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Effect of dietary supplementation of Ashwagandha (*Withania somnifera*) root powder on external egg parameters and body weight changes in laying hens

Sandeep Kumar, Raj Singh Berwal, Ramsawroop and Anuj Singh

Abstract
An experiment was conducted to evaluate the effect of supplementation of different levels of Ashwagandha root powder in the laying hens' diet on their production performance and egg quality parameters during a period of 16 weeks. A total of 120 white leghorn laying hens at 22 weeks of age were randomly selected and distributed into five experimental groups having four replicates of six birds each. The first group was kept as a control (T_1) and given the basal diet without antibiotics while second (T_2), third (T_3), fourth (T_4) and fifth (T_5) groups were fed basal diets supplemented with ARP @ 0.25, 0.5, 0.75 and 1%, respectively. The 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 Ashwagandha root powder supplementation.

Keywords: Ashwagandha, layers, body weight, external egg parameters

1. Introduction
Antibiotic growth promoters have been widely used for their property to enhance the production performance in livestock and poultry feeds. It is widely believed that use of antibiotics as growth promoters promotes evolution and/or selection of antibiotic-resistant strains in poultry farms. Continuous and sub-therapeutic use of antibiotics in animal feed as growth-promoters appears to promote emergence of antibiotic-resistant strains. The problem of bacterial resistance to antibiotics is a burning question throughout the world which became a reason to stop their use in feed (Chattopadhyay, 2014) [4]. Other commonly used feed additives are prebiotics, probiotics, synbiotics, enzymes, acidifiers and phytobiotics.
Herbal plants, are a new class of growth promoters and in recent years these feed additives have gained extensive attention in the feed industry. They are a wide variety of herbs, spices, and products derived thereof, and are mainly essential oils. Use of herbal plants is considered to be safe without having side effects for enhancing the performance of birds. The beneficial effects of herbs in farm animals may arise from activation of feed intake and secretion of digestive juices, immuno stimulation, antibacterial, coccidiostatic, anthelmintic, antiviral or anti-inflammatory activity and inhabitation of particularly antioxidant property. Several authors have given some overviews on physiologically active secondary plant metabolites and the principles of anti-oxidative characteristics (Rhodes, 1996) [11]. Realizing this, a number of he rbs have been identified for their use as feed additive including Ashwagandha which in turn may improve the performance of birds.
Withania somnifera, commonly known as Ashwagandha, Indian ginseng, poison gooseberry, or winter cherry is a plant in the solanaceae or nightshade family. The biologically active chemical constituents of *Withania somnifera* (WS) include alkaloids, steroidal lactones (withanolides, withaferins), saponins (Mishra *et al*., 2000) [7] somnitalglucose, rutinosides, inorganic salt and di-hydroxy kaempferol-3 (Murthy *et al*., 2009 and Pal *et al*., 2012) [8, 9]. These active principles have been reported to possess immunomodulatory, general tonic, hepato-protective, anti-stress, growth promoter, antioxidant properties (Kushwaha *et al*., 2012) [6] and also improves body weight gain, feed intake, FCR, immunological status, hematological profile, neuro-protective and rejuvenate muscles (Ansari *et al.*, 2008) [1]. beside antibacterial and anti-fungal properties (Punetha *et al*., 2010) [10].

2. Materials and Methods
A total of one hundred and twenty single comb white leghorn hens of commercial strain, 22

weeks of age, in the first phase of their production cycle with an average weight of 1109 ± 16.27 g were randomly divided into five treatment groups i.e. T_1 (control), T_2 (0.25% ARP), T_3 (0.50% ARP), T_4 (0.75% ARP), T_5 (1% ARP) having four 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) [3] standards. The ingredient composition and chemical composition of the layers' control ration (T_1), has been given in Table 1.

Table 3: Ingredient and chemical composition of ration for layers of control group

Feed ingredients	Percentage
Maize	56
Groundnut cake	11
Soybean Meal	15
Wheat bran	5
Fish Meal	6
Mineral Mixture	3
Salt	0.5
Shell Grit	3.5
Chemical composition	**%DM basis**
CP	18.86
CF	3.86
EE	3.84
NFE	62.52
Ash	10.92
Metabolizable energy(Kcal/Kg)	2699.10

Feed additive included Intermix regular-10g, Intermix-BE-10g per 100 Kg of ration.

After every two weeks 20 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 calliper. 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 analysed according to the procedure laid down by Snedecor and Chochran (1994) [12]. The statistical analysis of data was performed using SPSS 20.0 version of Microsoft (SPSS, 2001).

3. Result and Discussion

3.1 Body weight changes

The results of the study depicted that there was body weight gain under all the dietary treatments. The collective mean values (22-38 weeks) of body weight gain of layers were 0.36, 0.40, 0.45, 0.40 and 0.44 Kg in treatment groups T_1, T_2, T_3, T_4 and T_5, respectively (able 2). The statistical analysis of the data reported that there was no significant effect on the body weight gain of hens by dietary supplementation of basal ration with different levels of Ashwagandha root powder as compared to the control ration. Contrary to these findings Bhardwaj and Gangwar (2011) [2] reported that the body weight gain was statistically (P<0.05) higher in supplemented groups as compared to control group in quail hens.

In general, it can be stated that, other than for broiler production, body weight gain is not a biologically or economically relevant performance characteristic for laying hens and thus, body weight gain over the recommended levels is not targeted in laying hens due to the increased maintenance energy requirements. Nonetheless, the positive effects of phytogenic feed additive (PFA) on utilization of digestive products and availability of essential nutrients for absorption may increase body weight gain within the framework of their genetic potential without compromising productive performance.

Table 2: Body Weight changes (kg) of layers during the experimental period under different dietary treatments

Treatments	Initial Body Weight	Final Body Weight	Body Weight gain
T_1	1.17±0.04	1.53±0.05	0.36±0.03
T_2	1.11±0.04	1.51±0.04	0.40±0.03
T_3	1.06±0.02	1.51±0.03	0.45±0.03
T_4	1.14±0.02	1.54±0.04	0.40±0.03
T_5	1.11±0.02	1.55±0.04	0.44±0.03

3.2 Egg weight

The mean egg weights did not differ significantly during entire experimental period under different treatment groups. Cumulative mean of egg weight of different dietary Ashwagandha root powder treatment groups did not differ significantly when compared to control diet. Overall with respect to whole period, there was no significant (P<0.05) difference in egg weight in dietary supplemented treatment groups as compared to control group (Table 3). Present findings are in consistent agreement with Ibrahim *et al.* (2016) [5] who observed that in egg weight there is no significant difference in Ashwagandha supplemented groups as compared to control group in Japanese quails. While, opposite to these finding Bhardwaj and Gangwar (2011) [2] reported that egg weight was significantly (P<0.05) higher in diet containing 1 percent Ashwagandha than control group in laying quails. Tahmasbi *et al.* (2012) [13] found that hens fed on a diet supplemented with the highest *Withania somnifera* had significantly (P<0.05) lower egg weight than those fed on the diet without *Withania somnifera* in layers during late phase of production.

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

Weeks	Treatments				
	T_1	T_2	T_3	T_4	T_5
22 – 24	48.73±0.33	48.92±0.78	45.77±1.20	47.53±0.71	49.98±1.38
24 – 26	49.92±0.70	50.95±0.72	50.30±0.94	50.29±0.63	51.36±0.40
26 – 28	48.57±0.17	48.32±0.34	48.57±0.19	48.70±0.65	49.49±0.21
28 – 30	49.24±0.59	49.11±0.56	48.61±0.82	49.30±0.13	49.24±0.32
30 – 32	50.21±0.49	49.88±1.01	50.19±0.45	50.67±0.41	50.07±0.74
32 – 34	49.88±0.61	50.66±1.15	49.46±0.70	49.81±0.17	49.49±0.30
34 – 36	50.25±0.21	49.47±0.69	49.97±0.49	50.79±0.59	49.98±0.40
36 – 38	50.23±0.23	49.45±0.67	49.94±0.47	50.81±0.57	49.96±0.39
Mean	49.63±0.18	49.60±0.28	49.11±0.34	49.74±0.26	49.95±0.22

3.3 External egg quality

The external egg quality parameters observed in laying hens in the present study were egg shell thickness and egg shape index. The cumulative mean values (22-38 weeks) of egg shell thickness were 0.296, 0.301, 0.294, 0.303 and 0.302 mm in treatment groups T_1, T_2, T_3, T_4 and T_5, respectively (Table 4). The result findings showed that there was no significant difference in collective means of egg shell thickness in different treatment groups. During 24th, 26th, 28th, 30th, 32nd, 34th and 38th weeks the mean values of shell thickness were non-significant among different dietary treatments. During 34-36 weeks the mean values of egg shell thickness was significantly (P<0.05) higher in T_2 (0.25% Ashwagandha root powder) as compared to T_3 (0.5% Ashwagandha root powder) and T_4 (0.75% Ashwagandha root powder) but, it did not differ significantly with other treatment groups. 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 5). The present results are in agreement with Bhardwaj and Gangwar (2011) who concluded that the egg shell thickness and egg shape index were not found to differ significantly (P<0.05) among different supplemental levels of Ashwagandha.

Table 4: Mean values of egg shell thickness (mm) during progressive age (weeks) under different dietary treatments

Weeks	Treatments				
	T_1	T_2	T_3	T_4	T_5
22 – 24	0.252±0.012	0.276±0.009	0.253±0.016	0.282±0.014	0.283±0.016
24 – 26	0.263±0.005	0.270±0.012	0.262±0.007	0.269±0.010	0.286±0.014
26 – 28	0.298±0.006	0.292±0.007	0.293±0.005	0.306±0.008	0.293±0.004
28 – 30	0.297±0.011	0.290±0.011	0.310±0.006	0.289±0.007	0.303±0.004
30 – 32	0.290±0.012	0.308±0.009	0.298±0.004	0.313±0.006	0.308±0.007
32 – 34	0.312±0.007	0.317±0.005	0.296±0.010	0.317±0.002	0.306±0.003
34 – 36	0.334^{bc}±0.002	0.338^{c}±0.003	0.313^{a}±0.006	0.322^{ab}±0.005	0.324^{abc}±0.005
36 – 38	0.321±0.013	0.313±0.018	0.331±0.010	0.324±0.015	0.315±0.014
Mean	0.296±0.005	0.301±0.005	0.294±0.005	0.303±0.005	0.302±0.004

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

Table 5: Mean values of egg shape index during progressive age (weeks) under different dietary treatments

Weeks	Treatments				
	T_1	T_2	T_3	T_4	T_5
22 – 24	73.23±1.31	71.93±0.93	71.88±2.01	70.98±0.92	71.55±0.27
24 – 26	71.63±0.88	69.08±0.92	69.85±1.31	75.88±2.96	72.73±1.33
26 – 28	74.24±0.99	72.90±1.18	73.07±1.58	74.41±1.38	71.75±2.99
28 – 30	71.55±2.20	75.38±2.32	74.03±0.97	73.93±0.63	72.50±0.92
30 – 32	71.02±1.96	73.49±0.58	71.29±1.27	70.30±0.56	72.93±1.69
32 – 34	71.67±1.34	72.68±0.62	74.00±1.12	73.14±1.54	72.63±0.89
34 – 36	72.97±0.98	71.85±1.53	71.85±1.53	71.71±1.62	72.71±1.40
36 – 38	72.68±1.13	71.00±1.10	71.83±1.03	70.88±1.35	68.98±0.93
Mean	72.41±1.31	71.93±0.93	71.88±2.01	70.98±0.92	71.55±0.27

4. 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 Ashwagandha root powder as compared to the control ration.

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