leaves (*Mentha piperita*) with or without enzyme treatment in the broiler ration on performance of broiler chicken. The study was conducted in the Teaching and Research Farm of the Division of Livestock Production and Management, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama.

Collection and analysis of test material: The locally available Mint leaves (*Mentha piperita*) were procured from the market. The material was dried and stored properly for future use. Dried samples of herb were subjected to proximate analysis as per the standard procedures. The percentage crude protein, total ash, ether extract and crude fibre content of the control diet and herb was determined as per standard procedure of Association of Official Analytical Chemists (AOAC, 2005).

Experimental diets and treatment groups: The feeding programme consisted of a starter diet fed until 21 days and a finisher diet afterwards. Birds in the control group were fed the diets without any additive. The diets were formulated to meet the recommendations of Bureau of Indian standards (BIS, 1992). The ingredient composition of the control diet is given in Table 1 and nutrient composition of in Table 2. All the diets were prepared with the same batch of ingredients and all diets within a period had the same composition. The chicks were procured from a reputed source and reared together until 7 days of age. On 8th day, the chicks were individually weighed, distributed randomly into 5 treatment groups of 3 replicates with 15 chicks each. Birds in the control group (T1) were fed diets without additives, whereas in T2 and T3 basal diet was supplemented with raw mint leaves @ 1% (T2) and 2% (T3). In T4 and T5, enzyme treated mint leaves @ 1 and 2% were added to the basal diet respectively. Enzyme used was a cocktail product added to the feed @ 50 g/100 kg of feed. Composition of Enzyme used was as follows: Cellulase 180000000, Amylase 125000, Xylanase 1800000, Phytase 200000, Protease 16000, Lipase 40000 and Pectinase 7000 IU/g. Birds had *ad libitum* access to feed and water throughout and were maintained on a constant 24 h light schedule. All chicks were vaccinated against Ranikhet disease on 5th day with F_1 strain vaccine and B_2 K vaccine against Infectious bursal disease on 16th day. All chicks were kept under the same managerial, hygienic and environmental conditions.

Parameters recorded: The body weight of experimental birds was recorded on individual basis at weekly intervals. The feed consumption was recorded on group basis at weekly intervals. Feed conversion ratio of birds was worked out at weekly intervals for by taking into consideration the weekly body weight gain and feed consumption. Economics of feeding was calculated by taking into consideration the market prices of feed ingredients at the time of purchase, body weight gain and feed consumed.

Statistical analysis: The data obtained was statistically assessed by one-way ANOVA as per the standard methods of Snedecor and Cochran (1994) using the General Linear Model Procedure of Statistical Package for the Social Sciences, Base 10.0, 1999 (SPSS Software products, Marketing Department, SPSS Inc. Chicago, USA). To test the significance of difference between means Duncan's multiple range test (Duncan, 1955) was used and differences were considered significant at 5% level.

RESULTS AND DISCUSSION

The results of weekly body weight of broiler chicken fed different dietary treatments are summarized in Table 3. Initially there was no significant ($p<0.05$) effect of either raw or enzyme treated mint supplementation at both the levels (1 and 2%) when compared with the control group. However, beyond 3rd week, a significant ($p<0.05$) increase in the body weight of birds was observed as a result of mint supplementation compared to the control group. Among the groups fed raw mint leaves, highest body weight was found in group fed 2% mint leaves in the diet. Among all the groups, a significantly ($p<0.05$) highest improvement in the live body weight was observed in the group fed 2% enzyme treated mint leaves. Al-Ankari *et al*. (2004) also reported that supplementation of dried peppermint (*Mentha piperita*) at 1.5% level in the broiler chicken diet showed beneficial effects on body weight. Similarly, Durrani *et al*. (2008) found a significant increase in the body weight of broiler chicken fed diet supplemented with 1.5% Habek mint. Nobakht *et al*. (2011) found that feeding 0.5% *Mentha pulegium* resulted in positive effect in broiler chicken and Ocak *et al*. (2008) reported that the supplementation of dried peppermint (*Mentha piperita*) increased the body weight at 21 and 35 days of age. In contrast to the present results, Toghyani *et al*. (2010) reported no effect of dry peppermint on broiler performance. The variation among these studies might be due to the differences in the peppermint species, active ingredients, harvest time, drying process, form and part of

Table 1: Percent ingredient and nutrient composition of experimental basal diets (dry matter basis)

	Diet	
Ingredients	Starter (1-3 weeks)	Finisher (4 and 5th week)
Yellow maize	58.0	64.0
Soyabean meal	38.0	32.0
Vegetable oil	0.5	0.5
Premix*	3.0	3.0
Salt (NaCl)	0.3	0.3
Methionine	0.1	0.1
Lysine	0.1	0.1
Total	100	100
Calculated values		
Metabolizable energy (Kcal/kg/diet)	2850	2900
Crude protein (%)	22.4	20.2
Calcium	1.13	1.23
Available phosphorus	0.57	0.63
Methionine+Cystine	0.80	0.75
Lysine	1.22	1.15

*Premix contained: Provided per kg of diet. Vitamin A, 1400 IU; Vitamin D_3 300 IU; Vitamin E, 50 mg; Vitamin K,4 g; Vitamin B_6 3 mg; Vitamin B_{12} 6 mg; Niacin, 60 mg; Pantothenic acid 20 mg; Folic acid 0.2 mg; Choline 150 mg; Ca,4.8 mg; P,3.18 mg; Mn,100 mg; Fe, 50 mg; Zn, 80 mg; Cu, 10 mg; CO, 0.25 mg; Iodine, 1.5 mg

Table 2: Proximate composition of dried mint Leaves

Attribute	Percentage
Dry matter	92.53±0.184
Moisture	7.47±0.207
Crude protein	19.31±0.057
Ether extract	3.12±0.057
Crude fibre	12.60±0.094
Total ash	12.99±0.041
Calcium	1.20±0.041
Phosphorus	0.56±0.004

the plant used (Brenes and Roura, 2010). The improvement in the live body weight as found in the present study as a result of mint leaves supplementation might be due to the presence of antioxidant property due to various phenolic and flavonoid compounds present in it. Olennikov and Tankhaeva (2010) reported that *Mentha piperita* contained phenolic and flavonoid compounds approximately 2.70 to 5.52 and 3.02 to 6.32%, respectively. The results regarding the use of enzyme in the diet of broiler chicken corroborate with the findings of earlier workers (Bansal *et al*., 2012; Yousuf *at al*., 2012; Qureshi *et al*., 2015) who reported a significant ($p<0.05$) increase in live body weight with dietary enzyme supplementation in broiler chicken which has been attributed to the increase in dry matter and nutrient digestibility; apparent metabolizable energy and increased absorption of nutrients with consequent decrease in digesta viscosity in the intestine (Lazaro *et al*., 2003).

The results of cumulative feed consumption on weekly basis in broiler chicken fed raw or enzyme treated mint leaves in the diet are presented in Table 4. There was no significant ($p>0.05$) difference in the feed consumption of birds among different treatment groups when compared with the control group. Similar findings were observed by Durrani *et al*. (2008) and Amasaib *et al*. (2013) who reported that dietary treatment of spearmint had no significant effect ($p<0.05$) on feed intake in broiler chicken. However, the results of present study do not corroborate with the reports of some researchers who recorded a significant ($p<0.05$) increase in feed intake due to supplementation of mint based diets in the broiler chicken (Griggs and Jacob, 2005; Galib and Al-Kassie, 2010). It has been observed that the feeding pattern in monogastric animals is related to the flavour and secretion of digestive enzymes which has an effect on appetite of animals (Wenk, 2003; Yarnell and Abascal, 2009). The insignificant effect of addition of mint in the diet on feed intake may be the due to the fact that diets were isocaloric, so it was expected that the feed consumption could be similar as suggested by Scott *et al*. (1982).

The results of weekly feed conversion ratio (FCR) in broiler chicken fed mint leaves in the diet are shown in Table 5. There was a significant ($p<0.05$) improvement in the FCR of broiler chicken fed diets supplemented with either raw or enzyme treated mint leaves at both the levels when compared with the control group. Best FCR was observed in the group fed diets supplemented with enzyme treated 2% mint leaves. This trend continued till the completion of feeding trial. These results are in the agreement with the findings of Rahman *et al*. (1996) and Durrani *et al*. (2008) who reported that dietary supplementation of 1.5% mint in the basal diet of broiler chicken showed significantly better FCR in broiler chicken. Similarly, Al-Ankari *et al*. (2004) found that the supplementation of dried peppermint in broiler diet resulted in improved FCR. Using more than 1.5% of mint in the diet of broiler chicken did not have any effect on FCR up to 21 days of age but significantly differences in FCR were observed from 21-42 days of age. However, Ocak *et al*. (2008) reported that supplementation of dried peppermint had no effect on feed conversion ratio at 42 days of age. El-Gendi *et al*. (1994) however, also

Table 3: Average weekly body weight (g) of broiler chicken fed diets supplemented with raw and enzyme treated mint leaves

	Treatment groups				
Age (weeks)	T_1	T_2	T_3	T_4	T_5
1	123.33±0.71	120.28±2.93	121.44±1.74	123.84±1.03	122.57±1.07
2	306.97±5.64^{a}	317.44±2.22^{ab}	316.89±4.41^{ab}	320.81±4.88^{ab}	326.93±6.53^{b}
3	555.84±12.21	565.32±8.79	574.22±8.54	581.02±3.36	584.98±13.39
4	850.37±1.18^{a}	887.01±5.19^{b}	903.59±14.58^{bc}	920.18±3.52^{bc}	934.62±16.07^{c}
5	1184.10±3.96^{a}	1338.61±27.66^{b}	1400.14±28.65^{bc}	1440.58±19.87^{c}	1468.72±18.20^{c}

Means within the same row with different superscripts are significantly different (p<0.05)

Table 4: Average weekly feed consumption (g) of broiler chicken fed diets supplemented with raw and enzyme treated mint leaves

	Treatment groups				
Age (weeks)	T_1	T_2	T_3	T_4	T_5
1-2	273.99±7.86	273.84±8.02	271.55±9.84	271.91±2.25	270.53±5.68
2-3	436.22±18.14	425.08±14.07	416.66±34.26	425.28±22.93	419.19±25.54
3-4	552.42±31.72	532.57±25.70	519.17±20.19	525.75±31.40	520.88±24.68
4-5	714.71±43.57	680.19±33.22	676.38±27.22	689.22±29.26	675.33±41.40

Means within the same row with different superscripts are significantly different (p<0.05)

Table 5: Average weekly feed conversion ratio (g) of broiler chicken fed diets supplemented with raw and enzyme treated mint leaves

	Treatment groups				
Age (weeks)	T_1	T_2	T_3	T_4	T_5
1-2	1.49±0.061^{b}	1.39±0.036^{ab}	1.39±0.040^{ab}	1.38±0.021^{ab}	1.32±0.023^{a}
2-3	1.75±0.026	1.72±0.109	1.62±0.098	1.64±0.080	1.66±0.023
3-4	1.88±0.127^{b}	1.65±0.064^{ab}	1.58±0.099^{ab}	1.55±0.090^{a}	1.49±0.083^{a}
4-5	2.21±0.339^{b}	1.51±0.076^{a}	1.37±0.122^{a}	1.33±0.013^{a}	1.26±0.071^{a}

Means within the same row with different superscripts are significantly different (p<0.05)

Table 6: Economics (in rupees) of feeding raw and enzyme treated mint leaves (*Mentha piperita*) in broiler chicken

	Treatment groups				
Economic parameters	T_1	T_2	T_3	T_4	T_5
Basal feed (Rs/kg)	37.00	37.00	37.00	37.00	37.00
Cost of mint (Rs)	-	4.60	9.20	4.60	9.20
Cost of enzyme (Rs)	-	-	-	0.48	0.48
Total cost of feed (Rs/kg)	37.00	41.60	46.20	42.08	46.68
Feed cost/kg live weight gain (Rs)	75.85	71.13	74.38	66.90	71.42
Difference in feed cost compared to control (Rs)	-	4.72	1.47	8.95	4.43

observed an improvement in FCR with the feeding of herbal products and attributed it to their effect on improving the digestibility of dietary protein in the small intestine. Presence of antimicrobial, antioxidant and phenolic substances may be the main cause for improvement in FCR as a result of dietary supplementation of mint (Souri *et al*., 2004; Jazani *et al*., 2009).

The data related to the economics (in terms of Indian Rupee) of feeding mint leaves is given in Table 6. The feed cost per kg for the treatment groups T_1 (Control), T_2 (1% raw mint leaves), T_3 (2% raw mint leaves), T_4 (1% enzyme treated mint leaves), T_5 (2% enzyme treated mint leaves) was Rs. 75.85, 71.13, 74.38, 66.90 and 71.42, respectively. There was a reduction in the feed cost per unit live weight gain among different treatment groups supplemented with either raw or enzyme treated mint leaves when compared with the control group (T_1). Among different treatment groups, the highest reduction in the feed cost was observed in the group T_4 (1% enzyme treated mint leaves) followed by T_2 (1% raw mint leaves) when compared with T_5 (2% enzyme treated mint leaves) and T_3 (2% raw mint leaves). The improvement in terms of profit obtained with either raw or enzyme treated mint leaves in the diet of broiler chicken could be explained due to the improvement in body weight and efficient FCR. These results are in harmony with the results of Gerson *et al*. (2009) who reported that the use of the phytogenic feed additive in broiler chicken diets has a good economic advantage when feed cost was considered. Similarly, Minh *et al*. (2010) reported that supplementation of dried ginger to broiler diets resulted in the reduction of feed cost. Likewise, Yousuf *et al*. (2012) reported that the addition of enzyme in the diet of broiler chicken resulted in significant (p<0.05) decrease in the feed cost per kg of live body weight gain and high profit when compared with the control group.

Conclusion: In conclusion, supplementation of enzyme treated mint leaves caused a significant improvement in the performance of birds in terms of body weight and FCR with highest improvement at 2% level. Moreover, a

reduction in feed cost/kg live weight gain was observed in the birds fed 1% enzyme treated mint leaves in the diet, thereby economizing the broiler production.

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