

GROWTH PERFORMANCE OF NEWZEALAND WHITE RABBITS FED WITH GRADED LEVELS OF AZOLLA (*Azolla pinnata*) IN THE BASAL DIET

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Abstract: The present investigation was carried out to determine the effect of partial replacement of conventional protein in the concentrate ration with azolla protein on the growth performance of Newzealand white rabbits. Twenty four Newzealand white rabbits of 30 days age having similar body weights were chosen and randomly divided into 3 groups T₁ (0% Azolla), T₂ (10% Azolla) and T₃ (20% Azolla) with 8 rabbits in each group. The rabbits were fed for a period of 90 days. At the end of 90 days, rabbits of T₂ group showed higher average weight gain of 1131.00 ± 8.85 g as compared to that of groups T₁ (999.75 ± 9.21 g) and T₃ (673.62 ± 6.76 g). The ADG was higher in rabbits of T₂ (12.54 ± 0.46 g) than that of T₁ (11.09 ± 0.38 g) and T₃ (7.45 ± 0.65 g) groups. Rabbits of T₂ (4.34 ± 0.24) group showed favourable FCR over groups T₁ (4.84 ± 0.31) and T₃ (7.21 ± 0.66).

Keywords: Azolla, Newzealand white rabbits, Growth performance, ADG, FCR.

Introduction

In developing countries like India, Rabbit production contributes to improving the nutrition as well as the economy of small holder families. It has a promising scope to meet the critical shortage of quality animal protein. However, like other livestock species, economic rabbit production is constrained by high cost of commercial rabbit feed and shortage of fodder. Under these circumstances, various locally available low cost feed sources such as moringa leaf meal, water hyacinth, duck weed and azolla were assessed in the past for reducing the feed cost in the rations of livestock.

Aquatic plant species like azolla because of their growth habit offer a great potential in replacing the conventional protein to large extent than tree leaves for monogastric animals. Azolla is rich in protein and almost all essential aminoacids. It is also found to contain probiotics and polymers (Pillai *et al.* 2002). Utilization of azolla was already enlightened in broiler chicken (Balaji *et al.*, 2009), laying hens (Alalade *et al.*, 2007), buffalo calves (Indira *et al.*, 2009), pigs (Cherryl *et al.*, 2013) and rabbits (Anitha *et al.*, 2016). However, information

on its utilization in meat type rabbits is scanty. Hence, the present study was undertaken to explore the effect of graded dietary levels of sun dried azolla as a substitute to protein supplement on growth performance of Newzealand white rabbits.

Materials and methods

The present experiment was conducted on 24 Newzealand white rabbits of 30 days old of almost similar body weights divided into 3 groups with 8 rabbits in each group at Rabbitryunit of Instructional Livestock Farm Complex, College of Veterinary Science, Proddatur, Andhra Pradesh. The required quantity of azolla was cultivated in 2 rectangular pits of dimensions 5m x 4m. Harvested azolla was washed thoroughly in clean water and sundried for 2 to 3 days. The sun dried azolla was collected in air tight bags and stored in aluminium bins for further use. Conventional concentrate ration with CP 16% was formulated using maize, soybean meal, deoiled rice bran, molasses, mineral mixture, salt, lysine and limestone to cover the nutrient requirements of rabbits according to NRC, 1977 recommendations. Three rations T₁ (1000 g conventional ration), T₂ and T₃ were prepared and fed after incorporation of sundried azolla as a protein replacement at 10 per cent in T₂ (900g of conventional ration + 74.41g of sundried azolla) and 20 per cent level in T₃ (800g of conventional ration + 148.82g of sundried azolla). The diets were compounded in mash form and fortified with vitamins and mineral supplements.

Feeding was done thrice daily at 8.00AM, 1.00PM and 6.00PM. The concentrate ration and the required quantity of azolla to be fed were weighed, mixed thoroughly and fed accordingly. The feed left over was weighed daily and deducted from the feed supplied to know the amount of actual feed intake per day. Body weights of all the 24 rabbits were recorded every week on Monday before offering the morning feed to study the growth rates. The data were subjected to two way ANOVA technique (Snedecor and Cochran, 1994) to arrive at the meaningful conclusions.

Results and Discussion

The initial live weight of the rabbits in the groups T₁, T₂ and T₃ were 353.12 ± 1.87, 354.00 ± 0.59 and 353.00 ± 0.56g, respectively. At the end of 90 days, the mean live weight of the rabbits were 1352.87 ± 8.75, 1485.00 ± 9.01 and 1027.121 ± 6.40g in T₁, T₂ and T₃ groups, respectively. Rabbits fed with T₂ ration showed significantly (P<0.01) higher average weight gain of 1131.00 ± 8.85g as compared to T₁ (999.75 ± 9.21g) and T₃ (673.62 ± 6.76g) groups. As per the results in this study, it might be concluded that feeding of 10% replacement level of azolla in the basal diet significantly improved the average body weight gain of rabbits

when compared to that of T₁ and T₃. A slightly lowered body weights of rabbits in the present study might be due to thermal stress conditions under which rabbits were reared. On contrary Anitha *et al.* (2016) reported that the inclusion of azolla in the diets of rabbits as replacement to dry matter at 1.5 and 3% levels did not affect the body weight gains of rabbits significantly. Similarly, Cherryl *et al.* (2013) reported that the inclusion of dried azolla as a replacement to conventional protein up to 20% did not affect the body weight of pigs significantly. However, the present findings were in accordance with similar studies conducted in poultry by various researchers. Shoukat Ara *et al.* (2015), Shamna *et al.* (2013), Balaji *et al.* (2009) reported that the body weight of birds significantly improved with incorporation of azolla meal up to 5% in the diet but a decrease in the body weight was observed with further increase in the level of azolla meal in the diet. The reduced weight gain at higher levels of azolla might be due to higher NDF and lignin contributed by azolla which is the main limiting factor for efficient utilization (Basak *et al.*, 2002).

The average daily feed intake was 52.28 ± 2.35 , 53.14 ± 1.59 and 46.91 ± 1.24 g in the groups T₁, T₂ and T₃, respectively with significantly ($P < 0.01$) lower feed intake in T₃ group. However, no significant difference was observed between the groups T₁ and T₂. Similarly Anitha *et al.* (2016) also reported that the average daily feed consumption was slightly reduced when azolla was fed at 3% level as replacement to dry matter in the basal diet. However, Sreemannarayana *et al.* (1993) reported no significant differences with the inclusion of fresh azolla in the diets of rabbits. The results observed were in close agreement with the findings of Cherryl *et al.* (2013) who reported a significantly lower feed intake of 1.78 ± 0.05 kg per pig per day at 20% inclusion level of azolla in the diet. The difference in the results obtained by different researchers might be attributed to variation in agro climatic conditions, value and quality of consumed azolla, nutrient composition of the diets and the type of experimental animal used. The reduction in feed intake at higher levels of azolla in the diet might be due to reduced palatability of the feed (Bested and Morento, 1985).

The average daily gain of the rabbits in T₁, T₂ and T₃ groups was 11.09 ± 0.38 , 12.54 ± 0.46 and 7.45 ± 0.65 g, respectively with no significant ($P > 0.01$) difference between T₁ and T₂ while significantly ($P < 0.01$) lower ADG was recorded in T₃ group. It was clearly evident from the results presented in Table 1 that the rabbits fed with diet containing 10% (T₂) azolla had comparatively higher ADG than T₁ group. Sreemannarayana *et al.* (1993) reported that the rabbits fed 20% fresh azolla in the diet showed comparatively higher weight gain than rabbits fed with basal diet. However Anitha *et al.* (2016) and Cherryl *et al.* (2013) who

conducted similar studies in rabbits and pigs, respectively concluded that inclusion of sun dried azolla in the diet did not significantly affect the ADG of rabbits and pigs.

The mean FCR of the three groups T₁, T₂ and T₃ were 4.84 ± 0.31 , 4.34 ± 0.24 and 7.21 ± 0.66 , respectively. The FCR's of T₁ and T₂ did not differ significantly ($P > 0.01$) while significantly ($P < 0.01$) higher FCR was observed in T₃ group. No mortality was recorded in all the treatments. Thus indicating that azolla had no deleterious effect on the livability of rabbits. The rabbits fed with T₂ ration showed comparatively favourable FCR than T₁ group while rabbits fed with T₃ ration showed significantly higher FCR. Similar observations were reported by Parthasarathy *et al.* (2001a) and Basak *et al.* (2002) in birds who stated that the FCR's increased significantly as the level of azolla meal in the diets increased beyond 10%. Basak *et al.* (2002) explained that this might be due to higher levels of fibre and tannin in aquatic plants that may be responsible for decreased nutrient utilisation and ultimately increased FCR.

Table 1. Growth performance of Newzealand white rabbits fed with azolla based diets

S.No	Characteristics	Replacement of conventional protein by azolla protein		
		T ₁ (0%)	T ₂ (10%)	T ₃ (20%)
1	No. of animals	8	8	8
2	Average live weight (g)			
	a. Initial	353.12 ± 1.87^a	354.00 ± 0.59^a	353.00 ± 0.56^a
	b. Final	1352.87 ± 8.75^b	1485.00 ± 9.01^a	1027.12 ± 6.49^c
3	Average weight gain (g)	999.75 ± 9.21^b	1131.00 ± 8.85^a	673.62 ± 6.76^c
4	Average daily gain (g)	11.09 ± 0.38^a	12.54 ± 0.46^a	7.45 ± 0.65^b
5	Average daily feed intake (g)	52.28 ± 2.35^a	53.14 ± 1.59^a	46.91 ± 1.24^b
6	FCR	4.84 ± 0.31^a	4.34 ± 0.24^a	7.21 ± 0.66^b

Means with different superscript(s) differ significantly ($P < 0.01$)

Conclusion

Based on the results of the present study, it could be concluded that replacement of conventional protein source by sundried azolla in the rabbit diets up to 10% improved the average body weight gains and lowered the FCR in Newzealand white rabbits under tropical conditions. However, inclusion of azolla beyond 10% significantly lowered the weight gains and increased the FCR. Hence, it might be concluded that the replacement of conventional protein by azolla should be limited to 10% for superior performance of rabbits.

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