



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2023; 12(6): 3437-3439  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 09-03-2023  
Accepted: 13-04-2023

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## Economics of feeding of shade-dried azolla meal in Mecheri lambs under intensive system

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### Abstract

The present research work was carried out to study the economics of feeding shade-dried azolla as a protein replacer in the concentrate feed in Mecheri lambs. Twelve Mecheri ewe lambs were randomly divided into two groups with six number of lambs in each group for 90 days experiment. The experimental animals were fed with a measured quantity of concentrate mixture and sorghum fodder was offered *ad libitum* as per nutrient requirement. In group II, 10 percent protein requirement through concentrate mixture was replaced by shade-dried azolla meal. The feed intake and body weight was recorded at fortnightly interval to analyze the cost of production per kg body weight. The ADG was higher in group I ( $65.93 \pm 0.632$ g) than the group II ( $59.63 \pm 0.80$  g), but there was no significant ( $p > 0.05$ ) difference between the groups. The cost per Kg gain was Rs. 173.01 and Rs 182.43 in the group I and group II respectively. The Cost of feed per day/animal was Rs. 11.40 and Rs. 10.63 in the group I and group II respectively. The cost of feed per day was lower in the group II compared to the group I, but the cost per kg gain was high in the group II compared to the group I. Even though slightly higher cost in weight gain azolla can be used as alternative feed to reduce the use of conventional protein ingredients like soybean meal and groundnut cake.

**Keywords:** Shade-dried azolla, feeding cost, average daily weight gain

### Introduction

Sheep farming is one of the growing sectors in meat production in order to achieve the protein need of human beings. Mecheri sheep are a native breed of Tamil Nadu and have a good association with landless labourers, and farmers and play a main role in economic support to the farmers. Mecheri sheep produce good-quality mutton, and skin and can survive in near drought conditions. Due to an increase in feed cost which leads to an increase in the production cost of animals, farmers need to produce and incorporate alternative ingredients like azolla, in sheep ration to reduce the production cost and increase the level of good quality protein in animal diet. *Azolla pinnata* is an aquatic free-floating fern high in protein content widely used for animal feeding (El Naggat and El-Meser, 2022) [2]. Among protein feed azolla have good quality nutrients and is grown in smaller space of pit utilizing minimum labour cost throughout the year (Pillai *et al.*, 2002) [7]. Azolla has a higher amount of essential amino acids like lysine, methionine followed by non-essential amino acids and a smaller amount of sulphur-containing amino acids (Kathirvelan *et al.*, 2015) [6]. Apart from protein azolla contain good-quality fibre, vitamins and minerals (Sankar *et al.*, 2020) [10]. The present investigation was carried out to calculate the economics of production of per kg weight gain in Mecheri lambs, using shade-dried azolla.

### Materials and Methods

#### Location of Research

This experiment was conducted at Mecheri Sheep Research Station (MSRS), Pottaneri Tamil Nadu Veterinary and Animal Sciences University (TANUVAS) Chennai.

#### Design of the Experiment

The feeding trial was conducted in 3-4 months of age Mecheri female lambs. Twelve Mecheri female lambs were randomly divided into two groups with six no of lambs in each group for 90 days experiment. The experimental animals were acclimatized with experimental feeds and dewormed before starting of feeding experiment. The experimental animals were fed with a measured quantity of concentrate mixture and sorghum fodder was offered *ad libitum* as per nutrient requirement (ICAR, 2013) [5]. In group II, 10 percent protein requirement through concentrate mixture was replaced by shade- dried azolla meal.

### Cultivation, harvest, shade drying and storage of azolla

Azolla was collected from an established unit in the Mecheri sheep Research station, Pottaneri for the experiment. Azolla was collected on alternative days and allowed for shade drying to reduce moisture and bulkiness. These shade-dry azolla are easy to store for a long time and are used for feeding of animals. The cost of production of shade-dried azolla was calculated.

### Recording the body weights and feed intake

The experimental animals were weighed fortnightly before feeding. The feed intake and body weight was recorded at fortnight interval to analyze the cost of production per kg body weight.

### Statistical analysis

The data were processed and statistically analyzed as per the procedures of Snedecor and Cochran (1994)<sup>[12]</sup>.

### Results and Discussion

The cost of concentrate feed was Rs 31 per kg purchased from Veterinary College and Research Institute, Namakkal and the cost of production of one kg of shade-dried azolla was Rs 14.52. The cost of control and treatment group ration with the inclusion levels of azolla as protein replacement at 0, and 10% level Rs 31 and Rs 29.3 respectively. The concentrate intake in the control group was 153.4 kg and the treatment group was 136.4 kg during 90 days growth trial. Feeding of 19.8 kg shade-dried azolla replaced 17kg of concentrate mixture, in group II which corresponded to Rs 527 for 17 kg concentrate mixture cost and Rs 287.5 for 19.8 kg shade-dried azolla. The results show inclusion of shade-dried azolla in the concentrate mixture reduced the cost of feeding.

The nutrients like ether extract, total ash, fiber was higher and similar crude protein content in the azolla as compared to concentrate mixture (Table 2). The protein content of shade-dried azolla varies from 20-26 percent, its variability depends on the strain of azolla, soil nutrient availability and environmental conditions like light, intensity and humidity (Sanginga and VanHove, 1989)<sup>[9]</sup>. The protein content in azolla and concentrate rations was similar. The cost of concentrate is low when shade-dried azolla included in the concentrate mixture without affecting the protein percentage of the concentrate mixture. A similar result reported by Sireesha *et al.* (2017)<sup>[11]</sup> when shade-dried azolla added in the feed of rabbit. The cumulative fodder and concentrate intake

was 352.53 and 335.1 kg in the group I and group II respectively. The total feed intake was low in the group II compared to the group I. A similar result was observed by Ghodake *et al.* (2012)<sup>[4]</sup> who reported that azolla feeding was effective only up to 15 percent in a concentrate mixture due to the high fibre and lignin content of azolla in Osmanbadi goats. The fibre content of the concentrate mixture and shade-dried azolla was 7.96 percent and 30.62 percent respectively. The high fibre content of azolla might have reduced the sorghum fodder and total dry matter intake of animals.

Final body weight gain was 5.93±0.63 kg in group I and 5.37±0.72 kg in group II respectively, but there was no significant difference in body weight gain. Animals in both groups grew linearly throughout 90 days of experiment. Group I animals had numerically higher body weight as compared to group II animals. The average daily weight gain was 65.93±0.632 gram and 59.63±0.80 gram in the group I and group II respectively. The ADG was numerically higher in group I than in the group II. There was no significant ( $p>0.05$ ) difference in the body weight gain between the group I and group II (Table 3). Compared to our study, Thejavath *et al.* (2022)<sup>[13]</sup> reported that supplementation of shade-dried azolla meal up to 20% produced higher ADG compared to control in Deccani lambs under a grazing system. The cost per Kg gain was Rs. 173.01 and Rs 182.43 in the group I and group II respectively. In contrast to our study, Ahmed *et al.* (2016)<sup>[1]</sup> reported that the cost of feeding per kg gain was increased as levels of fresh azolla inclusion in the diet of Corriedale sheep. These might be due to the moisture level and bulkiness of fresh azolla as compared to shade-dried azolla. Similar to our result, Cheryl *et al.* (2013)<sup>[3]</sup> and Saini *et al.* (2020)<sup>[8]</sup> reported that increased inclusion levels of shade-dried azolla reduced the feed cost and cost per Kg gain in swine. Costs of feed per day/animal were Rs. 11.40 and Rs. 10.63 in the group I and group II respectively. The cost of feed per day was lower in the group II compared to the group I, but the cost per kg gain was high in the group II compared to the group I. These may be due to better weight gain in the group I. Even though the high cost in weight gain azolla shall be used as alternative feed to reduce the use of conventional protein ingredients like soybean meal and groundnut cake. In contrast to our result, Sireesha *et al.* (2017)<sup>[11]</sup> reported that with the inclusion of sun-dried azolla up 10% in the rabbit diet, the cost per kg gain was lower than the control group.

**Table 1:** Proximate Composition of Concentrate mixture and Shade dried Azolla

Composition	Concentrate mixture	Shade-dried azolla
Dry matter	88.0	89.55
Crude Protein	20.11	20.11
Crude Fibre	30.62	7.96
Ether Extract	4.17	3.2
Total Ash	24.35	8.86

**Table 2:** Fortnightly body weight changes during feeding trail period

Fortnight	Group I	Group II	SEM	P- Value
0	13.25±0.508	13.25±0.503	0.341	1.0
I	14.46±0.439	14.36±0.542	0.333	0.888
II	15.73±0.425	15.45±0.560	0.338	0.695
III	16.68±0.400	16.37±0.705	0.389	0.704
IV	17.61±0.404	17.10±0.760	0.418	0.542
V	18.45±0.491	17.80±0.863	0.483	0.527
VI	19.18±0.542	18.62±0.912	0.513	0.605
Total weight gain	5.93±0.56	5.37±0.72	0.445	0.550
ADG(g/day)	65.93±0.632	59.63±0.801	0.495	0.550

**Table 3:** Economics of azolla feeding during the growing stage of Mecheri sheep lambs

Particulars	Replacement of conventional concentrate mixture protein by shade –dried azolla	
	Group – I (0 %)	Group – II (10 %)
Quantity of Concentrate feed consumed (Kg)	153.3	136.0
Cost of Concentrate feed (Rs.31 per kg)	4752.3	4217.5
Quantity of dried Azolla consumed (Kg)	-	19.8
Cost of dried Azolla (Rs.14.52 per kg)	-	287.5
Quantity of dried sorghum fodder consumed (Kg)	199.2	177.3
Cost of sorghum dry fodder (Rs.7 per kg)	1394.6	1241.1
Total feed consumed (Kg)	352.5	335.1
Dry matter intake per animal/day	0.576	0.547
Total feed cost	6146.9	5746.2
Total feed cost per Kg	17.44	17.15
Feed intake per day (kg)	3.92	3.72
Cost of feed per day (Rs)	68.36	63.80
Cost of feed per day (Rs)/ individual animal	11.40	10.63
Production cost /individual animal	1026.0	977.9
Average daily weight gain (g)	65.93	59.63
Total weight gain (Kg)/individual animal	5.93	5.36
Cost per Kg gain (Rs)	173.0	182.5

### Conclusion

Shade-dried azolla effectively replaced up to 10 percent the conventional concentrate mixture without affecting growth and weight gain in Mecheri Sheep. Inclusions of shade-dried azolla reduced the cost of feed and have a similar cost per kg gain.

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