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Effect of dietary supplementation of garlic and onion powder on egg weight and egg quality parameters in laying hens

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Abstract
An experiment was conducted to evaluate the effect of dietary supplementation of different levels of Garlic powder (GP) and Onion powder (OP) on production performance and egg quality parameters in laying hens for a period of 16 weeks. A total of 126 white leghorn laying hens at 22 weeks of age were randomly selected and distributed into seven experimental groups having three replicates of six birds each. T_1 served as a control, while in treatment groups T_2, T_3, T_4 diet was supplemented with GP at levels of 10g, 20g and 30g /kg feed, respectively, and in T_5, T_6, and T_7 OP was supplemented 10g, 20g and 30g/kg feed, respectively. Results revealed that the body weight changes and the egg quality parameters *viz*. egg weight, shell thickness and egg shape index were not affected by the garlic and onion powder supplementation.

Keywords: body weight, egg parameters, garlic, laying hen, onion

Introduction
The poultry sector is continuously searching for new feed additives to improve the feed efficiency with minimum deleterious effects on animal health. Herbal plants are a new class of growth promoters and in recent years these feed additives have gained extensive attention in the feed industry. Realizing this, a number of herbs have been identified for their use as feed additive including garlic and onion, which in turn may improve the performance of layers (Rhodes, 1996). The garlic contains important organic sulfurous compounds aliin, allicin, ajoene and allylpropyl disulphide and diallyl trisulphide, sallilcisteine, and others (Freeman and Kodera 1995; Kemper 2000; Mansoub 2011) [4, 6, 9]. Reuter *et al*. (1996) [13] reported garlic as a plant possessing antibiotic, anticancer, antioxidant, immune modulator, anti-inflammatory, hypoglycemic and cardiovascular protecting effects. Onion (*Alliium cepa* L.) which belongs to the family Liliaceae is extensively used as food and the common medicinal plants. Onion bulbs possess numerous organic sulfur compounds including trans-S-(1-propenyl) cysteine sulfoxide, S-methyl-cysteine sulfoxide, spropylcysteine sulfoxides, and cycloallicin, flavinoids, phenolic acids, sterols including cholesterol, stigma sterol, b-sitosterol, saponins, sugars, and a trace of volatile oil compounds mainly of sulfur compounds (Melvin *et al.* 2009) [10]. Most of the plant parts contain compounds with proven antibacterial, antiviral, antiparasitic, and anti-fungal properties and have antihypertensive, hypoglycemic, antithrombotic, antihyperlipidemic, anti-inflammatory, and antioxidant activities (Lampe 1999) [7].

Materials and Methods
A total of one hundred and twenty-six single comb white leghorn hens of commercial strain, 22 weeks of age, in first phase of their production cycle with an average weight of 1290 ± 13.27 g were randomly divided into seven treatment groups i.e., T_1 (control), T_2 (10g GP/Kg feed), T_3 (20g GP/kg feed), T_4 (30g GP/kg feed), T_5 (10g OP/kg feed), T_6 (20g OP/kg feed), T_7 (30g OP/kg feed) having three replications with six birds in each replication. Hens were fed the experimental diet for sixteen weeks of experimental period beginning at 22 weeks of age and continued up to 38 weeks of age. The basal diet of laying hens was formulated as per BIS (2007) standards by using maize (56 parts), soybean meal (19.5 parts), groundnut cake (12 parts), fishmeal (6 parts), mineral mixture (2.5 parts), salt (0.5 parts) and shell grit (3.5 parts). This concentrate mixture had 18.67% CP, 4.23% Crude fibre, 3.84% ether extract, 8.71% total ash and 2695.12 Kcal of metabolizable energy per kg.

Feed additive supplemented were Intermix regular-10g, Intermix-BE-10g per 100 Kg of ration. After every two weeks 21 eggs were collected randomly, one from each replication of each treatment to estimate egg weight and egg quality parameter. Egg weights were measured by using electronic weighing balance. The width and length of each egg was taken using Vernier caliper. Shell thickness was measured by using Screw Gauge. For this purpose, membrane removed pieces of shell were collected from three places, the average shell thickness was taken as the final reading. Body weights of individual birds were taken at the start of the experiment and end of the experiment. The data were statistically analyzed according to the procedure laid down by Snedecor and Chochran (1994) [15]. The statistical analysis of data was performed using SPSS 20.0 version of Microsoft (SPSS, 2001).

Result and Discussion

Data pertaining to egg weight (g) during progressive period (weeks) under dietary treatments has been presented in Table 1. The mean egg weight did not differ significantly ($P>0.05$) during entire experimental period among the different treatment groups. Cumulative mean of egg weight of different dietary garlic and onion powder treatment groups did not differ significantly when compared to control diet. Overall mean of egg weight was not significantly different in dietary OP or GP supplemented treatment groups as compared to control group.

Present findings are in consistent agreement with Omer *et al.* (2019) [12] who observed that incorporating GP, OP, and the mixture of them in laying hen diets had no significant effect on the average egg weight throughout the three stages of egg collection. Similarly, Canogullari *et al.* (2010) [3] also demonstrated that egg weight did not change when laying hens fed ration containing 1% garlic powder. In contrast with the current study, Olobatoke and Mulugeta (2011) [11] found that egg weight increased significantly by 2.06 at 5% GP over control diet.

Table 1: Egg weight (g) during progressive period (weeks) under dietary treatments

Weeks/ Treatment	T_1	T_2	T_3	T_4	T_5	T_6	T_7
22 – 24	49.62±0.33	49.95±0.78	50.92±0.59	50.88±1.16	49.78±1.20	50.79±1.14	50.48±1.26
24 – 26	50.87±0.70	50.13±0.72	51.25±0.65	49.96±0.62	51.56±1.45	50.67±0.74	50.59±0.79
26 – 28	49.55_{a}±0.17	50.77_{ab}±0.34	52.53_{b}±0.33	50.92_{ab}±0.92	51.31_{ab}±1.17	51.19_{ab}±0.79	50.72_{ab}±0.27
28 – 30	52.89±0.20	53.06±0.23	53.34±0.80	52.99±0.72	53.43±0.38	53.15±0.54	52.30±0.89
30 – 32	52.84±0.49	52.65±1.01	54.74±0.26	54.03±0.47	53.96±0.55	53.18±0.84	53.46±0.33
32 – 34	53.48±0.61	52.50±1.15	54.20±1.80	53.01±1.55	54.11±0.77	53.15±0.10	53.27±0.51
34 – 36	53.28±0.23	53.85±0.68	54.25±0.02	53.22±0.04	53.42±0.92	52.94±0.92	53.38±0.97
36 – 38	53.74±0.24	53.46±0.67	54.04±0.38	53.42±0.23	53.91±0.10	53.51±0.41	53.91±0.52
Overall Mean	52.03±0.61	52.17±0.54	53.15±0.51	52.30±0.52	52.68±0.56	52.32±0.42	52.26±0.51

The mean values in same row with different superscripts differ significantly ($P<0.05$)

The external egg quality parameters observed in laying hens in the present study were egg shell thickness and egg shape index. The external egg quality parameters observed in laying hens in the present study were egg shell thickness and egg shape index. The collective mean values (22-38 weeks) of egg shell thickness were 0.319, 0.325, 0.327, 0.328, 0.322, 0.330 and 0.325 mm in treatment groups T_1, T_2, T_3, T_4, T_5, T_6 and T_7, respectively (Table 2). The result findings showed that there was no significant ($P>0.05$) difference in cumulative means of egg shell thickness in different treatment groups. During 26th, 30th, 32nd and 34th weeks the mean values of shell thickness were non-significant among different dietary treatments. During 26-28 weeks the mean values of egg shell thickness was significantly ($p<0.05$) higher in T_4 (3% garlic powder) among all the dietary treatments.

Table 2: Mean values of egg shell thickness (mm) during progressive age (weeks) under different dietary treatments

Weeks/ Treatment	T_1	T_2	T_3	T_4	T_5	T_6	T_7
22 – 24	0.383^{b}±0.012	0.357^{ab}±0.002	0.379^{b}±0.010	0.343^{a}±0.016	0.336^{a} ±0.003	0.337^{a}±0.003	0.331^{a}±0.005
24 – 26	0.371±0.004	0.375±0.012	0.350±0.011	0.340±0.010	0.353±0.016	0.360±0.005	0.356±0.006
26 – 28	0.313±0.013	0.376^{c}±0.008	0.366^{bc}±0.06	0.413^{d}±0.021	0.346^{abc}±0.012	0.336^{ab}±0.006	0.326^{a}±0.006
28 – 30	0.306±0.012	0.286±0.003	0.303±0.008	0.306±0.003	0.320±0.005	0.323±0.008	0.340±0.005
30 – 32	0.303±0.003	0.303±0.003	0.313±0.014	0.320±0.005	0.306±0.008	0.306±0.008	0.316±0.008
32 – 34	0.293±0.003	0.303±0.012	0.326±0.008	0.333±0.008	0.316±0.011	0.310±0.023	0.320±0.005
34 – 36	0.286^{a}±0.006	0.296^{a}±0.003	0.286^{a}±0.006	0.290^{a}±0.015	0.303^{ab}±0.012	0.296^{a}±0.014	0.330^{b}±0.005
36 – 38	0.300^{a}±0.011	0.306^{a}±0.008	0.296^{a}±0.012	0.286^{a}±0.017	0.303^{a}±0.013	0.310^{a}±0.010	0.326^{b}±0.008
Overall Mean	0.319±0.130	0.325±0.132	.327±0.120	0.328±0.142	0.322±0.007	0.330±0.007	0.325±0.004

The mean values in same row with different superscripts differ significantly ($P< 0.05$)

Similarly, the results of the study depicted that there were no significant differences in egg shape index among different dietary treatments during progressive weeks of age of hens as well as with respect to the whole period (Table 3). In agreement to the present study Aswal *et al.* (2017) [1] found that there was no significant difference in shape index and shell thickness among the different garlic powder treatment groups. Similarly, Omer *et al.* (2019) [12] observed that inclusion of garlic powder, onion powder, or the mixture of them in laying hen diets had no significant effect on the shape index. Non-significant difference in shell thickness was also observed by Canogullari *et al.* (2010) [3] and Lim *et al.* (2008) [8].

Table 3: Mean values of egg shape index during progressive age (weeks) under different dietary treatments

Weeks/ Treatment	T_1	T_2	T_3	T_4	T_5	T_6	T_7
22 – 24	71.13±2.16	72.92±2.23	74.05±0.57	71.28±1.14	74.08±0.76	74.63±0.48	72.27±0.99
24 – 26	71.72±1.63	74.39±2.95	74.47±0.98	72.48±1.25	74.02±2.60	70.96±1.57	72.28±0.60
26 – 28	72.21±0.70	74.56±1.40	73.75±0.33	73.36±0.89	73.19±1.16	72.86±1.27	70.37±2.09
28 – 30	71.89±0.58	73.15±1.08	72.46±1.53	73.98±0.65	73.24±0.26	72.83±1.64	72.60±1.31
30 – 32	72.63^{ab}±0.77	74.58^{b}±1.78	71.56^{ab}±0.89	72.44^{ab}±1.17	68.53^{a}±3.16	72.61^{ab}±1.54	71.04^{ab}±0.70
32 – 34	72.50±0.74	71.40±1.61	71.34±0.86	70.50±2.34	73.30±0.46	70.86±1.91	71.70±1.59
34 – 36	70.80±3.11	69.52±2.28	69.19±2.39	70.77±.80	70.14±1.37	72.48±0.71	73.11±1.13
36 – 38	69.98±2.20	72.09±1.84	69.79±1.80	71.19±2.43	73.46±0.90	70.97±0.86	72.89±1.00
Overall Mean	71.60±0.32	72.82±0.5	72.07±0.24	72.00±0.33	72.49±0.24	72.27±0.56	72.03±0.18

The mean values in same row with different superscripts differ significantly ($P< 0.05$)

Conclusion

The statistical analysis of the data reported that there was no significant effect on the body weight gain and external egg quality parameters of hens by dietary supplementation of basal ration with different levels of garlic and onion powder as compared to the control ration.

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