



Original Research

Effect of Feeding of Azolla (*Azolla pinnata*) on the Performance of White Pekin Laying Ducks

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Abstract

A study was conducted to see the effect of feeding of fresh azolla (*Azolla pinnata*) on the performance of White Pekin laying ducks (60 no., 56 weeks) divided into three groups (each group had four replicates with five laying ducks per replicate) and were randomly fed three diets i.e. T1-control diet (Standard duck layer diet(SDLLD)), T2 (SDLD reduced by 10% + fresh azolla @ 100g/duck/day) and T3(SDLLD reduced by 20% + fresh azolla @ 200g/duck/day). The azolla contained 4.74 % dry matter (DM); 24.93% crude protein (CP); 3.48% ether extract (EE); 13.80% crude fibre (CF), 16.84% total ash (TA) and 40.95 % nitrogen free extract (NFE). Egg production and egg weight increased significantly ($P<0.05$) due to the feeding of Azolla at both the levels. The feed consumption was significantly ($P<0.05$) higher for T₂ group. The feed conversion ratio (FCR), performance efficiency index and shape index of eggs were significantly ($P<0.01$) improved for the azolla fed ducks. The egg quality characteristics viz. haugh unit score, albumen index, yolk index and shell thickness with or without shell membrane (mm) were similar for both control and azolla fed ducks. The yolk colour of ducks fed azolla was deep orange compared to the control group. It can be concluded that feeding of fresh azolla @ 200g/duck/day as replacement of 20 % of concentrate feed in White Pekin Laying ducks was beneficial in terms of improved FCR, performance efficiency index, egg production, egg weight with better shape index of eggs and enriched yolk colour.

Key words: Azolla, Egg quality, Production Performance, White Pekin Laying Ducks

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Introduction

India ranks second in world, with a total duck population of around 23.5 millions according to the livestock census of India, 2012. Duck egg and meat are preferred by people next to chicken and has demand in market. Productivity in tropics has been limited by scarcity and consequent high prices of the conventional protein sources which are limiting factors for poultry feed production (Atawodi *et al.*, 2008). Hence, there



is a need to search for alternate protein sources for use as feed supplement for sustainable poultry production.

The search for alternative feed resource led the scientist to find a wonderful plant Azolla, which holds the promise of providing a sustainable feed for livestock and poultry. Azolla is a floating fern and belongs to the family of *Azollaceae*. Azolla hosts a symbiotic blue green algae *Anabaena azollae*, which is responsible for the fixation and assimilation of atmospheric nitrogen. Azolla in turn provides a carbon source and favourable environment for the growth and development of the algae. In this unique symbiotic relationship that makes Azolla, a wonderful plant with high protein content. Azolla (*Azolla pinnata*) is a very good source of protein, amino acids, vitamins (A, B₁₂ and β -carotene), growth promoter and intermediaries and minerals like calcium, phosphorous, potassium, ferrous, copper, manganese etc. On dry weight basis azolla contains 25-35 % crude protein (CP), 5-15 % minerals and 7-10 % amino acids. Carbohydrate and fat % are very low. It is easily digestible due to low lignin content. Azolla contains good amount of amino acids i.e. lysine, 1.51 %, Meth+Cys, 0.97 % with a protein content of 23.4 % (Buckingham *et al.*, 1978). In comparison to other conventional fodders like hybrid napier, lucerne, sorghum, Azolla produces higher quantity of biomass of about 730 t/ha (Pillai *et al.*, 2002). Keeping in view, its chemical composition, ease of biomass production and potential nutritional value in birds, present study was planned to study the effect of feeding of fresh azolla (*Azolla pinnata*) as a direct feed supplement replacing a portion of standard duck layer diet on the performance of White Pekin laying ducks.

Materials and Methods

Fresh azolla was produced in the azolla cultivation unit (in silpauline pit) of the research centre. Sixty White Pekin laying ducks (56 weeks) were divided into three groups (each group had four replicates with five laying ducks per replicate) and were randomly fed three diets i.e. T1-control diet (Standard duck layer diet(SDL)), T2 (SDL reduced by 10% + fresh Azolla @ 100g/duck/day) and T3 (SDL reduced by 20% + fresh azolla @ 200g/duck/day). All the birds were reared on deep litter system during the experimental period of 56 days. Standard management practices were followed and clean drinking water was made available *ad lib.* throughout the experiment. The weekly feed intake, daily egg production and egg weight were recorded. The egg quality parameters *viz.* shape index, albumen index, yolk index, haugh unit, albumen%, yolk%, shell%, and shell thickness were recorded once in a week. The feed cost to produce dozen egg and feed cost per duck per day were calculated. The proximate composition of Azolla and standard duck layer diet was analyzed (AOAC, 2005). The data pertaining to various parameters were analysed (Snedecor and Cochran, 1989). The means were tested for significant differences by Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Ingredient and nutrient composition (%) of Standard duck layer diet and azolla

Ingredients, %	Standard Duck Layer Diet
Wheat	55
Soybean meal	18
Deoiled rice bran	7
Fish Meal	7
DCP	2
Oyster Shell	10
Calcite	1
Trace Min.	0.5
Vitamin A,D,E,K	0.015
Vitamin B-Complex	0.015
DL-Methionine	0.05
L-Lysine HCl	0.05
Toxin Binder	0.1
Choline Chloride	0.1

Chemical Composition	Diet	Azolla
Analysed (%)		
Crude Protein	18.49	24.93
Ether Extract	4.36	3.48
Crude fibre	9.64	13.8
Total ash	11.13	16.84
Nitrogen free extract	56.38	40.95
Calculated (%)		
ME (Kcal/Kg),	2500	
Calcium	4.5	
Available Phosphorous	0.39	
Lysine	1.1	
Methionine	0.4	

Results and Discussion

Azolla contained 24.93 % crude protein (CP); 3.48 % ether extract (EE); 13.80 % crude fibre (CF) and 16.84% total ash (TA) and 40.95 % nitrogen free extract (NFE). Similar CP and EE contents were reported by earlier researchers (Parthasarathy *et al.*, 2002). However, lower values of CP were reported by other workers (20.45%, Rathod *et al.*, 2013; 21.17 %, Sujatha *et al.*, 2013; 21.4%, Alalade and Iyayi, 2006; 21.66 %, Kavya *et al.*, 2015; 21.80, Yadav and Chhipa, 2016 and 22.5 %, Ashraf *et al.*, 2015). Higher values for CP were reported by earlier workers (25.40 %, Acharya *et al.*, 2015; 25.42 %, Biswal *et al.*, 2016; 25.64 %, Mishra *et al.*, 2016; 25.69 %, Saikia *et al.*, 2014; 25.78%, Basak *et al.*, 2002; 26.6 %, Katoch *et al.*, 2017; 26.7 %, Becerra *et al.*, 1995 and 28.24%, Indira *et al.*, 2009). Significant ($P < 0.05$) decrease in feed intake was observed in laying ducks fed diet given fresh azolla @ 200g/duck/day (T_2) (Table 2).

Similarly, Henry *et al.* (2015) observed that feeding of fresh azolla @30g/bird/day reduced the feed intake by 82.26g (533.47g) compared to control (618.73g) in turkey birds.

Table 2: Effect of feeding Azolla (*Azolla pinnata*) on performance of White Pekin layer ducks

Treatment	Egg Production (Dozen)	Feed Consumption (kg)	Feed conversion ratio	DDEP %	Performance Efficiency Index	Egg weight (g)
T ₁	1.77 ^c	11.25 ^a	6.362 ^a	38.85 ^a	14.52 ^a	72.79 ^b
T ₂	2.26 ^b	11.75 ^{ab}	5.232 ^b	49.27 ^b	17.93 ^b	74.61 ^a
T ₃	2.61 ^a	11.11 ^b	4.277 ^c	56.91 ^c	22.12 ^c	74.79 ^a
SEM	0.112	0.115	0.274	2.435	1.028	0.349

Means bearing different superscripts in a column differ significantly ($P < 0.05$)

In contrast, non-significant differences in feed consumption was observed due to feeding of 5 and 10 % fresh azolla in white pekin broiler ducks compared to control (Acharya *et al.*, 2015) and increase in feed consumption in local ducks fed fresh Azolla @100g/duck/day was reported by earlier workers (Sujatha *et al.*, 2013). The egg production (dozen) and duck day egg production (DDEP) increased significantly due to supplementation of fresh azolla at both levels (both 100g and 200g/duck/day).

Table 3: Effect of feeding Azolla (*Azolla pinnata*) feeding on egg quality characteristics of White Pekin layer ducks

Treatment	Shape Index	Haugh Unit	Albumen index	Yolk index	Whole Egg contents (%)	Albumen (%)	Yolk (%)	Shell (%)	Shell thickness with membrane (mm)	Shell thickness without membrane (mm)
T ₁	71.12 ^b	94.8	14.38	44.08	84.99	50.32	35.06	13.59	0.555	0.476
T ₂	71.38 ^b	96.43	14.3	44.71	85.17	50.42	35.3	13.49	0.551	0.46
T ₃	72.69 ^a	94.93	14.19	44.16	85.09	51.65	34.53	13.63	0.56	0.461
SEM	0.292	0.352	0.073	0.206	0.205	0.341	0.242	0.101	0.005	0.005

However, Sujatha *et al.* (2013) observed similar values of percent duck day egg production for control (39.22 %) and azolla group (38.88 %) in a study conducted in non-descriptive local ducks in Andaman and Nicobar Islands. Significant ($P < 0.05$) improvement in feed conversion ratio was observed in laying ducks fed fresh azolla at both levels. In contrast, Lawas *et al.* (1998) noticed no significant difference in FCR between the laying ducks fed *ad libitum* azolla by replacing 50 % of control diet and those fed solely the control diet. Dhumal *et al.* (2009) and Balaji *et al.* (2009) observed non-significant difference in FCR of the broilers fed azolla at a level of 1-5 %. Biswal *et al.* (2016) also observed non-significant difference in FCR in broilers due to supplementation of azolla by replacing 5 and 10 % protein in isonitrogenous and isocaloric diets. The performance efficiency index increased significantly ($P < 0.05$) due to feeding of fresh Azolla in white pekin ducks at both levels which might be due to better FCR, egg production and egg weight

in azolla fed ducks. Egg weight (g) was increased significantly in ducks fed fresh azolla at both levels. However, (Sujatha *et al.*, 2013) reported similar egg weight for both control and azolla fed ducks. The shape index increased significantly in ducks kept on T₃ (200g fresh azolla/duck/day) and egg quality parameters such as albumen index, yolk index, haugh unit score and shell thickness in ducks fed fresh azolla were similar in all the groups. The egg yolk of the laying ducks fed azolla was deep orange in color compared to the light yellow color of the egg yolk in the control ducks. The deep orange color of egg yolk in azolla fed ducks might be due to the presence of β -carotene pigments in azolla. Pillai *et al.* (2004) observed that azolla contains appreciable quantity of β -carotene, vitamin B₁₂ and biopolymers.

In present study, feeding of fresh azolla @100g/duck/day and 200g/duck/day saved Rs1.03/egg and Rs2.52/egg on feed cost, respectively which might be due to better egg production and FCR in Azolla fed groups. Similarly, Sujatha *et al.* (2013) observed that there was a saving of Rs0.76/egg on feed cost due to feeding of fresh azolla @200g/duck/day which was due to reduction (30.73 %) in feed consumption in azolla supplemented group. Similar observation was also made in a previous study conducted by Sujatha *et al.* (2013) who reported a saving of Rs1/duck/day in feed cost due to feeding of fresh azolla.

Conclusion

It can be concluded that supplementation of fresh azolla (*Azolla pinnata*) @200g/duck/day by substituting 20 % of standard duck layer diet improved the egg production, egg weight, feed conversion ratio, performance efficiency index and shape index with enrichment of yolk colour.

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