

Original Research Article

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## Influence of Dietary Supplementation of Dried Azolla on the Growth Performance of Broiler Chickens

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### ABSTRACT

The present study was conducted to evaluate the effect of dietary inclusion of dried Azolla on weight gain, feed intake and feed efficiency of broiler chicken. The study was conducted for a period of six weeks with 240 day-old commercial broiler chicks (Vencobb). The chicks were randomly allotted to four dietary groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>. Each group comprised of two replicates of thirty birds each. Sun dried and ground Azolla at 0, 2.5, 5.0 and 7.5% levels were incorporated in the rations for T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, respectively. Weekly average body weight of chicks did not showed significant influence between the treatment groups at the end of second and fifth week of age except at the end of first, third, fourth and sixth week of age (P<0.05) among treatment groups. The mean weekly body weight gain was significantly (P<0.05) affected only at third and fourth week of age due to the dietary inclusion of dried Azolla at different levels. Average weekly feed intake had not significant influence among treatments except in the second and fifth week of age by the dietary inclusion of dried Azolla. Average weekly feed efficiency had significant (P<0.05) effects only during the second and fourth week of age and in the remaining weeks, the values were statistically comparable among treatments. It was concluded that inclusion of dried Azolla in broiler feed up to 7.5% level without any adverse effect on the performance of broiler chicken.

#### Keywords

Azolla, Body weight gain, Feed intake, Feed efficiency, Broiler chicken

#### Article Info

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### Introduction

Poultry development has taken a quantum leap in the last three decades emerging from a near backyard practice to a venture of industrial promotion. In India, broiler industry

is the fastest expanding component of agriculture registering 15% growth rate per annum and the annual growth rate of broiler production is much higher in comparison with many other developing countries. The increase in broiler production is in direct

competition with growing human population for high energy cereal grains. There is inadequate supply of poultry feed ingredients both in terms of quantity and quality due to urbanization and decreased land availability. The wide gap between the availability and requirement of feed materials may have an adverse effect on broiler enterprise.

Greater emphasis has been given during the past two decades to identify the new feedstuffs to widen the feed recourse base, thereby to improve the efficiency and economic viability of broiler production. In spite of extensive research on utilization of unconventional feed stuffs of agricultural, industrial, animal and aquatic origin there is only limited scope on actual usage of such materials in poultry rations, because of seasonal and scattered availability, variable nutrient quality, poor storage conditions and the presence of anti-nutritional factors or toxins.

Recently there is an increased emphasis in the use of aquatic plants in poultry rations because the protein and other nutrient content in aquatic plants are comparable to certain leguminous plants. Aquatic plants offer relatively cheap alternative feed stuffs and have many potential uses such as human food, animal feed, compost and bio-fertilizers. Among the aquatic plants floating fresh water fern, *Azolla pinnata* is a good source of protein and it contains almost all essential amino acids, minerals like iron, calcium, magnesium, potassium, phosphorus, manganese etc., apart from appreciable quantity of vitamin A precursor beta carotene and vitamin B<sub>12</sub>. It is capable of assimilating atmospheric nitrogen due to the presence of symbiotic algae in its leaves. It is also found to contain probiotics and biopolymers (Pillai *et al.*, 2004). *Azolla* is one of the plant resources with high bio-mass and protein production and economically used as a feed

stuff in broiler chicken (Parthasarathy *et al.*, 2002 and Alalade and Iyayi, 2006). However, there seems to be paucity of studies on the effect of dietary inclusion of *Azolla* on the production performance of the broilers. Therefore, the present study was conducted to evaluate the *Azolla* (*Azolla pinnata*) on growth performance of commercial broiler chickens.

## **Materials and Methods**

The present study was conducted at Livestock Farm Complex (25<sup>0</sup>59'42"N& 85<sup>0</sup> 08'08"E), Bihar Veterinary College, Patna, Bihar, India. A total of 240, day-old Vencobb broiler chicks were randomly allotted to four treatment groups with two replicates of thirty birds each. Dried *Azolla* was included in the ration at 0% (T<sub>1</sub>), 2.5% (T<sub>2</sub>), 5.0 % (T<sub>3</sub>) and 7.5% (T<sub>4</sub>). The chicks were reared under deep litter system of management. Standard management procedures were followed during the experimental period of 0-42 days (21 days for starter and 21 days for finisher phase). The birds were provided with feed and clean drinking water *ad libitum* throughout the experimental period. Proximate analysis of the rations was carried out according to procedures described by AOAC (1990) which have been presented in Table 1.

The body weight of individual bird was recorded at weekly interval. The amount of feed offered and refused was recorded daily and the feed consumed was determined. From these data, the average intake per bird per week was calculated for various treatment groups. Feed efficiency was calculated in each replicate based on the data on body weight gain and feed consumed.

Data recorded on various parameters were analyzed statistically using completely randomized design with the simple analysis of

variance (ANOVA) technique (Snedecor and Cochran, 1994).

**Chemical composition of Azolla (DM basis)**

Nutrients	Percentage
Dry Matter	90.92
Crude Protein	25.61
Crude Fibre	14.87
Ether Extract	2.96
Nitrogen Free Extract	32.18
Total Ash	16.57

**Results and Discussion**

The average body weight (g) of broiler chicken at weekly intervals influenced by different dietary treatments has been presented in Table 2. The results showed that the weekly average body weight gain of chicks did not reveal any significant effect between the treatment groups at the end of second and fifth week of age. However, there was significant (P<0.05) influence on average body weight gain of chicks among treatment groups at the end of first, third, fourth and sixth week of age.

This results of the present study are in accordance with the findings of (Parthasarathy *et al.*, 2001a; Parthasarathy *et al.*,2002; Alalade and Iyayi, 2006; Shoukat *et al.*, 2015; Mishra *et al.*, 2016; Rai *et al.*, 2016; Rout *et al.*, 2017 and Sinha *et al.*, 2018; Joysowal *et al.*, 2018) wherein broiler birds received 5% Azolla from 1<sup>st</sup> to 5<sup>th</sup> weeks of

age had similar weight gain as that of control, while the birds on 10, 15 and 20% Azolla diets had significantly (P<0.05) lower weight gain. On contrary, Basak *et al.*,2002 observed significant (P<0.01) improvement in live weight of broiler chicks than control diet fed birds when they were fed with 5% Azolla meal by replacing sesame meal. They also observed that use of higher levels of Azolla meal (10 and 15%) resulted in poor growth rate than control diet fed groups. The statistical interpretation of the results showed no significant difference in body weight among different dietary treatment groups.

The average weekly feed intake of broiler chicken influenced by dietary inclusion of dried Azolla is given in Table 3. The results on average feed intake at weekly intervals indicated that this trait was not statistically significant among treatments except in the second and fifth week of age.

Similarly, the average weekly feed intake of birds during the fifth week of age revealed significant (P<0.05) effects among the treatment groups. The birds maintained on 5.0% Azolla supplementation had significantly (P<0.05) lower feed intake than control, 2.5 and 7.5 % Azolla fed groups. Similar to average weekly feed consumption, the average daily feed intake as influenced by dietary inclusion of various levels of dried Azolla had significant differences only at second and fifth week of age.

**Table.1** Chemical composition of experimental rations (% DM basis)

Parameters	T <sub>1</sub>		T <sub>2</sub>		T <sub>3</sub>		T <sub>4</sub>	
	Starter	Finisher	Starter	Finisher	Starter	Finisher	Starter	Finisher
Moisture	10.98	10.65	11.02	11.02	11.08	10.78	10.83	10.25
Crude protein	22.60	18.77	22.40	18.92	23.16	19.28	22.80	19.03
Ether extract	3.05	3.40	3.10	3.47	3.18	3.43	3.22	3.50
Crude Fibres	4.20	4.80	3.95	4.96	4.17	4.87	4.30	5.10
NFE	50.97	53.88	50.43	53.09	49.71	53.23	49.55	53.19
Total ash	8.2	8.50	9.1	8.54	8.70	8.41	9.30	8.93

**Table.2** Average weekly body weight gain (g) of broiler chicken influenced by dietary inclusion of dried Azolla

Age (weeks)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
1 <sup>st</sup>	58.54 ± 2.55	61.55 ± 2.28	65.06 ± 2.10	64.27 ± 2.16	1.13
2 <sup>nd</sup>	174.47 ± 4.15	174.24 ± 3.90	176.51 ± 4.29	174.85 ± 3.91	2.04
3 <sup>rd</sup>	241.51 <sup>a</sup> ± 6.44	249.31 <sup>ab</sup> ± 7.64	278.92 <sup>b</sup> ± 7.27	248.50 <sup>ab</sup> ± 6.01	3.46
4 <sup>th</sup>	311.02 <sup>a</sup> ± 9.28	327.53 <sup>ab</sup> ± 9.94	357.29 <sup>b</sup> ± 11.83	330.09 <sup>ab</sup> ± 8.92	4.97
5 <sup>th</sup>	427.65 ± 13.28	450.41 ± 12.33	443.23 ± 15.34	452.29 ± 13.60	6.65
6 <sup>th</sup>	502.81 ± 17.21	539.48 ± 19.63	527.76 ± 16.72	536.63 ± 17.04	8.58

Mean values bearing same superscript within a row did not differ significantly (P<0.05)

**Table.3** Average weekly feed intake (g) of broiler chicken as influenced by dietary inclusion of dried Azolla

Age (weeks)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
1 <sup>st</sup>	84.59 ± 0.64	80.01 ± 1.28	81.97 ± 2.60	82.91 ± 2.35	0.94
2 <sup>nd</sup>	263.44 <sup>ab</sup> ± 4.76	273.56 <sup>b</sup> ± 7.66	247.11 <sup>a</sup> ± 2.15	276.63 <sup>b</sup> ± 4.64	4.97
3 <sup>rd</sup>	417.81 ± 10.41	426.32 ± 9.71	435.09 ± 12.96	405.05 ± 11.06	5.33
4 <sup>th</sup>	587.82 ± 6.44	632.13 ± 4.90	632.40 ± 8.24	613.96 ± 5.89	3.15
5 <sup>th</sup>	833.91 <sup>ab</sup> ± 7.31	842.24 <sup>b</sup> ± 5.98	806.67 <sup>a</sup> ± 4.69	854.82 <sup>b</sup> ± 4.21	4.32
6 <sup>th</sup>	980.47 ± 40.73	1041.19 ± 18.68	1008.01 ± 33.92	1041.06 ± 9.98	15.93

Mean bearing different superscript within a row differ significantly (P<0.05)

**Table.4** Average weekly feed conversion efficiency of broiler chicken as influenced by dietary inclusion of dried Azolla

Age (weeks)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
1 <sup>st</sup>	1.53 ± 0.02	1.51 ± 0.03	1.47 ± 0.02	1.51 ± 0.04	0.02
2 <sup>nd</sup>	1.45 <sup>a</sup> ± 0.02	1.59 <sup>ac</sup> ± 0.05	1.71 <sup>c</sup> ± 0.03	1.52 <sup>ab</sup> ± 0.06	0.03
3 <sup>rd</sup>	1.52 ± 0.05	1.52 ± 0.04	1.65 ± 0.14	1.61 ± 0.07	0.04
4 <sup>th</sup>	1.67 <sup>ab</sup> ± 0.05	1.63 <sup>ab</sup> ± 0.03	1.56 <sup>a</sup> ± 0.03	1.72 <sup>b</sup> ± 0.02	0.02
5 <sup>th</sup>	1.76 ± 0.06	1.83 ± 0.03	1.94 ± 0.08	1.93 ± 0.06	0.03
6 <sup>th</sup>	2.18 ± 0.09	2.21 ± 0.10	2.20 ± 0.09	2.20 ± 0.10	0.04

Mean bearing different superscript within a row differ significantly (P<0.05)

The birds fed with 2.5 and 7.5% Azolla had significantly higher ( $P<0.05$ ) daily feed intake than other treatment groups during second week. Whereas, in the fifth week, the Azolla fed groups ( $T_2$  and  $T_4$ ) consumed significantly ( $P<0.05$ ) more feed than control birds. The results of present study are in agreement with Querubin *et al.*, 1986, Alalade and Iyayi, 2006; Shojukat *et al.*, 2015; Rout *et al.*, 2017 and Lakshmanan *et al.*, 2017 also observed that 10 and 15% Azolla meal in the diet of chicks significantly reduced the average weekly feed intake. But average weekly feed intake was similar, up to 5% Azolla meal inclusion in diets, to that of control diet. Differences in feed intake with addition of varying levels of Azolla in poultry rations observed by researchers are not consistent.

Variation in feed intake with changes in dietary ingredients as supported by Isshiki and Nakahiro (1989) could be the possibility for the numerical increase in daily feed intake noted in this study with Azolla fed groups. They stated that passage rate and feed intake changed based on type of feed ingredients used in formulating the diets. But, Bested and Morento (1985) stated that Azolla affected the palatability of the feed and reduced feed consumption.

The average weekly feed conversion efficiency of birds maintained on different dietary treatments is presented in Table-4. The mean weekly feed efficiency values showed that the different dietary levels of Azolla had significant ( $P<0.05$ ) effects only during the second and fourth week of age and in the remaining weeks, the values were statistically comparable among treatments. In the second week the feed efficiency was best for control ( $T_1$ ) group and it was statistically similar to 7.5% Azolla fed ( $T_4$ ) group. The birds fed with 5.0% Azolla ( $T_3$ ) had significantly inferior feed efficiency than control and 7.5% Azolla fed ( $T_4$ ) groups.

Although the feed efficiency of 2.5% Azolla ( $T_2$ ) fed group was poorer than control, the same was statistically similar to other Azolla supplemented groups during second week of age. The feed efficiency was best for 5.0% Azolla ( $T_3$ ) fed group and it was statistically similar to control ( $T_1$ ) and 2.5% Azolla fed ( $T_2$ ) groups during fourth week. The birds fed with 7.5% Azolla ( $T_4$ ) had significantly ( $P<0.05$ ) lower feed efficiency than 5.0% Azolla fed group ( $T_3$ ).

Similar results were reported by Basak *et al.*, 2002; Parthasarathy *et al.*, 2002; Mishra *et al.*, 2016 and Shukla *et al.*, 2018 who indicated that higher levels of Azolla (10 to 20%) significantly reduced feed efficiency in broiler chicken. On the other hand, Ardakani *et al.*, 1996 observed better feed efficiency in broiler birds fed with 6% fresh Azolla compared to control birds.

However, Buckingham *et al.*, (1978) reported that higher levels of acid detergent fibre (ADF), neutral detergent fibre (NDF) and lignin in Azolla could be the reason for the poor feed utilization in monogastric animals. However, in the present study maximum level of Azolla incorporation was 7.5%. Based on the results of this experiment, it is clear that the dried Azolla could be used in broiler chicken ration up to 7.5% level without any adverse effect on feed efficiency.

In conclusion the results showed that dried Azolla could be used as an unconventional feed resource has a potential for use in diets of chicken. For the best performance, it can be included in broiler feed up to 7.5% level without any adverse effect on broilers. Dried Azolla has no deleterious effect on the palatability of the diets. Dried Azolla is a protein rich feed ingredient at low price and may be used in poultry feed to reduce the feed cost.

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