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Influence of Incorporation of Azolla Meal on Performance of Laying Japanese Quails

R. Kasi Sowjanya Lakshmi*, Ch. Venkata Seshiah, P. Ravikanth Reddy, K. Nagaraja and I. Kumar

NTR College of Veterinary Sciences, Sri Venkateswara Veterinary University, Gannavaram-521102, Andhra Pradesh, India

ABSTRACT

This study was conducted to evaluate the performance of laying Japanese quails fed on different levels of azolla meal (AZM). Ten weeks old 150 quails (*Coturnix coturnix japonica*) were randomly divided into 3 groups with 5 replicates of 10 birds each. Control group was fed with a diet containing 0% AZM while the other two groups received diets with 3 and 6% AZM, respectively for a period of 6 weeks. Feed consumption and egg production were recorded and feed efficiency (g feed consumed/12 eggs) was calculated during the entire trial period. Ten eggs from each treatment were examined for quality. At the end of the trial, 5 birds from each treatment group were slaughtered to study the carcass characteristics. There were no significant differences in both performance and egg quality parameters by incorporation of AZM. Carcass characteristics were also found to be similar in 3 groups except for giblet, back and wings percentage. It was concluded that AZM could be incorporated in laying quail's diet up to 6% without affecting the performance and egg quality parameters.

Key words: Azolla meal, Carcass traits, Egg quality, Japanese quails, Performance

INTRODUCTION

In poultry production, feed cost accounts for nearly 60% of the total cost of production (Shaikh and Zala, 2011). The shrinking feed resources of the world and their escalating cost has triggered search for cheap unconventional feeds for poultry production. There is a conscientious effort to switch on to non-conventional feed items to slash feed cost in poultry production.

Azolla has been established as a potential feed ingredient for livestock and poultry by many researchers (Pillai *et al.,* 2005). Azolla (*Azolla pinnata*), an aquatic fern, abundantly available in stagnant water in tropical and subtropical regions of the world, has been recommended for feeding broiler and layer chicken (Basak *et al.,* 2002). It is very rich in proteins, essential amino acids, vitamins, growth promoter intermediaries and minerals (Pillai *et al.,* 2005; Henry *et al.,* 2017). Inclusion of azolla in the poultry diet economises production (Dhumal *et al.,* 2009) but very limited studies have been conducted on evaluating its effects on the laying performance and carcass traits of Japanese quails. Further, in the recent past, small and marginal poultry farmers of India are more interested in rearing Japanese quails rather than other species due to increasing consumer demand especially in urban areas. Hence, an attempt was made to investigate the effect of feeding azolla (*Azolla pinnata*) meal (AZM) on laying performance, egg quality and carcass traits of Japanese quails (*Coturnix coturnix japonica*).

MATERIALS AND METHODS

Azolla was collected from the ponds maintained at the farm, dried under shade, ground and stored in plastic bags. One hundred and fifty quails of 10 weeks belonging to single hatch were weighed individually and allotted randomly to 3 groups with 5 replicates of 10 quails each. Three experimental diets were prepared by incorporating 0, 3 and 6% of azolla meal (AZM) in quail layer ration of groups T_1, T_2 and T_3, respectively. The diets were isocaloric and isonitrogenous and prepared to meet the requirements (NRC, 1994) of laying quails (ME-2800 Kcal/kg and CP-20%). Birds were kept in quail layer cages and feed and water were provided *ad lib.*

Ingredient composition and calculated nutrient content of three diets have been presented in Table 1. Daily egg production, mortality of birds and weekly feed

*Correspnding author: E-mail: soujanyavetty@gmail.com, Assistant Professor (Animal Nutrition) Livestock Farm Complex, NTRCVSc, Gannavaram, Andhra Pradesh

Table 1. Ingredient composition and calculated nutrient content

	Level of azolla meal (%)		
	0	**3**	**6**
Feed ingredient			
Maize	40	38.8	37.6
Soyabean meal	24	23.3	22.5
Gingelly cake	12	11.6	11.3
Azolla meal (AZM)	0	3	6
Deoiled rice bran	15	14.5	14.1
Shell grit	7	6.85	6.6
DCP	1.5	1.45	1.4
*Premix	0.5	0.5	0.5
Total	100	100	100
Chemical composition (calculated)			
CP (%)	19.84	19.92	19.98
ME (Kcal/kg)	2790	2756	2783
Ca (%)	3.06	3.04	2.99
P (%)	0.6	0.59	0.59

*Premix: : 0.1%, heptocare 0.05%, coccidiostat 0.05%, 0.065% choline chloride, B-complex- 0.09% (mg/kg) (thiamin-1; pyridoxine-2; cyanocobalamine-0.01; niacin,15; pantathonic acid-10; ±-tocopherol-10; biotin-0.08); menadione-0.002%; retinol acetate-0.03%; Cholecalciferol -0.03%

consumption were recorded. FCR was calculated based on feed intake and egg production. Ten eggs per treatment were collected for studying the egg quality parameters. Egg weight, yolk color, yolk index, albumen index and Haugh unit were calculated (Card and Nesheim, 1972). At the end of feeding trial, 5 birds from each treatment (total 15 birds) were slaughtered to study the carcass characteristics like dressed weight, weight of legs, wings, breast, back, neck thigh, giblet and dressing percentage.

Azolla meal was analysed for proximate principles, Ca and P contents (AOAC, 2005). Data were statistically analyzed by one way ANOVA using SPSS windows (SPSS, Inc., 2002). Significant differences ($P<0.05$) between means were determined by Duncans multiple comparison test (Duncan, 1955).

RESULTS AND DISCUSSION

The proximate composition of azolla meal has been presented in Table 2. The CP content (22.56%) of AZM was comparable to the values repoted by Alalade and Iyayi (2006) and Shaukat *et al.*(2015). The Ca content (1.93%) was in close conformity with the values reported by Parthasarathy *et al.* (2001). The P content (0.64%) found in present study was in close agreement with value (0.64%) reported by Shaukat *et al.* (2015).

Incorporation of AZM in diets of quails up to 6% level did not affect egg production, feed intake and FCR (feed consumed/dozen of eggs produced) for the experimental period of 6 weeks (Table 3). However, Shamna *et al.* (2013) reported that performance of broiler quails depressed beyond 5% by substitution of AZM in the diet. Inconsistent results on AZM inclusion have been reported which could be due to differences

Table 2. Chemical composition (% DM basis) of azollla meal

Constituent	Percentage
Dry matter	89.65
Organic matter	83.35
Total ash	16.65
Crude protein	22.56
Ether extract	1.96
Crude fiber	16.80
Nitrogen free extract	42.03
Calcium	1.93
Phosphorus	0.61

Table 3. Effect of different levels of AZM in quail ration on production performance

Group	Feed intake (g per bird/d)	Egg Production (%)	FCR (g/Feed consumed 12 eggs produced)
T_1 (0% AZM)	24.03	69.38	0.407
T_2 (3% AZM)	22.81	65.18	0.435
T_3 (6% AZM)	24.34	63.38	0.459
SEM	0.459	1.979	0.023
P value	0.378	0.479	0.699

in species, physiological status, percent levels of AZM and type of concentrate replaced. Several workers (Basak *et al.,* 2002; Bholka, 2011; Naghshi *et al.,* 2014) reported that feeding of AZM upto 5% level in diets of commercial broiler chicken had positive effect on production performance. Including AZM up to 7.5% of body weight increased body weight gain by 2.6% with higher Ranikhet virus titers in commercial broilers (Prabina and Kumar, 2010). However, Alalada *et al.* (2007) observed non-significant variations in growth performance of Nera brown pullets when AZM was fed upto 10% level. Shaukat *et al.* (2015) noticed a linear reduction in feed consumption of broiler chicken with increased AZM levels in the diets. Similar findings on production performance of ducks were reported elsewhere (Lawas *et al.,* 1998; Sujatha *et al.,* 2013). Recently, Henry *et al.* (2017) found that fresh azolla supplementation @ 30 g/bird/d reduced feed consumption without affecting the growth performance in turkeys at 7 weeks age which might be due to high protein and mineral content of azolla.

There were no significant variations in egg quality parameters in different groups except for yolk color which was found more pronounced (3.5 to 4.0) with increased levels of AZM in the diet. Similarly, Sujatha *et al.* (2013) also reported an increase in yolk color from 6.0 to 7.4 on feeding fresh azolla to ducks. Incorporating AZM in layer diet resulted in better yolk color which might be attributed to the carotenes present in AZM (Bholka, 2011). However, Alalade *et al.* (2007) reported no impact of feeding AZM during grower phase of pullets on egg quality characteristics including yolk color in laying phase. Lawas *et al.* (1998) observed a non-significant difference in average egg weight values on feeding fresh azolla to laying ducks. On the contrary, Bholka (2011) reported higher egg weights in layers fed with 7.5% AZM.

There was no significant influence of level of AZM on carcass traits except for giblet, back and wings percentage which were higher ($P<0.05$) in 3% AZM fed group (Table 5). Shaukat *et al.* (2015) also reported no effect on carcass traits on feeding azolla up to 20% level. Basak *et al.* (2002) reported higher dressing percentage of broiler chicken in treatment group fed 5% AZM due to the higher body weight gains. Naghshi *et al.* (2014) also reported better carcass efficiency with 5% azolla feeding in commercial broilers except for abdominal fat, liver, gizzard and breast relative percentage.

CONCLUSION

It could be concluded that azolla meal might be fed to laying quails up to 6% as a replacement without

Table 4. Effect of different levels of AZM in quail ration on egg quality traits

Group	Egg weight	Shape index	Albumin index	Haugh unit score	Yolk index	Yolk color
T_1 (0% AZM)	10.36	75.327	0.086	81.325	0.512	3.5
T_2 (3% AZM)	10.26	78.639	0.083	81.499	0.487	3.7
T_3 (6% AZM)	10.28	79.748	0.077	81.810	0.499	4.0
SEM	0.171	2.856	0.003	0.695	0.016	-
P value	0.994	0.816	0.477	0.962	0.824	-

Table 5. Effect of different levels of AZM in quail ration on carcass traits

Group	Live wt	Head, leg, wing (g)	Giblet (%)	Back (g)	Breast (g)	Wings (g)	Thigh (g)	Dressed weight (g)	Dressing (%)
T_1 (0% AZM)	169.20	16.38	08.84[b]	32.58[ab]	38.54	09.08[b]	23.86	109.22	64.706
T_2 (3% AZM)	176.92	16.36	13.18[a]	34.68[a]	44.66	11.28[a]	21.94	111.48	63.462
T_3 (6% AZM)	174.14	16.96	10.16[b]	27.48[b]	38.68	08.22[b]	22.81	104.86	60.402
SEM	4.222	0.415	0.675	1.218	1.358	0.425	1.576	1.982	1.240
P value	0.779	0.822	0.013	0.031	0.103	0.002	0.898	0.412	0.372

[ab]Means bearing different superscripts in a column differ significantly (P<0.05)

affecting feed consumption, egg production, FCR, egg quality parameters and carcass traits.

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