

Original Research Article

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Economics of Feeding *Azolla caroliniana* in Crossbred Calves

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ABSTRACT

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To analyse the impact of feeding dried *Azolla caroliniana* in partial replacement of concentrate feed on feed conversion efficiency and feeding cost of crossbred calves a study was conducted on crossbred calves. The dried *Azolla caroliniana* were mixed with concentrate mixture at 0%, 10% and 20% level on DM basis and fed to the eighteen (18) crossbred calves distributed in T0, T1 and T2 group respectively along with equal quantity of green grass (Napier) and paddy straw in each group. The feed conversion efficiency was highest in T0 followed by T1 and then T2 group. The cost of feeding per kg live weight gain was lowest in T2 (Rs.78.14) in comparison to T1 (Rs. 85.12) and T0 (Rs. 96.67). Thus, it can be concluded that *Azolla caroliniana* feeding would be economic for calf growth rate.

Introduction

Livestock sector has been a major factor in boosting economic upliftment of marginal farmers. The unavailability of fodder land area however is a burning issue for raising livestock. To make concentrate feed available for livestock is also a great challenge in marginal farmers due to high cost. However, the cost analysis indicates the feed alone constitute major items of expenditure in livestock production and accounts for about 70% of the total cost of production (Karangiya *et al.*, 2016).

As a solution, nutritionists have come up with use of non conventional feed for feeding livestock. Many researches in this field have been experimented so that farmers could adopt this new technology with encouraging results. One of the important examples of non conventional feed is *Azolla caroliniana*.

Azolla is a promising water fern with high production rate and nutritive value (Indira *et al.*, 2009; Wagner 1997). *Azolla*, a free floating fern, rich in protein content, mainly grows well in stagnant water bodies like ponds, ditches, etc.

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 and vitamin B12. It is also found to contain probiotics and biopolymers (Pillai *et al.*, 2002). It can be grown easily with minimum maintenance cost. Moreover, Calves bear the flagship of a farm. A good and healthy calf would be the best input for the utmost profit in the future. So, partially replacing concentrate feed with *Azolla caroliniana* in feeding calves would be of highly profitable.

On this context, the current experiment was conducted to evaluate the cost effectiveness due to partial replacement of concentrate feed with *Azolla caroliniana* in feeding of crossbred calves.

Materials and Methods

The present study was experimented at Instructional Livestock Cattle Farm, ILF(C), College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22, Assam. Dried powder of *Azolla caroliniana* was made available; replaced and mixed with concentrate mixture at 10% and 20% level in group T1 and T2 respectively.

The control group T0 was fed with concentrate mixture without mixing of *Azolla caroliniana* powder in the basal diet. However, equal parts of green (Napier), dry roughage (paddy straw), mineral mixture was made available in all the groups. Provision of regular clean drinking water for the calves was taken as utmost concern for avoiding any untoward situation.

Results and Discussion

Feed conversion efficiency (FCE) can be defined as unit of feed (DM basis) required per unit gain in body weight. It is generally employed as an index to determine the productive efficiency in case of meat animals. The fortnightly feed consumed by the experimental calves of treatment groups T0, T1 and T2 has been recorded. The total feed consumed by the treatment groups were 178.62 ± 6.68 , 184.81 ± 6.72 and 190.98 ± 6.99 in T0, T1 and T2 group respectively (Table 1). Statistically there had non significant difference ($P > 0.05$) among the treatment groups in terms of total feed consumed by the experimental calves.

The graphical representation has been depicted in Fig 1. On statistical analysis it was observed that there was non significant difference in respect of overall mean of feed conversion efficiency among different treatment groups and numerically better feed conversion efficiency was found in T2 group followed by T1 and less in T0 group. Similar findings are also recorded by Chatterjee *et al.*, (2013) reported improvement in FCR in crossbred calves supplemented with 60 g dried *Azolla (Azolla microphylla)* significantly ($P < 0.05$) in replacement of 10% of the concentrate mixture. Ahmed *et al.*, (2015) observed non significant ($P > 0.05$) difference among the treatment groups on feeding 12, 18 and 24% *Azolla* by

replacing 50, 75 and 100% linseed cake respectively to the male Corriedale sheep. Arvindraj *et al.*, (2017) reported replacement of 10% concentrate mixture by supplementing *Azolla* meal @ 60 g/animal/day could improve feed conversion efficiency in crossbred male calves. Sihag *et al.*, (2018) recorded non significant ($P > 0.05$) difference among the treatment groups on feeding *Azolla* replaced feed at 10, 15, 20% to the crossbred female kids and better FCR was observed at 10% replacement.

The cost incurred on various feed stuffs has been imprinted in Table 2. The housing, management and labour cost were similar for all the groups of experimental animals and expenditure on these have been excluded. The total cost incurred in terms of feed consumption per animal per day was calculated and found to be Rs. 23.54, Rs. 22.11 and Rs. 21.27 (on DM basis) in T0, T1 and T2 group respectively. The average daily gain in body weight in T0, T1 and T2 were 243.51, 259.81 and 272.27 g respectively. When compared with daily weight gain in different treatment group, the cost of production per kg gain in live weight was found out as Rs. 96.67, Rs. 85.12 and Rs. 78.14 and the relative cost of growth production was 100%, 88.05% and 80.83% in T0, T1 and T2 respectively. Indira *et al.*, (2009) reported significantly ($P < 0.01$) higher average feed cost in Rs/kg body weight gain for the control than the treatment group of buffalo calves and the costs were Rs. 17.87 and Rs. 13.58 per kg weight gain respectively. Rao *et al.*, (2009) reported about 50% reduction in feed cost/kg weight gain in the experimental groups of Nellore sheep than the control group. The cost of feed/kg weight gain was reduced by 50% in experimental diets over control diet.

They observed higher ($P < 0.01$) cost of feed/kg weight gain were in the semi intensive system. Ghodake *et al.*, (2012) reported total cost per kg live weight gain were recorded as Rs. 40.49, Rs. 39.27 and Rs. 81.68, for T1 (0% *Azolla*), T2 (15% *Azolla*) and T3 (25% *Azolla*) respectively indicating economically beneficial effect on feeding 15% *Azolla* in T2 group to Osmanabadi kids.

Sihag *et al.*, (2018) reported net saving of Rs. 7.90 and Rs. 5.16 per kg weight gain for feed cost of crossbred kids when feeding *Azolla* at 10% and 15% on replacement of concentrate feed respectively. The present study indicates that feeding *Azolla (Azolla caroliniana)* by replacing concentrate mixture at 10% and 20% level to the crossbred calves will be economically beneficial with higher daily gain in body weight.

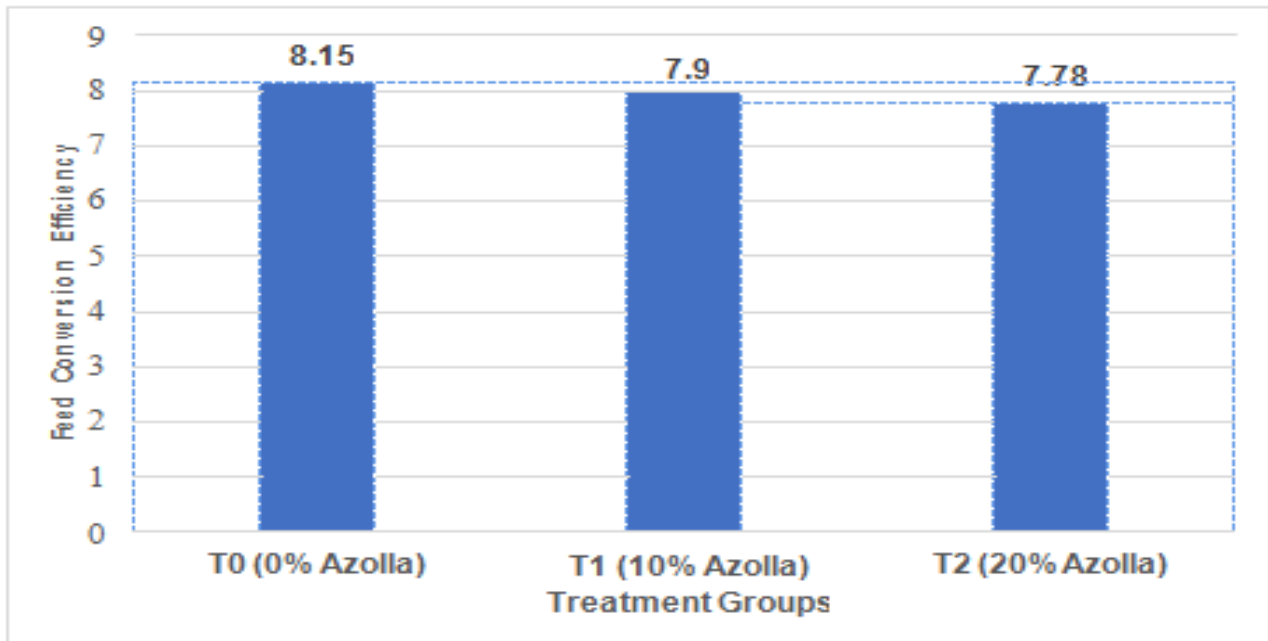
Table.1 Average Feed Conversion Efficiency of the Experimental Calves During Feeding Trial

Particulars	Treatment			SEM	p† value
	T0 (0%Azolla)	T1 (10% Azolla)	T2 (20% Azolla)		
Average total gain in body weight (kg)	21.91 ^a ±0.20	23.38 ^b ±0.21	24.51 ^c ±0.35	0.74	<.0001
Total feed consumed (kg DMI/animal/90 days)	178.62±6.68	184.81±6.72	190.98±6.99	3.57	0.8257
Average feed conversion efficiency (kg DMI/kg gain)	8.15±0.34	7.90±0.27	7.78±0.21	0.11	0.646

Table.2 Relative Cost of Growth Productions in Crossbred Calves on Various Treatments

Particulars	Treatment		
	T0 (0% Azolla)	T1 (10% Azolla)	T2 (20% Azolla)
Dry matter intake/animal/day (kg)	2.31	2.41	2.52
Cost of feed consumed/head/day (Rs.)	23.54	22.11	21.27
Growth rate (g/d)	243.51	259.81	272.27
Cost of production per kg live weight gain			
Absolute	96.67	85.12	78.14
Relative (%)	100	88.05	80.83

Figure.1 Feed Conversion Efficiency of Different Dietary Treatment Groups



Author Contributions

Kalita Sunita: Investigation, formal analysis, conceptualization, data curation, writing original draft. Borah Lakhyajyoti: Validation, methodology, writing-reviewing. Bhuyan Robin- Formal analysis, writing-reviewing. Kalita Udhab- Investigation, methodology.

Data Availability

The data generated during and/or analysed during the present study are available from from the corresponding author on reasonable request.

Declarations

Ethical approval Not applicable

Consent to participate Not applicable

Consent to publish Not applicable

Conflict of interest The authors declare no competing interests.

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