Original Research Article

Effect of Supplementation of Ashwagandha (*Withania somnifera*) Root Powder on Body Weight and Egg Quality in Layers

ABSTRACT

Background: As the demand for natural and sustainable solutions in poultry production continues to rise, ashwagandha root powder presents itself as a promising avenue for improving egg quality while aligning with consumer preferences for wholesome and nutritious products. Therefore, research trial was conducted to study the effect of supplementation of ashwagandha root powder on body weight and egg quality in layers during a period of 10 weeks.

Methodology: One hundred and twenty white leghorn layers were randomly divided into four treatments and reared on standard managemental conditions. The Ashwagandha root powder was supplemented with the basal diet at 0.5% level (T_1), 1% (T_2), 1.5 % (T_3) while T_0 was kept as control i.e. basal diet without ashwagandha root powder.

Design used: Completely Randomized Design

Results: The result noted that the body weight change was not affected by ashwagandha root powder supplementation. Egg quality parameters *viz*., egg shape index, shell weight, yolk weight, yolk height, albumen weight and albumen index were not influenced by addition of ashwagandha root powder. However, significant ($p<0.05$)) effect was observed on yolk index. No significant difference was seen on sensory evaluation of egg.

KEYWORDS: layers, egg quality, yolk index, *Withania somnifera*, sensory evaluation

1. INTRODUCTION

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In recent years, there has been a growing interest in utilizing herbal feed supplements to enhance the health and productivity of poultry. Among these supplements, ashwagandha (*Withania somnifera*) has gained attention for its potential benefits in improving egg quality in layer hens. Ashwagandha, also known as Indian ginseng or winter cherry, is an adaptogenic herb renowned in traditional Ayurvedic medicine for its various health-promoting properties. Ashwagandha contains bioactive compounds

such as withanolides (witanopherin A, withanolides A-Y, witanone), alkaloids (somnin, witanin, anaferin and somniferinin) and flavonoids (3-O-rutinoside, quercetin) and its glycosidic derivatives [13] which possess antioxidant, anti-bacterial, anti-inflammatory and immunomodulatory properties [6]. Ashwagandha is loaded with minerals such as Ca, Cd, Al, K, Mn, Fe, Ni, Cu and Zn. Moreover, it also contains crude fibre (21-25 %), starch (6.09-9.46 mg/g), tannins (0.39-0.82), reducing and non-reducing sugars [10]. These compounds are believed to contribute to ashwagandha's potential to positively impact health and egg quality in layers. Understanding the effects of ashwagandha on layer egg quality is not only pertinent for the poultry industry's quest for sustainable and natural solutions but also holds significance for consumers who prioritize the nutritional quality of eggs. Therefore, we delve the effect of supplementation of Ashwagandha (*Withania somnifera*) root powder on body weight and egg quality in layers.

2. MATERIAL AND METHODS

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The study was conducted at Poultry unit, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (Maharashtra). The research trial was carried out on 120 white leghorn layers of 40 weeks of age for period of 10 weeks (40-50 weeks) and randomly assigned into four treatment groups. Four treatment includes T_0 (control): fed basal diet; T_1: fed basal diet incorporated with 0.5 percent ashwagandha root powder; T_2: fed basal diet incorporated with 1 percent ashwagandha root powder; T_3: fed basal diet incorporated with 1.5 percent ashwagandha root powder. The basal diet of laying hens was formulated as per BIS (2007). To calculate body weight gain of birds initial and final body weights of the laying hens were recorded. The maximum length and maximum width or breadth of egg was measured by vernier calliper and shape index was express as ratio of maximum width and maximum length of eggs in percentage.

$$\text{Shape index} = \frac{\text{Width of egg in mm}}{\text{Length of egg in mm}} \times 100$$

The weight of shell along with shell membrane was measured in grams on an electronic balance after proper drying of egg shell. Specific gravity was tested using the floatation method [11]. Yolk and albumen were separated with a separating spoon and weighed with an electronic balance in grams. The length of albumen and yolk diameter was measured with the help of Vernier Calliper in

millimetres. The height of yolk and albumen were recorded with spherometer. Albumen index was measured using formula,

$$\text{Albumin index} = \frac{\text{Average height of albumin in mm}}{\text{Albumin width of albumin in mm}} \times 100$$

Yolk index was calculated as per the formula given by Card and Nesheim (1972). The data obtained on various egg quality parameters during experiment were statistically analyzed using Completely Randomized Design (CRD) as per procedure described by Snedecor and Cochran (1994).

3. RESULT AND DISCUSSION

3.1 Effect on body weight gain

The average body weight gain in T_0, T_1, T_2 and T_3 treatment groups were presented in Table 1. The average values of body weight changes of laying hens were 52.06, 51.51, 51.14 and 52.20 gm in T_0, T_1, T_2 and T_3 treatments, respectively. There was no significant difference was noted in the gain in body weight of white leghorn layers in different treatment groups. The results of body weight gain are similar with the findings [1,2] noted that no significant effect of garlic feeding on gain in body weight in laying hens.

Table 1. Body weight changes of layers

Treatment	Initial Body weight	Final Body weight	Body Weight Gain
T_0	1307.77	1359.83	52.06
T_1	1307.06	1358.57	51.51
T_2	1312.63	1363.77	51.14
T_3	1312.03	1364.23	52.20

3.2 Effect of feeding ashwagandha root powder on egg quality parameters of white leghorn layers

The mean values of egg shape index, egg shell weight and specific gravity were depicted in Table 2. Numerically higher average egg shape index was reported in group T_2 (1 % ARP) followed by T_3, T_1 and T_0 however, the statistical analysis revealed that no significant differences in all treatment

groups over entire period of experiment. The results are in close agreement [15] examined egg shape index were not significantly differ between treatment groups.

Table 2. Effect of ashwagandha root powder on external egg qualities of white leghorn layers

	Weeks	Treatment				SE (±)	CD @ 5 %
		T_0	T_1	T_2	T_3		
Egg Shape index (%)	40-42 Weeks	73.34	75.33	76.97	73.97	0.81	NS
	42-44 Weeks	73.84	74.94	75.94	74.73	0.71	NS
	44-46 Weeks	71.76	73.91	74.25	73.60	0.91	NS
	46-48 Weeks	72.62	75.75	77.37	75.82	1.08	NS
	48-50 Weeks	72.90	74.62	75.23	74.72	0.61	NS
Shell weight (g)	40-42 Weeks	6.15	6.28	6.34	6.36	0.10	NS
	42-44 Weeks	6.29	6.23	6.41	6.33	0.15	NS
	44-46 Weeks	6.25	6.31	6.36	6.28	0.17	NS
	46-48 Weeks	6.42	6.34	6.30	6.35	0.13	NS
	48-50 Weeks	6.33	6.37	6.45	6.35	0.10	NS
Specific gravity	40-42 Weeks	1.089	1.088	1.090	1.086	0.0011	NS
	42-44 Weeks	1.090	1.091	1.085	1.087	0.0018	NS
	44-46 Weeks	1.091	1.088	1.088	1.090	0.0012	NS
	46-48 Weeks	1.088	1.089	1.090	1.089	0.0011	NS
	48-50 Weeks	1.091	1.088	1.085	1.090	0.0020	NS

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

Statistical analysis of data on shell weight was shown in Table (2) were noted no significant difference among the treatment throughout the trial period. Adding of herbal extracts of garlic, thyme and caraway to drinking water of quails were no significant effect on shell weight [3]. The Uttara layers fed 1gm, 2gm and 4gm/kg arjun bark powder produced eggs with unchanged egg shape index and shell weight [16]. Regarding egg specific gravity values, no significant differences were found in all treatment groups throughout the experimental period. These results are parallel to the findings of [8]

who noticed that specific gravity was not significantly affected by feeding of turmeric powder at 0.0, 0.50, 1.0, 1.5 and 2.0 g/kg of feed to the laying hens.

From Table 3, it can be revealed that during 40 to 48 weeks of age, different levels of ashwagandha root powder showed non-significant effect on yolk height (YH). During fifth biweekly (48-50 week) of experiment, T_2 (1 % ashwagandha root powder) had significantly ($P<0.05$) higher yolk height as compared with T_3, T_1 and T_0 (control) groups. Concerning yolk diameter, no significant differences were observed among treatments throughout the experimental trial (Table 3). Our results corroborate well with those of [9] pointed out yolk height did not significantly change by inclusion of plant extracts to the bird's diet.

During 40 -44 biweekly of age, yolk index was not affected on inclusion of ashwagandha root powder in the basal diet of layer. However, from III biweekly (44-46 weeks) onwards of experiment surprisingly observed a significant ($p<0.05$) difference in the yolk index of eggs of white leghorn layers. At 44-48 of bird age, T_2 group had significantly ($P<0.05$) higher yolk index as compared to other treated groups. Significantly ($p<0.05$) superior yolk index was observed in treatment T_2 (1 % ARP) than the T_1 (0.5% ARP), T_3 (1.5 % ARP) and T_0 (Control) groups between 48- 50 weeks of experimental trial. Similar findings were noted [12] on feeding *Withania somnifera* roots in powdered form in diet of heat stressed Japanese quails. As yolk index is ratio of the height and diameter of yolk so, improvement in yolk index could be due to numerically high values of yolk height and yolk diameter as recorded. The increased diameter and height of yolk indicated that more vitellogenin might be synthesized by hepatocytes and deposited in the ovarian follicles [18].

Table 3. Effect of ashwagandha root powder on egg yolk height, width and index of white leghorn layers

height (mm)	Weeks	Treatment				SE (±)	CD @ 5 %
		T_0	T_1	T_2	T_3		

	40-42 Weeks	17.96	17.88	17.64	17.88	0.30	NS
	42-44 Weeks	18.19	17.94	18.51	18.15	0.25	NS
	44-46 Weeks	18.49	18.38	18.82	18.59	0.26	NS
	46-48 Weeks	17.85	18.39	18.47	17.92	0.28	NS
	48-50 Weeks	18.01^{b}	18.26^{b}	19.12^{a}	18.61^{ab}	0.19	0.60
Yolk diameter (mm)	40-42 Weeks	36.32	38.81	40.19	39.92	1.18	NS
	42-44 Weeks	39.64	38.38	40.34	40.14	0.89	NS
	44-46 Weeks	39.25	38.54	39.61	39.15	0.44	NS
	46-48 Weeks	37.74	38.65	38.67	37.88	0.69	NS
	48-50 Weeks	39.15	37.45	39.49	39.71	0.78	NS
Yolk index (%)	40-42 Weeks	46.50	45.84	44.92	46.52	0.77	NS
	42-44 Weeks	47.69	46.92	45.83	45.33	1.38	NS
	44-46 Weeks	46.98^{b}	47.58^{a}	48.03^{a}	47.78^{a}	0.18	0.60
	46-48 Weeks	48.14^{b}	48.63^{ab}	49.05^{a}	48.89^{a}	0.20	0.65
	48-50 Weeks	46.11^{b}	47.03^{b}	48.52^{a}	46.91^{b}	0.33	1.06

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

Biweekly data pertaining to albumen weight, height and albumen index are set out in Table 4. The average albumen height and albumen index did not differ significantly among treatment groups during progressive weeks of age of white leghorn layers as well as with respect to whole period. Results are in agreement [14] who discovered that albumen index had not been affected significantly due to dietary supplementation of ARP. Also, [12] examined *Withania somnifera* supplements had non-significant effect on albumen height.

Data related to albumen weight of eggs of white leghorn layers are represented in Table 4. It was notified that the difference in albumen weight was non-significant during different weeks of age during period of trial except at beginning of experiment. At first bi-weekly (40-42 weeks) of experiment, significant difference observed in albumen weight. The mean significant higher value observed in T_3 (35.22 g) treatment group followed by T_1 (34.39), T_2 (33.86) and T_0 (32.67), respectively. It can be concluded; dietary supplementation of ashwagandha root powder at different levels had no effect on the albumen weight. The findings of study were parallel with [4] demonstrated

albumen weight and albumen index did not significantly affected on addition of *Withania somnifera* to Japanese quail ration. Additionally, [21] determined that egg albumen had not influenced on the addition of garlic powder at 5 and 10 g/kg of feed garlic in laying hens.

Table 4. Effect of ashwagandha root powder on egg albumen height, weight and albumen index of white leghorn layers

	Weeks	Treatment				SE (±)	CD @ 5%
		T_0	T_1	T_2	T_3		
Albumen height (mm)	40-42 Weeks	7.25	7.53	7.54	7.73	0.28	NS
	42-44 Weeks	7.60	7.96	7.75	7.80	0.24	NS
	44-46 Weeks	7.61	7.83	8.06	7.50	0.28	NS
	46-48 Weeks	7.65	7.76	7.80	7.87	0.14	NS
	48-50 Weeks	7.29	7.73	7.40	7.23	0.37	NS
Albumen weight (g)	40-42 Weeks	32.67^{c}	34.39^{ab}	33.86^{bc}	35.22^{a}	0.39	1.27
	42-44 Weeks	35.04	33.05	32.80	32.75	0.87	NS
	44-46 Weeks	34.42	32.85	33.58	33.26	0.78	NS
	46-48 Weeks	33.09	33.76	34.15	33.94	1.19	NS
	48-50 Weeks	33.95	34.08	33.38	34.30	0.84	NS
Albumen index (%)	40-42 Weeks	12.19	13.33	12.79	12.57	0.65	NS
	42-44 Weeks	12.16	12.67	12.07	11.58	0.47	NS
	44-46 Weeks	12.69	12.61	12.98	12.51	0.41	NS
	46-48 Weeks	13.12	13.60	12.93	13.07	0.70	NS
	48-50 Weeks	11.41	12.55	11.57	11.18	0.60	NS

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

3.3 Sensory evaluation of eggs

Regarding sensory attributes of eggs sample *viz*., their appearance & colour**,** flavour, aroma and overall acceptability showed in Table 5. It was observed that there was no significant distinction in appearance & colour**,** flavour, aroma and overall acceptability of eggs among the treatment groups of

white leghorn layers fed diets supplemented with Ashwagandha root powder at different levels. Likely, [17] revealed that addition of Phyto herbal feed additives in laying hens didn't impact on egg aroma, flavour and all eggs were accepted by panelists. Inclusion of herbal feed additives (black cumin, garlic and turmeric) with feed in laying hens did not affect on organoleptic parameters of eggs [19].

Table. 5 Effect of dietary supplementation of ashwagandha root powder on sensory score of eggs

Treatments	Sensory evaluation of Eggs			
	Appearance & Colour	Flavour	Aroma	Overall acceptability
T_0	7.89	7.89	8.07	7.95
T_1	7.83	8.04	8.06	7.98
T_2	7.84	7.99	7.98	7.93
T_3	7.80	8.02	7.81	7.88
SE (±)	0.12	0.09	0.08	0.06
CD @ 5 %	NS	NS	NS	NS

CONCLUSION

The statistical analysis of data revealed that utilization of ashwagandha root powder at different levels with basal diet of layer had no significant effect on egg shape index, shell weight, egg specific gravity, albumen height, index and yolk height. However, yolk index showed significant effect on supplementation ashwagandha root powder.

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