

Effect of azolla supplemented feeding on milk production of crossbred milch animals

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ABSTRACT

The experiment was carried out to determine the effect of feeding azolla to crossbred milch animals. Experiment consists of 4 groups viz., Group I (control devoid of azolla feeding), Group II (azolla 500 gm + grazing), Group III (azolla 500gm + concentrate feeding + green fodder), Group IV (azolla 1kg + concentrate feeding + green fodder). Azolla feeding trial was continued for 2 months. The two parameters viz., milk yield and milk fat percentage were recorded and analysed. The milk yield and fat percentage recorded for Group III and Group IV milch animals were highly significant than Group II animals which were devoid of concentrate feeding. Twenty eight percent replacement of concentrate feed with supplementation of 1 kilogram of azolla improved the milk yield to 800 ml/ day (11.4%) and 0.9 percent increase in milk fat (26%) compared to the control Group. The supplementation of 1 kilogram of azolla along with regular concentrates and green fodder to the crossbred milch animals has improvised the milk yield, milk fat percent and also a gain of extra profit to the farmers which in turn improves socio economic status of dairy farmers.

Key words: Azolla feeding, milch animals, milk, fat

Green fodder supplement is an important requirement in the feed for cattle. Even if the animals are fed with commercial feeds from the market, fresh green grass or dry straw is essential, as fodder availability greatly reduces the expenditure on commercial feeds. The success of a dairy plant depends largely on increasing milk production without escalation in feeding cost. Shortages of fodder are therefore being compensated with commercial feed, resulting in increased cost of meat and milk production. Moreover, as commercial feed is mixed with urea and other artificial milk boosters, it has a deleterious effect on the quality of milk produced and the longevity of the livestock, which in turn leads to degenerative diseases like cancer and coronary ailments in human beings. Fodder cultivation is a good option but it requires suitable land, ploughing, irrigation, fertilizers etc, cutting of fodder at regular intervals which is costlier. Thus suitable alternative fodder is Azolla cultivation and one hectare of Azolla can produce 540-720 kg of protein per month (Alcantara and Querubin, 1985 ; Dao and Tran, 1979).

Azolla is the most promising aquatic plant for livestock feed due to its ease of cultivation, productivity and nutritive value. Azolla has been used for many years to feed cattle, sheep, goats, pigs, ducks, chickens, fish and rabbits (Becerra *et al.*, 1995 ; Lumpkin and Plucknett, 1982). Azolla has enormous potential as a livestock feed due to its high rate of growth in water without the need to displace existing crops or natural ecological systems. Azolla is also very rich in proteins, essential amino acids, vitamins (vitamin A, vitamin B12, Beta Carotene), growth promoter intermediaries and minerals including calcium, phosphorous, potassium, ferrous, copper, magnesium. On a dry weight basis, azolla has 25-35% protein content, 10-15% mineral content, and 7-10% comprising a combination of amino acids, bio-active substances and biopolymers (Kamalasana *et al.*, 2002). Azolla's carbohydrate and oil content is very low. Azolla is also rich in iron (1000-8600 ppm dry weight), copper (3-210 ppm dry weight) manganese (120-2700 ppm dry weight), vitamin A (300-600 ppm dry weight), chlorophyll and carotenoids. It contains 4.8-6.7% dry weight crude fat, with 6.1-7.7% and 12.8-26.4% total fat for the polyunsaturated

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acids omega 3 and omega 6 (Paoletti *et al.*, 1987). Azolla's composition therefore makes it one of the most economic and efficient feed substitutes for livestock, particularly as it can be easily digested by livestock due to its high protein and low lignin content. Keeping in view the advantages of feeding Azolla and management of fodder scarcity a study using Azolla supplement as cattle feed was taken up for cost effective feeding and improvement in milk production.

METHODOLOGY

Dairy farmers of Unnamalai village of Kancheepuram district of Tamilnadu were given proper training on azolla cultivation through Front Line Demonstrations. To study the impact of feeding azolla, 12 dairy farmers

who have at least two milch animals were chosen for the study and they were also educated on feeding azolla to milch animals. Selected cross bred milch animals were fed with 0.5 – 1 kg azolla / day and Co-4 was given as green fodder (~10 kg) and approximately 3.5 kgs of concentrate feed mixture per day was also incorporated in the study group (n=6). The details of treatments are shown in Table 1. Harvested azolla was thoroughly washed with fresh water to remove the smell of dung before feeding the milch animals. Data on milk production and fat % was recorded for control and the treatment groups after 60 days of azolla feeding and the additional income generated through feeding azolla was also calculated. Statistical analysis was made using student's t-Test.

Table 1 Details of Treatments

Group (n=6)	Treatment
I	Control
II	Azolla 500 gm/ day + Grazing
III	Azolla 500 gm + Concentrate feeding (~3.5kg) + Green fodder (~10 kg) / day
IV	Azolla 1 kg + Concentrate feeding (~3.5kg) + Green fodder (~10 kg) / day

RESULTS AND DISCUSSION

Milk production (litres) and Milk fat percent before and after feeding azolla to milch animals of various groups were recorded. Data analysis revealed that Azolla feeding increased the Milk yield and increased the fat content of cows' milk as shown in Table 2. The results obtained were coinciding with Dinesan, (2007) and Biradar, (2007) who reported feeding Azolla improved milk production and quality of milk from dairy animals. The results of milk production and fat % of Group IV was significant ($p < 0.05$) compared to Group III. However it was noteworthy to observe that the quantity of milk production and fat % obtained for Group III and Group IV milch animals were highly significant ($p < 0.01$) compared to Group II animals. Group II (fat %), Milk production and fat % of Group III and Group IV were highly significant ($p < 0.01$) whereas milk production of Group II was significant ($p < 0.05$) compared to the control group devoid of azolla feeding.

Percentage increase in milk fat and quantity of milk after feeding azolla is represented in Fig. 1. The

percentage increase of milk fat and milk yield of treatment groups was compared against control group. The increase in milk production was to the tune of 10 % and 11.4%, in Group III and IV, respectively whereas, it was only 4 % in group II which was not fed with concentrates and green fodder. Similarly 23% and 26% increase in the Milk fat percent was noticed in Group III and IV when compared to 8.5 % increase in group II. Feeding Azolla @ 1kg/day/ animal along with concentrate and green fodder had shown better result than treatment group II and group III. Therefore supplementing azolla as an alternate fodder in milch animals helped to increase the milk yield and milk fat %. Similar results were obtained by Manjunath patil *et al.* (2013) and Mathur *et al.* (2013).

The treatment groups (II, III, IV) supplemented with azolla had shown an increase in milk yield of 300-800 ml which was coinciding with the earlier reports of Manjunath patel *et al.* (2013) who also recorded 700 ml increase in milk production and Rawat Nidhi *et al.* (2015) also reported that feeding of azolla in cattle improved the production performance. In our study,

Table 2 Effect of azolla feeding on milk yield and fat percentage

Group (n = 6)	Treatment	Before feeding Azolla		After feeding Azolla	
		Fat (%)	Milk yield (lit)	Fat (%)	Milk yield (lit)
I	Control	3.6±0.051	6.9±0.032	3.5±0.041	7.0±0.052
II	Azolla 500 gm/ day + Grazing	3.5±0.055	7.1±0.042	3.8±0.031"	7.3±0.032'
III	Azolla 500 gm + Concentrate feeding (~3.5kg) + Green fodder (~10 kg) / day	3.6±0.033	7.0±0.042	4.3 ±0.045"	7.7±0.036"
IV	Azolla 1 kg + Concentrate feeding (~3.5kg) + Green fodder (~10 kg) / day	3.62±0.041	7.1±0.044	4.46±0.029"	7.8±0.036"

Note : 30 days average data. Control vs Group II, III and IV

'Significant $p<0.05$, " Highly Significant $p<0.01$

28% of concentrate feed was replaced with the same quantity of azolla which was in close agreement with Kamalasana *et al.* (2002) who replaced 15-20% of commercial feed with azolla without affecting milk production providing a 20-25% savings on buying commercial feeds.

Partial budgeting was done for the assessment of cost benefit ratio of azolla supplementation (Table 3)

revealed that a farmer by investing ₹ 630/- on azolla production can earn net gain of ₹ 11000/- milch animal/ lactation indicating the high economic utility of this supplemental feeding. From the results it was evident that a saving of ₹ 20/- animal/day due to 28% replacement of azolla and an additional earning of ₹ 19/animal/day due to increase in quantity of milk. Similar results were quoted earlier by Kologi *et al.* (2009).

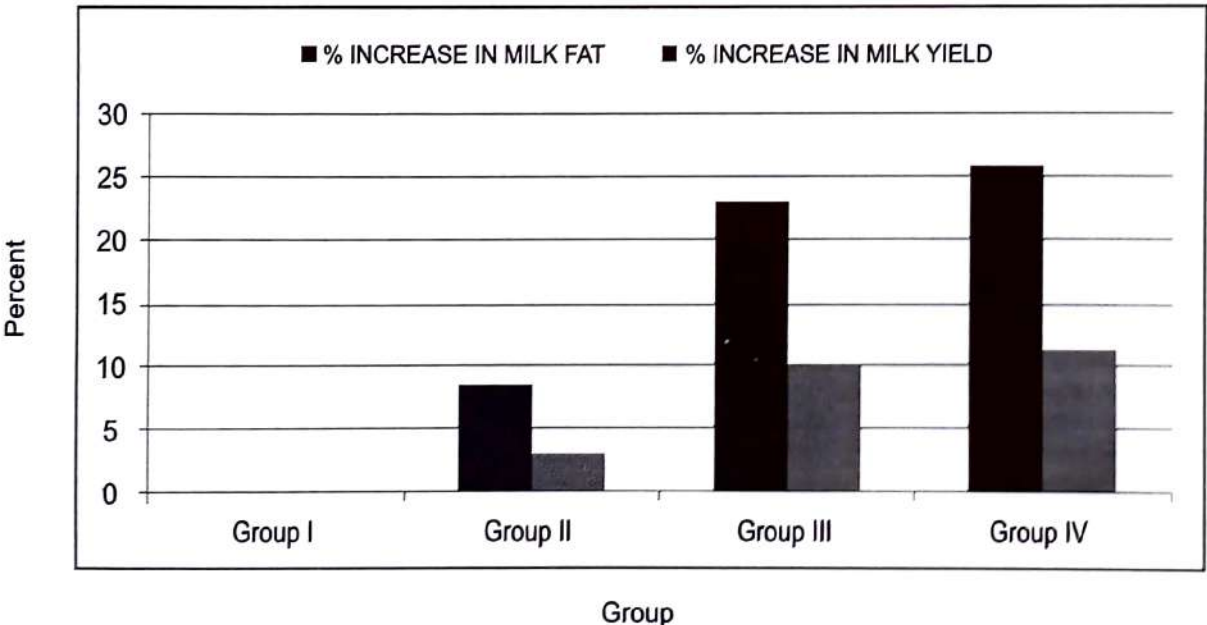


Fig. 1 Augmentation of fat percent and quantity of milk after azolla feeding

Table 3 Cost Benefit Ratio Analysis

No.	Particulars	Calculation	Amount (₹)
I	Increased milk yield 0.7 to 0.8 L/day/ animal For 30 days Cost of Milk @ ₹ 25/L (Procurement)	Avg 0.75L/day/animal $30 \times 0.75 = 22.5 \text{ L}$ $22.5 \times 25 = ₹ 563/\text{month}$ $₹ 563 \times 10 \text{ months (Lactation period)}$	5630.00
II	Reduction in concentrate feed cost 1 kg Azolla / animal/day Considering animal is yielding Avg.7 lit of milk/day, then it will consume ~3.5 kg concentrate/animal/day Replace concentrate feed with Azolla (1 kg per day) Cost of concentrate feed @ ₹ 20/ kg	$3.5 \text{ kg} \times 300 \text{ days} = 1050 \text{ kg / Lactation}$ $1 \text{ kg} \times 300 \text{ days} = 300 \text{ kg}$ $300 \text{ kg} \times ₹ 20$ Total (I + II)	6000.00 11630.00
III	Additional Cost	Additional cost ₹ 630.00 for making Azolla plot	630.000
IV	Economics Net gain= (Additional returns + Reduction in Concentrated Feed Cost) - Additional Cost		11000.00/ animal / lactation

CONCLUSION

Overall the study concluded that azolla supplement as an alternate fodder to milch animals improved the quantity and quality of milk. Azolla supplementation to milch animals @ 1 kg / animal / day is sufficient to improve the milk yield and milk fat percentage. Azolla feeding also reduce the feed cost and increase the profit.

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