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SHORT COMMUNICATION

Effect of azolla as feed supplement on milk production of lactating buffaloes at Neemuch district Madhya Pradesh

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Abstract: Azolla holds the promise of providing a sustainable feed for livestock. Azolla, a floating fern reported to be a very good source of protein, essential mineral elements and vitamins for livestock. The present study was undertaken to know effect of feeding azolla on milk production performance (milk yield, fat%, SNF%) of lactating buffaloes under field conditions. A total of 40 lactating buffaloes were selected and categorized into two groups each having 20 buffaloes. The animals in control group (T0) were fed on conventional ration of paddy straw, green fodder and concentrate mixture as per recommendation of NRC. In the treatment group (T1) 2 kg of fresh azolla was supplemented over conventional ration. The effect of fresh Azolla supplementation in lactating buffaloes was studied in an early lactation period of 90 days. The average milk yield (kg/d) was found significantly higher ($P<0.05$) in T1(7.4±0.08) than T0 (6.5±0.13). On an average milk yield increase by 0.9 L/day over control group animals. These results showed that supplementing of azolla caused an increase in milk yield by 13.8 %. The average percentage of milk fat, milk protein, SNF showed no significant difference between two groups but the fat% was found higher in T1 as compared to T0. Peak milk yield was also found significantly ($P<0.05$) higher in azolla fed group than the control group. Thus, it can be concluded that azolla can serve as a potential alternative nutrient supplement for the lactating buffaloes for the improvement of productivity in terms of milk specially where/when green fodder availability is scanty. However, further studies are needed for determining the replacement amount of azolla for concentrate to make it cost effective for farmers.

Keywords: Azolla, Buffalo, Milk, Milk fat, Milk SNF

India has huge and rich livestock population which play significant role in national economy. At present India is a leading country in milk production out of this majority of production i.e, 56% is being contributed by buffaloes. The milk production is not dependent on only one factors rather than several factors, one among them is decreasing feed and fodder for the supporting the growing livestock's population. There is acute shortage of feed and fodder for dairy animals due to lack of land availability for growing fodder for animals and high population density. Today shortage of dry fodder, green fodder and concentrate has been estimated to be 21%, 35.6 % and 44%, respectively (Kumar, 2018). To maintain continuous milk production it is essential to be provided with adequate feed and fodder, along with other supplement. Primary consideration on feed resources must be to identify the feed resources in ample supply to provide the bulk of a ration for the local herd and the supplements needed to balance the animal's nutrition. One among them is Azolla as a feed supplement which could be a good alternative for green fodder and concentrates to fulfill the nutrient requirement of animal.

Azolla is a free floating, rapidly growing aquatic fern on water surface forming symbiotic relationship with the cyanobacterium Anabaena azollae, which fixes atmospheric nitrogen. Azolla is rich incrude protein content which varies between 15.4 to 27.93%i.e 4 to 5 times more protein of excellent quality in comparison to hybrid napier and lucerne, respectively (Pillai et al. 2002). Along with this it is also good source of minerals (calcium, phosphorous, potassium, ferrous, copper, magnesium) and vitamins (vitamin A, vitamin B12, Beta Carotene). Azolla meal contains 25.78% crude protein, 15.71% crude fiber, 3.47% ether extract, 15.76% ash and 30.08% nitrogen free extract on the air-dry basis (Basak et al. 2002). Azolla pinnata had high crude protein content and better mineralprofiling (Calcium, phosphorus and Potassium are1.67%, 0.31% and 2.68%) respectively (Bhatte et

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al. 2020). Azolla can act as a valuable green feed supplement for dairy cattle to improve productivity (Chatterjee et al. 2013). Due to easy cultivation, good nutritive value and high productivity it may be used as a beneficial fodder supplement as reported by various scholars (Prabina and Kumar, 2010). One hectare of azolla can produce 540-720 kg of protein per month. Various work on economics and nutritive value of azolla rich in protein and low in lignin content indicates that it has been one of the most economic and efficient feed substitutes for livestock which can be easily digested. Due to its beneficial characteristics Azolla is called "Green Gold" (Wagner, 1997). Keeping in view the above features of the supplement the objective of the present study was to evaluate the effect of Azolla as feed supplement on milk production performance of lactating buffaloes.

The present study was carried out at farmers field of various villages of Neemuch district (Madhya Pradesh, India). For trial a total of 20 locally available buffalo breeds having 2nd to 5th parity of early lactation stage were selected. The lactating buffaloes were divided into two groups of 10 buffaloes each. Treatment 1 (T0) (n=10): Control group (Farmers' practices), no supplementation of Azolla as feed supplement. Treatment 2 (T1) (n=10): Supplementation of Azolla as feed supplement at rate of 2 kg/day/animal for 90 days. In control group (T0) animals were fed with wheat straw with market purchased concentrate mixture, whereas the treatment group (T1) was fed with same quantity of roughages and concentrate with supplementation of fresh green Azolla pinnata. The buffaloes were hand-milked twice daily morning and evening. Before commencement of the trial the milk yield of individual buffalo was noted as well as after commencement of the experiment the milk yield was recorded fortnightly for a period of 3 months. Along with this on each milk recording day the milk sample was subjected for the analysis of Fat % and SNF %. The data was recorded for 90 days and the comparison was carried out for milk yield,fat percentage in between groups. The data were compiled and analyzed using T-test (Snedecor and Cochran, 1994) with the help of SPSS package programme (SPSS 9.00 software for Windows, SPSS Inc., Chicago, IL).

Table 1 Effect of azolla supplementation on milk yield and fat% in lactating buffaloes

	T0	T1
Milk yield (L/day)	6.5±0.13[a]	7.4±0.08[b]
Fat%	5.81±0.20	6.01±0.25
Average increase in milk yield	-	0.9
% increase in milk yield	-	13.8
% increase in Milk fat	-	0.2
Total Milk Yield for 90 days (L)	585±0.53[a]	666±0.58[b]

Means bearing different superscripts in a row differ significantly (P<0.05)

For demonstration of the azolla unit a kuccha trench was made at farmers land. Before this a plain area was selected and then cleaned and leveled. A trench of area 3m X 1.5 m X 0.2 m dug, further covered with silpaulin sheet to prevent draining of water into the earth. The size of the sheet was 0.5m longer and wider than the pit and was secured by a layer of mud at the edges. Filtered fertile soil 10-15 kg uniformly spread over the silpaulin sheet. Cow dung slurry 2kg along with super phosphate 20 gms mixed in 10 litre of water and poured into the pit. Pour water into the pit until a 10 cm space left from top. Finally add about 1 kg of fresh azolla culture on the surface of water, so that in 10-15 days azolla will multiply rapidly to fill the whole pond. As per requirement azolla is fed 1.5-2.0 kg/animal/day and the investment in milk production can be minimized

Economics of Azolla production (Kuccha azolla pit)

Cost of silpaulin sheet	Rs. 340.00
Nylon Shady net (5 x 2 mt). @ Rs. 30/- mt	Rs. 300.00
Azolla 2 kg @ Rs. 55/-kg	Rs. 110.00
Super phosphate 240 gms@ 20g/month	Rs. 6.00
Total cost	Rs. 756.00

From the above data it is clear that the cost of construction a kuccha azolla pit is very easy and cheap. Here the cost of labour, and dung is excluded, as the farmer itself dug the pit without hiring the labour, using dung excreted by his own cow/ buffalo.Giving due consideration to the one-time cost of permanent structure and recurring expenses, the cost of *Azolla* production would be less than 65 paisa per Kg.

The average milk yield (kg/d) over 6 fortnights was significantly higher (P<0.05) in T1(7.4±0.08) than T0 (6.5±0.13). Similar trend was also found for fat % however the result was non significant i.e, 5.81±0.20 and 6.01±0.25 for T0 and T1 respectively. The result was in concordance with Chaterjee et al. (2013), performed trial in crossbred cattle and found significant increase in milk yield in control and azolla fed group cattle (7.14±0.08 vs 6.42±0.13L/day). Here the fat corrected milk followed increasing trend with 7.04±0.15 (Control) and 7.92±0.09 (Azolla fed) groups. Further the milk yield showed increasing trend and it increased to 10.5 L/ day from 8.8 L/day after 90 days of azolla feeding per day with conventional feed Mustard oilseed cake in lactating buffaloes (Singh et al. 2017; Meena et al. 2017). Hence the total milk yield for 90 days also have significant difference between control and treatment group i.e, 585±0.53 L and 666±0.58 L respectively.

Average increase in milk yield recorded to be 0.9 L/day. Percent increase in milk yield found to be high (13.8%), however percent increase in fat recorded to be very low (0.2), indicating the azolla rich in protein and mineral content is helpful in enhancing milk yield but have little effect on fat%. Bhatt et al (2020) concluded that *Azolla pinnata* feeding improves the feeding and resting behavior without affecting the overall performance ofcalves. Similarly, an average milk yield increase of 1.70 L/day was reported by Singh et al. (2017) in lactating buffaloes and tremendous increase in milk yield (19.32 %) was found. It was also supported by Mathur et al. (2013), with 20.96 % and 16.90 % increase in milk yield in cattle and buffalo respectively and by Rawat et al. (2015) and Gowda et al. (2015) in cross bred cattle. Fat % when compared was also reported to be slightly increased i.e 4.3 to 4.7 in cattle and 6.2 to 6.7 in buffaloes. Due to increase in milk yield per day the overall milk production for observation period (90 days) was also found to be significantly ($P<0.05$) higher in azolla fed group as compared to control group (666±0.58versus 585±0.53 L).

Conclusion

From above study it can be concluded that azolla can serve as a potential alternative nutrient supplement for lactating buffaloes for the improvement of productivity in terms of milk as this is a good source of protein especially where/when green fodder availability is scanty. It enhances milk yield along with fat % in lactating buffaloes improving economic status of farmers. However, further studies are needed for determining the replacement amount of Azolla for concentrate to make it cost effective for farmers.

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