

EFFECT OF DIETARY INCLUSION OF AZOLLA (*Azolla pinnata*) ON GROWTH PERFORMANANCE AND MEAT CHARACTERISTICS OF SATPUDA POULTRY

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ABSTRACT

The present investigation was conducted at Animal Husbandry and Dairy Science section, College of Agriculture, Dhule during 2019 to assess the effect of feeding Azolla on body weights, feed consumption, feed conversion ratio (FCR), meat characteristics and proximate composition of meat. Forty eight, day old, Satpuda chicks were purchased from Yashwant Agritech Hatchery, pvt. Ltd. Jalgaon, Maharashtra. They were randomly distributed into four groups T₀, T₁, T₂ and T₃ with 12 chicks in each group. The experimental broiler chicks were reared on deep litter system in well ventilated shed from 0–8 weeks. The Azolla was added in experimental diet at the rate of 0, 2, 4 and 6 per cent for T₀, T₁, T₂ and T₃ respectively. The control group (T₀) was without Azolla. The experimental ration was proteinous. The experiment was continued up to 8 weeks. There was no mortality recorded in Satpuda poultry birds of various groups during the experimental period.

The average body weights at the end of eighth weeks of age were 716.58, 737.58, 775.67 and 855.92 g in T₀, T₁, T₂ and T₃ groups, respectively. The body weight of T₃ group was significantly superior over others. Average weekly body weight gain at the end of 8th week were 160.08, 161.25, 170.50 and 185.08 in T₀, T₁, T₂ and T₃ group respectively. The significantly higher weight gain was observed in T₃ followed by T₂, T₁ and T₀. Average total weekly feed intake (g/bird⁻¹) at the end of 8th week of study was recorded as 600.08, 603.09, 615.07 and 635.13 g for T₀, T₁, T₂ and T₃ groups, respectively. The trend of significantly higher feed intake was observed in T₃ followed by T₂, T₁ and T₀. The average weekly feed efficiency at 8th week of age was 3.76, 3.75, 3.66 and 3.44 in T₀, T₁, T₂ and T₄ groups, respectively. The FCR was found to be statistically significant for different treatment groups from 5th week onwards. T₃ group was significantly superior over control group followed by T₂, T₁ and T₀ groups.

Meat characteristics showed non-significant differences among all treatments regarding dressing percentage, meat bone ratio, and weight of heart, liver and gizzard and also regarding cut up parts percentage. It is therefore inferred that dietary inclusion of Azolla upto 6% was beneficial in Satpuda poultry to improve growth performance and it didn't had any adverse effect on meat quality.

(Keywords: Azolla meal, broiler, body weight, protein and energy and dressing per cent)

INTRODUCTION

The poultry industry in India has benefited from scientific advances in poultry breeding and disease control but an additional factor has been the accessibility of low-priced, high-quality feed (Ravindran, 2013). Feed is the largest single input cost for broiler production (Davis *et al.*, 2013) and can constitute up to 70 % of the total cost. Thus, of the feed proteins that are generally used in poultry most are of plant origin and economically cheaper than protein of animal origin. Though, very limited work has been done in our country, on the use of unconventional feed ingredients in poultry diet. Thus, poultry nutritionist's world over are exploiting the use of various un-conventional feed

ingredients in poultry feeding to enhance the consumer demand for eggs and meat.

One of such plant which can be used as non-conventional feed resource (NCFR) is Azolla (*Azolla pinnata*). Azolla is a floating fern and belongs to the family of *Azollaceae*. Azolla being aquatic plants do not accumulate secondary plant compounds and therefore, offer greater potential than tree leaves as protein source for monogastric animals (Bacerra *et al.*, 1995). Azolla have good source of protein and also other nutrient like minerals, vitamins, amino acids and growth promoting intermediates (Akhud *et al.*, 2017 and Adake *et al.*, 2016). Azolla have symbiotic relationship with the nitrogen-fixing blue-green algae this unique symbiotic relationship that makes Azolla,

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a wonderful “super plant” with high protein content, as it can readily colonize areas of fresh water and grow at great speed doubling its biomass every two to three days. It is also found to contain probiotics and biopolymers. Thus, Azolla appears to be a potential source of nutrients especially proteins. Hence, an attempt was made to investigate the effect of dietary inclusion of Azolla (*Azolla pinnata*) on growth performance and meat characteristics of satpuda poultry.

MATERIALS AND METHODS

Azolla was procured from KVK, Dhule and after sun drying; meal was prepared and mixed in commercial broiler feed as per different treatment levels. Fourty eight day old chicks of Satpuda breed were procured from Yashwant Agritech Hatchery pvt. .Ltd. Jalgaon, Maharashtra. On arrival, chicks were weighed and equally distributed into 4 treatment groups viz, T₀, T₁, T₂ and T₃ with 12 chicks in each treatment. Four experimental diets were prepared by incorporating 0, 2, 4 and 6% of dry Azolla in ration of groups T₀, T₁, T₂ and T₃, respectively. All the Satpuda chicks were fed crumbled maize grains for first 2 days of age followed by the experimental ration. The experimental birds were managed properly including housing environment, providing floor space, feeder and waterer space, litter management, lighting management, sanitation, immunization and medication. During the managemental period, body weight, feed intake, body weight gain, feed consumption ratio, and meat characteristics etc. were recorded. The data generated during the experimental period was statistically analysed by CRD given by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The result on feeding azolla on growth performance and meat characteristics of satpuda poultry are presented and discussed under the following subheading.

1. Body weight : The growth performance of experimental bird was assessed by recording the weekly body weight of an individual bird throughout the experimental period. The data pertaining to average weekly body weight are presented in Table 1. The average body weights at the end of eighth weeks of age were 716.58, 737.58, 775.67 and 855.92 g in T₀, T₁, T₂ and T₃ groups, respectively.

Significant difference in weekly body weight was found from second week onwards. The trend of significantly better growth was recorded in T₃ (855.92 g) as compared to control group. The higher body weight was also observed in T₃ followed by T₂, T₁ and T₀. This indicated that the beneficial effect of feeding azolla at the rate of 6%. The findings of present study were in accordance with the results of Dhumal *et al.* (2009) as they observed the body weights at 6th week for treatment groups A 1757.10, B 1845.80 and C 1892.40 g while the control group (A) was fed diet without Azolla and group B and C were fed diet with Standard Broiler

Mash (SBM) replacement with Azolla meal @ 2.5 per cent and 5 per cent, respectively.

Similar findings were also reported by Jawad *et al.* (2018). He reported that incorporation of Azolla in the diet of vanaraja birds at 3% to 12% resulted in higher body weight than birds fed without Azolla. The average final body weight of birds fed without Azolla at the end of seventh week were 991.30 and that of fed with Azolla at the rate of 3%, 6%, 9%, 12% were 1036.04, 1128.59, 1079.22 and 1042.40 respectively.

2. Body weight gain: The data on the average weekly weight gain are presented in Table 2. Average weekly body weight gain at the end of 8th week were 160.08, 161.25, 170.50 and 185.08 in T₀, T₁, T₂ and T₃ group respectively. Significant differences in weekly body weight gain in Satpuda birds were found from 2nd week onwards. The analysis of variance for mean weekly cumulative body weight gain at 8th week of age showed that treatment T₃ was significantly superior over other treatments. Treatments T₀, T₁ and T₂ were at par with each other. The value of weekly gain in body weight indicated that Satpuda chicks receiving 6% Azolla had faster weight gain followed by T₂ (4% Azolla), T₁ (2% Azolla) and T₀ (control). Similar to present findings, significant effect of feeding of Azolla also observed by Naghshi *et al.* (2014). They reported that in all rearing periods between treatments, chickens fed diets containing 5% Azolla powder significantly had an improved daily weight gain.

3. Feed intake : The data regarding average weekly feed intake of Satpuda chicks are presented in Table 3. Average feed intake at 8th week of age for T₀, T₁, T₂ and T₃ was 600.09, 603.08, 615.07 and 635.13 g respectively. The highest feed intake was observed in T₃ (635.08 g), followed by T₁, T₀ and T₂ groups. The analysis of variance showed that feed intake in treatment T₃ and T₂ was significantly superior over other and they also differed significantly between themselves. Treatment T₀ and T₁ were at par with each other. Findings of present study was in accordance of results of Kumar *et al.* (2018). They found that there was highly significant effect of Azolla incorporation on feed consumption which was highest in T₃ (3900.98) group followed by T₄ (3851.30), C (3734.02) and T₂ (3634.56). Lowest feed consumption was in T₁ (3576.33).

4. Feed conversion ratio : The data regarding mean weekly feed conversion ratio (feed intake kg⁻¹ gain) and their standard error at different weeks of age are given Table 4(a). The average weekly feed efficiency at 8th week of age was 3.76, 3.75, 3.66 and 3.44 in T₀, T₁, T₂ and T₄ groups, respectively. The FCR was found to be statistically significant for different treatment groups from 5th week onwards. T₃ group was significantly superior over control group followed by T₂, T₁ and T₀ groups.

Data regarding feed conversion ratio of Satpuda birds for different treatments are presented in Table 4(b). Feed conversion ratio of T₃ was significantly superior over other treatments however T₂ was also significantly superior

over T_0 and T_1 . FCR for treatment T_0 and T_1 were comparable with each other.

Results of the present finding were in agreement with the results obtained by Sujatha *et al.* (2013). Experimental Nicobari chicks were fed Azolla, at the rate of 200 g chick⁻¹day⁻¹ in separate feeder, in addition to 120 g of basal diet, from 45-60 weeks. They found that the feed conversion ratio was better in Azolla supplemented group than the birds in control group, during the experimental period.

5. Meat characteristics : The data regarding means of dressing (%), meat bone ratio, weight of heart (g), liver (g) and gizzard (g) for various treatment groups are given in Table 5.

Meat characteristics showed non-significant differences among all treatments regarding dressing percentage, meat bone ratio, weight of heart, liver and gizzard and also regarding cut up parts percentage. Similar to present findings non-significant results were reported by Naghshi *et al.* (2014). Experimental diet contained 5, 10 and 15% of Azolla.

Balaji *et al.* (2009) also reported that per cent dressed yield, eviscerated yield and ready-to-cook yield in broilers were not influenced by dietary supplementation of dried Azolla at the rate 1.5, 3 and 4.5% in commercial broilers.

The results of the present study showed that inclusion of Azolla at 6% level in Satpuda poultry ration as rich protein source found to be better in terms of overall performance followed by 4% and 2% inclusion of Azolla.

Table 1. Average weekly cumulative body weight (g) bird⁻¹ of Satpuda

Weeks	Groups				Mean	SE(m)±	CD at 5 %
	T ₀	T ₁	T ₂	T ₃			
Initial weight	37.17	36.83	37.00	36.92	36.98	0.35	-
1 st week	65.91	65.94	66.03	66.19	66.02	0.47	-
2 nd week	99.29 ^a	103.18 ^b	108.33 ^c	112.67 ^d	105.87	0.85	2.41
3 rd week	155.33 ^a	159.50 ^a	162.58 ^a	176.25 ^b	163.42	2.62	7.46
4 th week	244.58 ^a	251.42 ^{ab}	261.33 ^b	274.58 ^c	257.98	4.16	11.85
5 th week	332.75 ^a	337.50 ^a	351.33 ^b	377.17 ^c	349.69	2.41	6.86
6 th week	444.33 ^a	460.83 ^{ab}	483.83 ^b	521.08 ^c	477.52	8.37	23.85
7 th week	556.50 ^a	576.33 ^a	605.17 ^b	670.83 ^c	602.21	9.52	27.15
8 th week	716.58 ^a	737.58 ^a	775.67 ^b	855.92 ^c	771.44	11.21	31.95

Values within a row with different superscripts differ significantly

Table 2. Average weekly gain in body weight (g) bird⁻¹ of Satpuda

Weeks	Groups				Weekly Mean	SE(m)±	CD at 5 %
	T ₀	T ₁	T ₂	T ₃			
1 st week	28.74	29.11	29.03	29.27	29.04	0.49	-
2 nd week	33.39 ^a	36.60 ^b	42.18 ^c	45.98 ^d	39.54	0.74	2.11
3 rd week	56.04 ^a	56.32 ^a	54.25 ^a	63.58 ^b	57.55	2.15	6.12
4 th week	89.25 ^a	91.92 ^a	98.75 ^b	98.33 ^b	94.56	2.31	6.58
5 th week	88.17 ^a	86.08 ^a	90.00 ^b	102.58 ^b	91.71	1.13	3.14
6 th week	111.58 ^a	123.33 ^{ab}	132.50 ^{bc}	143.92 ^c	127.83	6.16	17.56
7 th week	112.17 ^a	115.50 ^a	121.33 ^a	149.75 ^b	124.69	3.38	9.64
8 th week	160.08 ^a	161.25 ^a	170.50 ^a	185.08 ^b	169.23	3.72	10.59

Values within a row with different superscripts differ significantly

Table 3. Average weekly feed intake (g) of Satpuda

Weeks	Groups				Weekly Mean	SE(m) \pm	CDat 5 %
	T ₀	T ₁	T ₂	T ₃			
1 st week	36.67	37.08	36.75	36.58	36.77	2.66	-
2 nd week	84.17 ^a	85.50 ^a	96.17 ^b	103.18 ^b	92.25	3.08	8.79
3 rd week	165.26	167.25	157.27	169.42	164.80	3.17	-
4 th week	278.46 ^a	284.88 ^a	303.79 ^b	300.13 ^{ab}	291.81	3.44	9.80
5 th week	302.58 ^b	292.67 ^a	299.63 ^a	307.50 ^b	300.59	3.24	9.23
6 th week	504.63 ^a	512.50 ^a	541.58 ^b	535.75 ^b	523.61	3.44	9.79
7 th week	527.54 ^b	538.42 ^b	507.50 ^a	597.58 ^c	542.76	4.66	13.27
8 th week	600.08 ^a	603.09 ^a	615.07 ^b	635.13 ^c	613.34	5.23	14.91

Values within a row with different superscripts differ significantly

Table 4 (a). Average weekly feed conversion ratio of experimental birds

Weeks	Groups				Weekly Mean	SE(m) \pm	CD at 5 %
	T ₀	T ₁	T ₂	T ₃			
1 st week	1.29	1.29	1.27	1.27	1.28	0.11	-
2 nd week	2.56	2.35	2.28	2.24	2.36	0.10	-
3 rd week	3.00	3.01	2.94	2.69	2.91	0.12	-
4 th week	3.14	3.11	3.09	3.08	3.10	0.07	-
5 th week	3.45 ^a	3.42 ^a	3.35 ^a	3.01 ^b	3.31	0.08	0.23
6 th week	4.65 ^a	4.23 ^a	4.18 ^a	3.80 ^b	4.21	0.18	0.50
7 th week	4.77 ^a	4.71 ^a	4.21 ^{bc}	4.00 ^c	4.42	0.12	0.36
8 th week	3.76	3.75	3.66	3.44	3.65	0.09	-

Values within a row with different superscripts differ significantly

Table 4 (b). Feed conversion ratio of Satpuda birds fed with varying levels of Azolla

Attribute	Treatment				SE(m) \pm	CD at 5%
	T ₀	T ₁	T ₂	T ₃		
Total body weight gain (g)	679.42 ^a	700.10 ^a	738.55 ^b	818.50 ^c	11.09	31.62
Total feed consumption (g)	2499.38 ^a	2521.38 ^a	2557.75 ^{ab}	2685.27 ^c	14.21	40.49
FCR	3.67 ^c	3.60 ^c	3.46 ^b	3.28 ^a	0.039	0.11

Table 5. Effect of feeding Azolla on carcass characteristics of Satpuda chicken at 8 weeks of age

Parameter	Groups				SE (m) \pm	CD at 5%
	T ₀	T ₁	T ₂	T ₃		
Dressing (%)	62.20	62.00	62.40	62.60	0.87	-
Meat Bone Ratio	11.75	11.54	11.41	11.73	0.33	-
Heart weight (g)	7.00	6.60	6.80	7.00	0.35	-
Liver weight (g)	24.80	24.20	24.40	24.60	0.24	-
Gizzard weight (g)	32.20	32.00	32.40	32.60	0.64	-

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