



## Effect of Inclusion of Sun Dried Azolla (*Azolla pinnata*) at Different Levels on the Growth and Performance of Broiler Chicks

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### ABSTRACT

A total of 150, day old broiler chicken were randomly distributed into 5 treatments with three replicates having ten chicks in each replicate to evaluate the effect of inclusion of different levels of Azolla (*Azolla pinnata*) on growth and performance of broiler chicks. The birds in group control (C) were fed on basal diet while in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> the basal diet was supplemented with 2.5, 5, 7.5 and 10% of sun dried Azolla, respectively. The body weight gain was higher (P<0.01) in treatment T<sub>3</sub> (2182.07) which was comparable with T<sub>2</sub> (2173.10) and T<sub>4</sub> (2132.67). Highest (P<0.01) feed consumption was recorded T<sub>3</sub> (3900.98) group FCR was significantly (P<0.01) lowest in T<sub>2</sub> (1.67) which was comparable with T<sub>1</sub> (1.72) group. The DM digestibility and nitrogen balance were found to be similar in all the groups however nitrogen voided was higher (P<0.05) in T<sub>2</sub> group. Performance index was highest (P<0.01) in T<sub>2</sub> (1299.62) group similarly protein efficiency ratio was also higher (P<0.01) in T<sub>2</sub> (3.33) group which was statically similar to that of T<sub>3</sub> (3.13) and control (2.93). Feed cost/ kg broiler (in ₹) and total cost/ kg broiler (in ₹) was lowest in T<sub>2</sub> group. Therefore, inclusion of Azolla up to 7.5% level in the ration improved body weight gain and feed consumption in broiler chicken. Beyond this level of supplementation, there was reduction in Performance of broilers.

**Keywords:** Broiler, Azolla, Growth performance, PER, Performance index

Feeds of plant origin, as the green plants are recognized as excellent sources of protein, fat and pharmacologically active secondary metabolites. Aquatic plants are gaining much interest in food and biomedical research, resulting from its broad range of uses such as human food, animal feed and bio-fertilizers. Among aquatic plants floating fern Azolla (*Azolla pinnata*) can be used as unconventional high potential feed resource. Azolla is a free floating fresh water fern belonging to the family *Azollaceae* and order *Pteridophyta*. It contains almost all essential amino acids, minerals such as iron, calcium, magnesium, potassium, phosphorus, manganese etc. apart from appreciable quantities of vitamin A precursor beta carotene. Azolla have a symbiotic relationship with the nitrogen-fixing blue-green algae. It is this unique symbiotic relationship that makes Azolla, 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 (Pillai *et al.*, 2005). Thus, Azolla appears to be a potential source of nutrients. The bio-composition of Azolla makes it one of the most economic, efficient and sustainable feed substitute for poultry thus incorporation of Azolla as an alternative protein ingredient in poultry ration could make poultry production economical. The present study was, therefore, conducted to see the effect of inclusion of sun dried Azolla at different levels on the growth and performance of broilers chicks.

### MATERIALS AND METHODS

A total of 150, day old, unsexed broiler chicks (Cob-400 strain) were procured from a commercial hatchery and reared at poultry farm, RAJUVAS, Bikaner, Rajasthan,

India. On the day of arrival, they were weighed and randomly assigned to one of the five treatment groups containing 3 replicates with 10 chicks in each replicate. Each group of 30 chicks was reared in separate, clean, disinfected deep litter brooder pens. The standard management practices were followed. The Azolla had been cultivated at Livestock Feed Resource Management and Training Center, Rajasthan University of Veterinary and Animal Sciences; Bikaner was dried and included in the broiler ration @ 0, 2.5, 5, 7.5, 10% levels of dried Azolla in control (C), T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> groups, respectively (Table 1). At the end of feeding trial, 2 birds from each replicate were transferred to metabolic cages in order to study DM digestibility and N balance. For nitrogen estimation, fecal samples were preserved in 5% H<sub>2</sub>SO<sub>4</sub> (v/v). The relative economics were compared among treatments to predict their effect on the performance of broiler chicks. Standard formula used for calculating the cost of production/Kg live broiler (Narhari and Rajini, 2005). The representative samples of feeds and faeces were analysed for proximate composition (AOAC, 2005). The data were analyzed using one way ANOVA (Snedecor and Cochran, 1994) and the significance of mean differences was tested by Duncan's New Multiple Range Test (Duncan's Range Test) as modified by Kramer (1957).

## RESULTS AND DISCUSSION

There was highly significant improvement in body weight gain due to supplementation of Azolla. The mean body weight gain in T<sub>3</sub>, T<sub>2</sub> and T<sub>4</sub> was comparable but higher than in C and T<sub>1</sub>. C had lowest body weight gain (Table 2). Basak *et al.* (2002) observed highly significant improvement in live body weight of broiler chicks fed diet with 5% Azolla meal, while diet containing AZM at higher levels (10%) resulted in significant reduction in body weight gain. Rathod *et al.* (2013) also observed significant improvement in live weight of quail fed diet with 7.5 per cent AZM.

There was highly significant effect of Azolla incorporation on feed consumption which was highest in T<sub>3</sub> followed by T<sub>4</sub>, C and T<sub>2</sub>. Lowest feed consumption was in T<sub>1</sub> (Table 2). The results obtained corroborate well with the findings of Alalade *et al.* (2007) recorded decreases in feed intake up to 5% level but increase in feed intake on inclusion of Azolla at 7.5% level in the diet of broiler chicks.

During a period of 42 days, lowest FCR was recorded in T<sub>2</sub> which was though comparable with T<sub>1</sub> but significantly lower than C, T<sub>3</sub> and T<sub>4</sub>. C had highest FCR. The result obtained in present study fall in line with the findings of

**Table 1:** Ingredient composition of experimental ration (kg/100kg feed)

Ingredients	C	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
<b>Starter ration (0-3 weeks)</b>					
Maize	63	61.40	59.80	58.18	56.59
Soyabean meal	27	26.10	25.20	24.32	23.41
Azolla	—	2.5	5	7.5	10
Premix*	10	10	10	10	10
Soya Oil	—	—	—	—	—
<b>Finisher ration (4-6 week)</b>					
Maize	70.03	68.23	66.40	64.74	63.00
Soya bean meal	18.94	18.24	17.57	16.84	16.13
Azolla	—	2.5	5	7.5	10
Premix*	10	10	10	10	10
Soya Oil	1.03	1.03	1.03	0.92	0.87

\*Premix contained (g/100g): Lysine-2.85g, DL-Methionine-2.12g, Cystine-0.65g, Calcium-9.20g, Phosphorus-4g, Chloride-2.30g, Sodium-1.30g.

**Table 2:** Performance of broilers on feeding different levels of Azolla meal

Parameter	C (0%)	T <sub>1</sub> (2.5%)	T <sub>2</sub> (5%)	T <sub>3</sub> (7.5%)	T <sub>4</sub> (10%)	SEM
Body weight gain (g)	2033.30 <sup>a</sup>	2075.37 <sup>ab</sup>	2173.10 <sup>c</sup>	2182.07 <sup>c</sup>	2132.67 <sup>bc</sup>	67.61 <sup>**</sup>
Feed consumption (g)	3734.02 <sup>c</sup>	3576.33 <sup>a</sup>	3634.56 <sup>b</sup>	3900.98 <sup>c</sup>	3851.30 <sup>d</sup>	0.19 <sup>**</sup>
FCR	1.84 <sup>b</sup>	1.72 <sup>a</sup>	1.67 <sup>a</sup>	1.79 <sup>b</sup>	1.81 <sup>b</sup>	0.01 <sup>**</sup>
Dry matter digestibility%	78.1	81.97	83.65	81.52	79.57	2.90
N intake g/day/chick	2.87	3.31	3.55	3.15	2.89	0.26
N voided g/day/chick	0.27 <sup>a</sup>	0.26 <sup>a</sup>	0.37 <sup>b</sup>	0.21 <sup>a</sup>	0.26 <sup>a</sup>	0.03 <sup>*</sup>
N balance g/day/chick	2.60	3.05	3.18	2.94	2.63	0.26
Performance index	1107.66 <sup>a</sup>	1204.41 <sup>b</sup>	1299.62 <sup>c</sup>	1220.62 <sup>b</sup>	1181.24 <sup>ab</sup>	17.81 <sup>**</sup>
Protein efficiency ratio	2.93 <sup>b</sup>	3.22 <sup>a</sup>	3.33 <sup>b</sup>	3.13 <sup>b</sup>	3.11 <sup>a</sup>	0.02 <sup>**</sup>
Feed cost/ kg broiler (in ₹)	52.60	48.41	46.43	47.59	47.94	4.32
<b>Total cost/ kg broiler (in ₹)</b>	<b>71.85</b>	<b>67.16</b>	<b>64.93</b>	<b>66.23</b>	<b>66.63</b>	<b>4.84</b>

Means bearing different superscripts (a, b, c, d) in a row differ significantly.

\*\* = P<0.01 \* = P<0.05

Basak *et al.* (2002), Naghshi *et al.* (2014), Saikia *et al.* (2014) recorded improvement in FCR with inclusion of Azolla as feed supplement in the diet of broilers. Azolla supplementation had no effect on DM digestibility, N intake and N retention (Table 2). However, there was significant effect of supplementation of Azolla in terms of nitrogen voided. Statistically maximum excretion was noticed in T<sub>2</sub> which was significantly (P<0.05) higher than rest of groups (Table 2). All broilers in various treatment groups were found to have positive nitrogen balance. Rathod *et al.* (2013) and Rana *et al.* (2017) also recorded non-significant effect on dry matter digestibility on account of having gradually increasing levels up to 5% incorporation of Azolla but Rathod *et al.* (2013) contrarily recorded decrease in dry matter digestibility upon incorporation of Azolla at 7.5 and 10% levels.

There was significant effect (P<0.01) of Azolla supplementation on performance index and protein efficiency ratio (PER). Highest performance index was recorded in T<sub>2</sub> followed by T<sub>3</sub>, T<sub>1</sub> and T<sub>4</sub> exhibited statistically comparable mean values but lower than T<sub>2</sub>. C *i.e.* control group had lowest performance index. Highest PER was recorded for T<sub>2</sub> was comparable with C and T<sub>3</sub> but higher than T<sub>1</sub> and T<sub>4</sub>. C *i.e.* control group had Lowest PER. Basak *et al.* (2002) recorded significant effect on PER at 5% inclusion level of Azolla.

Feed cost and total cost for production of one kg live weight though upon observing mean, T<sub>2</sub> had lowest mean

value followed by T<sub>3</sub>, T<sub>4</sub> and T<sub>1</sub>. C had highest Feed cost and total cost for production of one kg live weight.

None of the birds died in any treatments during the experimental period. The present study indicated that the inclusion of AZM up to 10 per cent in broiler diets has no influence on livability of birds. Balaji *et al.* (2009) and Dhumal *et al.* (2009) who also found no toxic effect of dietary Azolla.

## CONCLUSION

Therefore, looking to the performance of broilers *i.e.* growth parameters, feed utilization and ultimately production in terms of live body weight gain it could be concluded that inclusion of Azolla up to 7.5% level is quite effective and could be a viable proposition for lucrative rearing of broilers for meat production.

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