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Effect of Feeding Graded Levels of Pudina (*Mentha arvensis*) Leaf Powder on Egg Quality Traits in Laying Hens

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A B S T R A C T

A feeding trial of 12 weeks duration was conducted to evaluate the effect of different levels of pudina leaf powder supplementation on egg quality traits in laying hens. A total number of 120 White leghorn laying hens of 36 weeks old were randomly assigned to 4 treatment groups (T1, T2, T3 and T4) with 6 replicates of 5 birds each. The basal diet was supplemented with pudina leaf powder containing 0, 5.0, 7.5 and 10.0 g/ kg in dietary treatment groups respectively. The feeding trial was divided into phase I (36^{th}-39^{th} weeks), phase II (40^{th}-43^{th} weeks), phase III (44^{th}-47^{th} weeks) and overall (36^{th}-47^{th} weeks). At the end of each phase, egg quality and composition traits were studied. The results of the egg quality traits indicated that there were significant ($P<0.05$) improvement in egg weight, haugh unit and crude protein contents in the eggs of pudina added groups, whereas egg crude fat and cholesterol content were significantly ($P<0.05$) decreased with increased supplementation of pudina leaf powder. The overall best performance was shown at 10.0 g/kg diet. Therefore, it can be concluded that the significant effect of pudina leaf powder supplementation on increase in egg weight, haugh unit, egg protein and decrease in crude fat and total cholesterol contents showed the major importance of pudina leaf powder in designer egg production.

Introduction

Egg is one of the most nutritious, unadulterated natural food which is accepted in all ages in human society with no religious taboo and hence has attained a vital place in human diet. Now a day's supplementation of herbs/ herbal preparations is done to boost performance of poultry by increasing growth rate, better feed conversion efficiency, greater livability, lower mortality, lower cost of egg and meat production, reduced risk of toxicity, minimum health hazards, environment friendliness and altered egg composition like reduced cholesterol level, increased protein level *etc.* to a considerable extent (Devegowda, 1996). One of these herbal plants used for curing illness since times immemorial is the common pudina, belongs to the genus *Mentha* and family Lamiaceae. Pudina (*Mentha arvensis*) is an erect herbacious perennial herb; the various sub-

species of the herb usually grow 20 cm to 80 cm tall on square, hairy stem. Pudina have been used since ancient days across the world for the prevention and treatment of many diseases and is also broadly accepted and consumed as a spice and herbal medicine. It has a stimulant, tonic, anti-spasmodic, diaphoretic, stomachic, carminative, antibacterial, antifungal, antiviral and choleretic activities. Pudina contains menthol (77.5–89.3%) as the main constituent, followed by menthone (0.3–7.9%) and isomenthone (3.7–6.1%) (Singh *et al.*, 2005).

The literature survey unveiled that since there is limited number of scientific studies conducted on pudina (*M. arvensis*) leaf powder supplementation on the effect of egg quality traits, the main purpose of this study was to determine the potential of the plant as a feed additive in laying hens by measuring its effect on the egg quality traits. Since, there is few literatures available on pudina (*Mentha arvensis*) on laying hens, comparative study was made with various plants of the *Mentha* species.

Materials and Methods

The experiment was conducted at Instructional Poultry Farm, C.V.A.Sc., Pantnagar (Uttarakhand). A total of 120 white leghorn laying hens of 36 weeks of age were randomly distributed in Californian cages in a completely randomized design (CRD). The laying hens were randomly divided into four treatment groups (T1, T2, T3 and T4) each with six replicates of five birds each and the replicates were equally distributed into upper and lower cage levels to minimize the cage level effect. Each hen was housed in a single cage. The basal diet was supplemented with pudina leaf powder containing 0, 5.0, 7.5 and 10.0 g/ kg in dietary treatment groups respectively. The feeding trial was divided into phase I (36^{th}-39^{th} weeks), phase II (40^{th}-43^{th} weeks), phase III (44^{th}-47^{th} weeks) and overall (36^{th}-47^{th} weeks). The experimentation was carried out for 12 weeks. The egg quality traits were studied at the end of each phase. Two eggs from each replicate (48 eggs) were collected randomly for the last three consecutive days of each phase for analysis of egg quality traits in each phase. The composition of the egg was determined as per standard procedures (AOAC, 2005). At the end of each phase, two eggs from each replicates (48 eggs), consecutively for three days were collected carefully. The collected eggs were carefully broken and studied egg composition (crude protein, crude fat and ash) contents. The eggs were first boiled and shell and shell membranes were then removed carefully. The boiled eggs were chopped, transferred on previously weighed petridishes and kept in hot air oven at 70 ± 2^{0}C for 24 hours and dried until no weight change was observed. Then the egg samples were kept in moisture free bags for further analysis of protein, fat and total ash. All statistical analysis was done with the help of SPSS procedure and the data obtained during the experiment was further evaluated using 1-way analysis of variance (ANOVA).

Results and discussion

It was observed from study that the increasing levels of pudina leaf powder supplementation in the feed (5.0, 7.5 and 10.0 g/kg) of laying hens resulted significant increased ($P<0.05$) in egg weight (Table-3). Increased egg weight might be due to better utilization of nutrients by pudina leaf powder which in turn resulted in better egg weight. The results of the present study are in line with the findings of Abdel-Wareth and Lohakare (2014). They reported that supplementation of peppermint in laying hens improved egg weight due to the beneficial action of peppermint in the process of oviposition and also imperative effect on the conversion of digested feed into eggs.

Table.1 Proximate analysis and nutritive value of dried Pudina (*Mentha arvensis*) leaf powder

Chemical composition	Analyzed
Dry matter	98.10
Crude protein	14.53
Crude fibre	21.03
Crude fat	2.95
Total ash	9.38
Nitrogen free extract	52.11
Calcium	1.90
Phosphorus	0.32

Table.2 Ingredient and chemical composition (% dry matter basis) of experimental basal diets used for laying chickens

Ingredient	Percentage (%)
Maize	53.00
Soyabean meal	27.00
Deoiled rice bran	8.80
Limestone powder	9.00
Di calcium phosphate	1.40
Common salt	0.30
DL-methionine	0.15
TM-premix	0.10
Choline chloride	0.15
Toxin binder	0.05
Total	100.00
Chemical composition (%)	Percent
Dry matter	90.79
Crude protein	18.03
Ether extract	2.52
Crude fibre	5.78
Calcium	3.87
Total ash	12.00
Acid insoluble ash	1.53
Total phosphorus	0.73
Available phosphorus *	0.40
Metabolisable energy (kcal/kg)*	2601.38
Lysine *	1.10
Methionine *	0.48
Linoleic acid *	1.39

*Calculated value:

[1]Trace mineral pre mix supplied (per kg diet): Magnesium- 300 mg, Manganese- 55 mg, Iodine-0.4 mg, Iron- 56 kg diet): vitamin A-8250 IU, vitamin D_3- 1200 ICU; vitamin E- 40 IU, mg; Zinc- 30 mg and Copper 4 mg. [2] Vitamin premix supplied (per vitamin K- 1 mg; vitamin B_1- 2 mg, vitamin B_2 - 4 mg; niacin- 60 mg, pantothenic acid-10 mg, cyanocobalamin-10 microgram and choline-500 mg.

Table.3 Means± S.E. of egg quality traits of laying hens during phase wise

Traits	Period	T1	T2	T3	T4
Egg weight (g)	I Phase	54.74±0.41	55.40±0.24	55.33±0.40	**55.81±0.53**
	II Phase*	55.15^{b}±0.40	56.24^{ab}±0.54	56.74^{a}±0.42	**56.88^{a}±0.28**
	III Phase*	55.90^{b}±0.20	56.41^{ab}±0.33	56.88^{a}±0.38	**57.03^{a}±0.24**
	Overall*	55.30^{b}±0.20	56.02^{a}±0.16	56.30^{a}±0.22	**56.55^{a}±0.15**
Haugh Unit	I Phase	84.06±0.62	84.03±0.87	84.47±0.46	**85.04±0.42**
	II Phase	84.77±0.94	85.03±0.34	85.18±0.40	**85.40±0.41**
	III Phase*	85.15^{b}±0.42	85.65^{ab}±0.37	86.23^{a}±0.28	**86.62^{a}±0.20**
	Overall*	**84.66^{b}±0.37**	**84.90^{ab}±0.28**	**85.30^{ab}±0.20**	**85.70^{a}±0.15**

Table.4 Means± S.E. of egg quality traits of laying hens during overall experimental period (36th-47th weeks)

Traits	T1	T2	T3	T4
Shape index	75.37±0.11	75.50±0.14	75.61±0.08	**75.74±0.12**
Albumen index	8.87±0.17	8.88±0.14	8.93±0.10	**9.11±0.13**
Yolk index	47.11±0.28	47.17±0.32	47.80±0.31	**47.60±0.16**
Shell thickness (mm)	0.35±0.01	0.36±0.01	0.37±0.01	**0.37±0.01**
Albumen %	60.18±0.13	60.27±0.10	60.34±0.09	**60.42±0.13**
Yolk %	30.22±0.20	30.32±0.08	30.38±0.10	**30.40±0.15**
Shell weight %	9.40±0.16	9.41±0.15	9.42±0.11	**9.35±0.21**
Yolk/ Albumin ratio	**49.91±0.34**	**50.30±0.14**	**50.33±0.17**	**50.37±0.23**

Values with different superscripts row wise differ significantly (P<0.05)

Table.5 Means ± S.E. of egg composition traits of laying hens during overall experimental period (36th-47th weeks)

Traits	Period	T1	T2	T3	T4
Total ash (%)	I Phase	4.81±0.15	5.10±0.05	4.90±0.06	**4.83±0.06**
	II Phase	5.18±0.15	5.23±0.13	5.10±0.04	**5.05±0.05**
	III Phase	4.92±0.13	5.08±0.18	5.22±0.15	**5.19±0.06**
	Overall	4.98±0.30	5.11±0.26	5.07±0.18	**5.02±0.12**
Crude fat (%)	I Phase	43.49±0.07	43.42±0.05	43.44±0.07	**43.31±0.12**
	II Phase	43.43±0.07	43.33±0.08	43.35±0.11	**43.08±0.13**
	III Phase*	43.45^{a}±0.23	43.23^{ab}±0.10	42.96^{b}±0.08	**42.92^{b}±0.14**
	Overall*	43.46^{a}±0.10	43.33^{ab}±0.06	43.25^{ab}±0.07	**43.10^{c}±0.11**
Crude protein (%)	I Phase	44.12±0.17	44.24±0.30	44.34±0.30	**44.67±0.18**
	II Phase*	44.36^{b}±0.20	44.59^{ab}±0.17	44.66^{ab}±0.12	**44.98^{a}±0.11**
	III Phase	44.68±0.15	44.87±0.23	44.93±0.13	**45.07±0.13**
	Overall*	44.39^{b}±0.12	44.58^{ab}±0.15	44.62^{ab}±0.13	**44.91^{a}±0.05**
Egg cholesterol (mg/ g yolk)	I Phase	12.31±0.06	12.28±0.12	12.22±0.05	**12.13±0.11**
	II Phase	12.35±0.07	12.15±0.13	12.08±0.05	**11.95±0.13**
	III Phase*	12.28^{a}±0.06	11.96^{a}±0.17	11.41^{b}±0.13	**11.45^{b}±0.11**
	Overall*	**12.31^{a}±0.03**	**12.13^{b}±0.07**	**11.90^{c}±0.05**	**11.85^{c}±0.04**

Values with different superscripts column wise differ significantly (P<0.05)

Pudina leaf powder supplementation in the feed @10.0g/kg in feed of laying hens resulted significant increased (P<0.05) in haugh unit (Table 3). Similar findings were recorded by Sayedpiran *et al.,* (2011) Abdei-Wareth and Lohakare (2014). No significant difference in albumen and yolk percentages among different treatment groups in any of the phase of trial. Similarly, shape index, albumen index, shell thickness, shell weight and yolk/albumen ration etc., in all phases and in overall period (Table 4) were not affected by supplementation of pudina leaf powder. Total ash content in egg did not show significant difference among different treatment groups in any phase including overall period. Significantly lower egg fat per cent and cholesterol content of was recorded in birds of group T3 and T4 (Table 5). As serum cholesterol is the precursor for egg yolk cholesterol, reduction in egg yolk cholesterol might be related to reduction in serum cholesterol. These findings indicate that there is positive correlation between serum cholesterol and egg cholesterol values. Similar results were obtained by Lim *et al.,* 2006 and Yin *et al.,* (2008). Significant (P<0.05) increase of egg crude protein in T4 group (44.98±0.11) during phase II and overall trial periods reflexed the beneficial effect of pudina. The increased protein of eggs might be due to the possible reason that pudina supplementation enhances absorption of amino acid and thereby increase protein synthesis. This may be attributed to better utilization of protein by pudina leaf powder supplementation. The result of present study also indicated that there is positive correlation between serum protein and egg protein levels due to the supplementation of pudina leaf powder.

The effect of 12 weeks supplementation of pudina leaf powder showed increased egg weight, haugh unit, egg crude protein and decrease egg fat and cholesterol contents indicating the importance of pudina in designer egg production. The overall best performance was shown at 10.0 g/kg diet. The addition of pudina to the diet of laying hens as performance booster could be a promising alternative to the use of synthetic products in egg production. More detailed studies are essential in future to determine the optimal and safety dietary inclusion and its economic impact.

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