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Performance of broilers different phases fed on different levels of Azolla meal

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Abstract

A total of 150, day old broiler chicken were randomly distributed into five treatments with three replicates having ten chicks in each replicate to evaluate the effect of inclusion of different levels of Azolla (*Azolla pinnata*) on performance of broiler chicks. The birds in group control (C) were fed on basal diet while in treatments T₁, T₂, T₃ and T₄ the basal diet was supplemented with 2.5, 5, 7.5 and 10% of sun dried Azolla, respectively. The dry matter (DM) content of sun dried Azolla meal was 91.78 percent. It contained 74.50 percent organic matter, 22.25 percent crude protein, 11.19 percent crude fiber, 2.45 percent ether extract, 25.50 percent total ash, 38.61 percent nitrogen free extract (NFE) and 7.94 percent acid insoluble ash. The effect of supplementation of Azolla revealed highly significant effect on the body weight gain, daily body weight gain, Feed conversion ratio (FCR), Performance index (PI) in the finisher phase. Significantly the highest body weight gain (1547.83g) and daily body weight gain (73.71g) was recorded in T₃ group. Significantly the lowest and better FCR (1.80), highest PI (849.51) and PER (3.19) was observed in T₂ group. There was highly significant effect on Feed consumption was observed in both the phases and significantly the highest feed consumption was recorded in control (893.30g) group during the starter phase and T₃ (3010.73g) group during the finisher phase. From the result obtained it may be concluded that Azolla may be used upto 10% level in the broiler diet. Azolla meal is a non-conventional feed ingredient at low price and may be used as poultry feed to reduce feed cost.

Keywords: Azolla, broiler, starter, finisher, performance

Introduction

In India, poultry industry had developed leaps and bound from a small-scale backyard venture to the status of full-fledged, modernized, agro-based industry. The growth of poultry population is directly proportional to feed industry growth. Feed is by far the most important single factor which plays a significant role, since it accounts for more than two-thirds of total poultry production cost. Conventional protein and energy rich ingredients are nowadays not only becoming scarce but also costly. 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. Azolla is a little aquatic fern which flows on the water surface. Azolla have a symbiotic relationship with the nitrogen-fixing blue-green algae. The fern offers nutrients and a protective cavity to Anabaena colonies in exchange for fixed atmospheric nitrogen and other growth-promoting substances Pillai *et al.* (2005) ^[1]. It contains almost all essential amino acids, minerals apart from appreciable quantities of vitamin A precursor beta carotene. 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.

Materials and methods

The experiment was conducted at Poultry Farm and Department of Animal Nutrition of College of Veterinary and Animal Science, Bikaner (Rajasthan). One hundred and Fifty day-old, unsexed, apparently healthy broiler chicks individually weighed and randomly divided into five groups of 30 chicks each having almost similar average body weight. Each group of 30 chicks was further subdivided into three replicates having 10 chicks each. Identical to standard management practices were followed for each group. Five dietary treatment groups designated as C, T₁, T₂, T₃ and T₄ were formulated by incorporating 0.0, 2.5, 5.0, 7.5 and

10.0% levels of dried Azolla, respectively. 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. Chemical composition of the Azolla was analyzed and is presented in Table 1. As Azolla contain a higher content of protein; parts of soybean meal and maize were replaced with graded level of Azolla incorporation in the diet. Proximate composition of feed ingredients is presented in Table 2. The crude protein content of starter and finisher ration was 22 percent and 19 percent, respectively. All the rations formulated for various treatments were made iso-caloric and iso-nitrogenous. The nutrient compositions of experimental starter and finisher rations have been presented in Table 3.

Data for body weight gain, daily body weight gain (ADG), feed consumption, feed conversion ratio (FCR), performance index (PI) and protein efficiency ratio (PER) was recorded. Considering the feed efficiency as well as the growth rate, a performance index was obtained for each treatment by dividing the average weight gained by the feed conversion ratio. The protein efficiency ratio (PER) was calculated by dividing the body weight gain by the protein consumed. 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, (1955).

Table 1: Chemical composition of the Azolla

Constituents	% DM
Dry matter (DM)	91.78
Organic matter (OM)	74.50
Crude protein (CP)	22.25
Crude fiber (CF)	11.19
Ether extract (EE)	2.45
Nitrogen free extract (NFE)	38.61
Total ash (TA)	25.50
Acid insoluble ash (AIA).	7.94

Table 2: Proximate composition of feed ingredients (% DM basis)

Ingredients	DM	CP	CF	EE	NFE	TA
Maize	91.00	10.00	3.17	2.78	79.38	4.67
Soya meal	90.40	43.80	10.50	1.00	39.84	4.86
Azolla	91.78	22.25	11.19	2.45	38.61	25.50
Premix	95.15	40.12	5.00	5.74	12.71	36.43

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

Ingredients	C	T ₁	T ₂	T ₃	T ₄
Starter ration (0-3 weeks)					
Maize	63.00	61.40	59.80	58.18	56.59
Soyabean meal	27.00	26.10	25.20	24.32	23.41
Azolla	-	2.50	5.00	7.50	10.00
Premix*	10.00	10.00	10.00	10.00	10.00
Soya Oil	-	-	-	-	-
Finisher ration (4-6 week)					
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	-	2.50	5.00	7.50	10.00
Premix*	10.00	10.00	10.00	10.00	10.00
Soya Oil	1.03	1.03	1.03	0.92	0.87

Result and discussion

The data on gain in weight is presented in Table no. 4 as well as in Figure no. 1. The effect of supplementation of Azolla revealed highly significant effect the body weight gain in the finisher phase. In the finisher phase the highest gain was recorded in T₃ (1547.83g) group which was comparable with T₂ (1531.33) and T₄ (1502.17g) group but significantly higher than control (1410.17g) and T₁ (1458.00g) groups. However, in the finisher phase the gain in control and T₁ groups and, T₁ and T₄ groups were differing non-significantly from each other. The gain in daily weight is presented in Table no. 4 as well as in Figure no. 2. Highly significant effect was observed on the daily body weight gain due to supplementation of Azolla in the finisher phase. In finisher phase the highest daily gain was recorded in T₃ (73.71g) group which was comparable with T₂ (72.92g) and T₄ (71.53g) group but significantly higher than control (67.15g) and T₁ (69.43g) groups. However, in finisher phase the daily gain in control and T₁ and, T₁ and T₄ groups were differ non-significantly from each other. Finding of this experiment is well corroborated with the finding of Rathod *et al.* (2013) [2] reported better gain in Azolla supplemented group Basak *et al.* (2002) [3] reported that the diet containing 5% AZM was best in respect of the body weight in broiler chicken.

The data on feed consumption is presented in Table no. 4 as well as in Figure 3. The statistical analysis of data for feed consumption revealed a highly significant effect of Azolla supplementation in both the phases. In the starter phase significantly highest and lowest feed consumption was recorded in control (893.30g) and T₁ (844.01g) groups, respectively, however in T₃ (890.25g) and T₄ (890.68g) groups the feed consumption was comparable with each other which was significantly higher than T₁ and T₂ (873.35g). In the finisher phase significantly the highest feed consumption was recorded in T₃ (3010.73g) group which was followed by T₄ (2960.73g), control (2840.72g), T₂ (2761.21g) and T₁ (2732.32g) groups. The results obtained in study in text corroborate well with the findings of Alalade *et al.* (2007) [4] 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. However on contrary Rathod *et al.* (2013) [2] reported non-significant effect of Azolla supplementation on feed consumption.

The data on FCR is presented in Table 4 as well as in Figure 4. The effect of supplementation of Azolla revealed non-significant effect on FCR in starter phase but there was a highly significant effect was observed in finisher phase. In finisher phase significantly lower and best FCR was recorded in T₂ (1.80) which was comparable with T₁ (1.87) but significantly higher than the rest of the groups however in T₁ and T₃ (1.95) and control (2.02) and T₄ (1.97) groups FCR was comparable with each other. Similar finding was observed by Basak *et al.* (2002) [3] who also reported non-significant effect of Azolla supplementation during 2-4 week period but observed significant better FCR in 5% Azolla supplemented group during 5-6 week period. The result obtained in present study fall in line with the findings of Basak *et al.* (2002) [3], Naghshi *et al.* (2014) [5], Saikia *et al.* (2014) [6] recorded improvement in FCR with inclusion of Azolla as feed supplement in the diet of broilers. However on contrary Rathod *et al.* (2013) [2] reported non-significant effect of Azolla supplementation on FCR.

The data on PI is presented in Table 4 as well as in Figure 5. The effect of supplementation of Azolla revealed non-

significant effect on PI in starter phase but there was highly significant effect was observed in finisher phase. In finisher phase the highest performance was recorded in T₂ (778.05) group which was comparable with T₃ (795.78) group but significantly higher than control (700.77), T₁ (778.05) and T₄ (762.28). The PI was statistically comparable in T₁, T₃ and T₄ groups. The lowest PI was recorded in the control group. The data on PER is presented in Table 4 as well as in Figure 6. The effect of supplementation of Azolla revealed non-significant effect on PER in the starter phase but there was a

highly significant effect was observed in the finisher phase. In the finisher phase the highest PER was observed in T₂ (3.19) group. The PER in T₁ (3.06) and T₃ (2.97) group was comparable with each other but significantly higher than control (2.84) and T₄ (2.94) groups. The lowest PER was recorded in the control group. These results obtained in study in text corroborate well with the findings of Basak *et al.*, (2002) [3] also recorded significant effect on PER due to incorporation of Azolla in the diet of broilers and recorded highest PER at 5% level of inclusion of Azolla in broiler diet.

Table 4: Performance of broilers fed on different levels of Azolla meal

Parameter	C (0%)	T ₁ (2.5%)	T ₂ (5%)	T ₃ (7.5%)	T ₄ (10%)	SEM
Body weight gain						
Starter	623.13	617.37	641.77	634.23	630.50	4.12
Finisher	1410.17 ^c	1458.00 ^{bc}	1531.33 ^a	1547.83 ^a	1502.17 ^{ab}	15.10 ^{**}
Daily body weight gain						
Starter	29.67	29.40	30.56	30.20	30.02	0.20
Finisher	67.15 ^c	69.43 ^{bc}	72.92 ^a	73.71 ^a	71.53 ^{ab}	0.72 ^{**}
Feed consumption						
Starter	893.30 ^a	844.01 ^d	873.35 ^c	890.25 ^b	890.68 ^b	4.96 ^{**}
Finisher	2840.72 ^c	2732.32 ^e	2761.21 ^d	3010.73 ^a	2960.63 ^b	29.10 ^{**}
FCR						
Starter	1.43	1.37	1.36	1.40	1.41	0.01
Finisher	2.02 ^a	1.87 ^{bc}	1.80 ^c	1.95 ^{ab}	1.97 ^a	0.02 ^{**}
PI						
Starter	434.89	451.71	471.67	451.94	446.74	5.84
Finisher	700.77 ^c	778.05 ^b	849.51 ^a	795.78 ^{ab}	762.28 ^b	14.74 ^{**}
PER						
Starter	3.47	3.66	3.70	3.61	3.61	0.03
Finisher	2.84 ^d	3.06 ^b	3.19 ^a	2.97 ^{bc}	2.94 ^{cd}	0.03 ^{**}

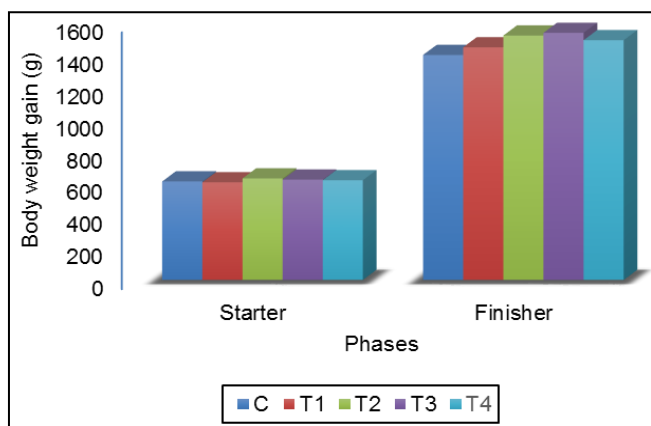


Fig 1: Effect of feeding *Azolla pinnata* on body weight gain at different phases

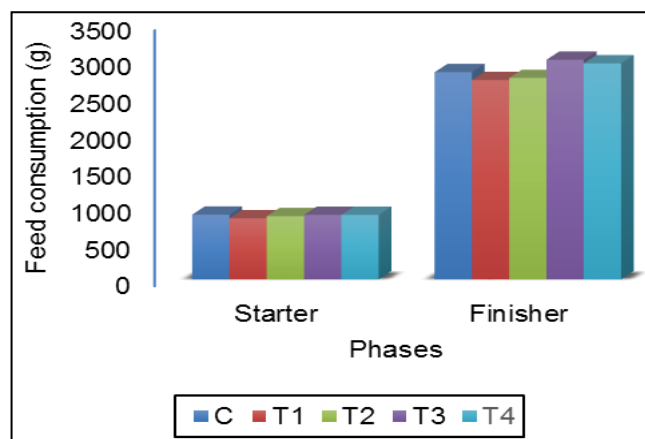


Fig 3: Effect of feeding *Azolla pinnata* on feed consumption at different phases

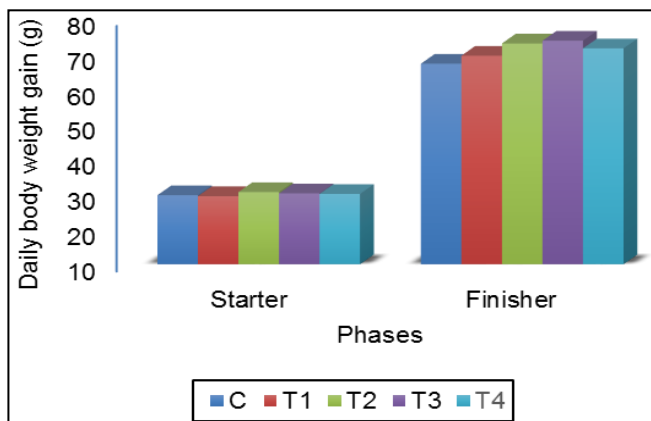


Fig 2: Effect of feeding *Azolla pinnata* on daily body weight gain at different phases

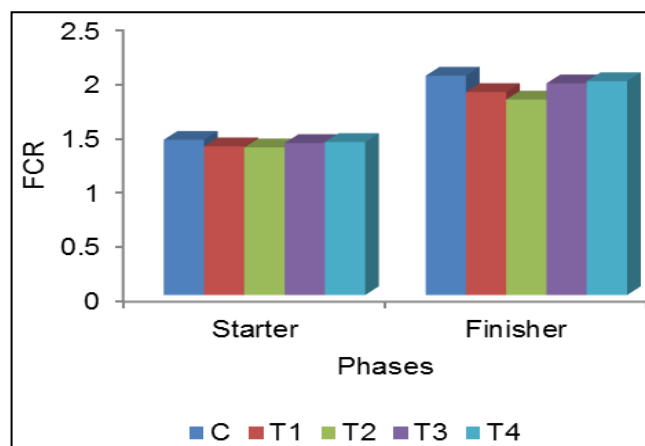


Fig 4: Effect of feeding *Azolla pinnata* on FCR at different phases

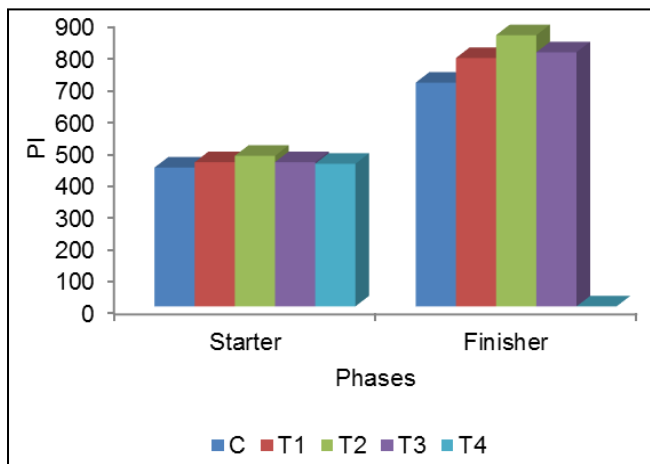


Fig 5: Effect of feeding *Azolla pinnata* on PI at different phases

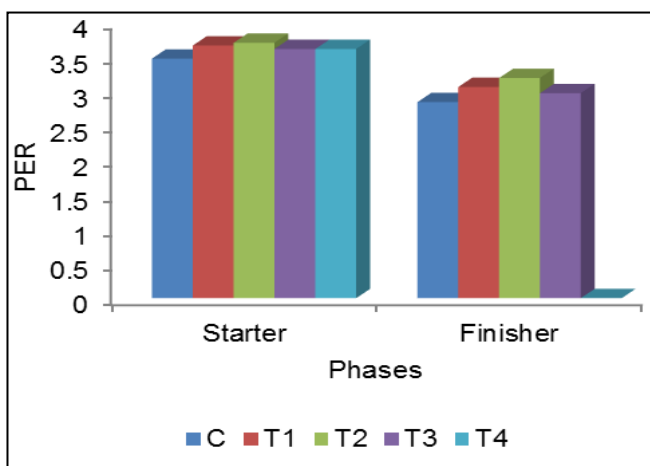


Fig 6: Effect of feeding *Azolla pinnata* on PER at different phases

Conclusion

Azolla pinnata on chemical analysis showed that it is rich in crude protein. The study envisaged that *Azolla* supplemented groups were better than control in term of growth performance. Broiler are reared for meat purpose so on looking for the performance of broilers i.e live body weight gain was significantly higher in 5 to 10% *Azolla* supplemented groups. The optimum performance, feed and protein utilization of broiler chicks is observed at the 5% inclusion level of *Azolla pinnata*. Therefore, 5% *Azolla* may be incorporated in a maize-soybean based diet of broiler chicken to make the broiler production more profitable. From the above discussion it may be concluded that *Azolla* is a good source of protein and may be used upto 10% level in the broiler diet. *Azolla* meal is a non-conventional feed ingredient at low price and may be used as poultry feed to reduce feed cost.

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