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Impact of Feeding Shatavari *(Asparagus racemosus)* Root Powder on Milk Quality and Feeding Cost in Crossbred Cows

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ABSTRACT: Background: Although India has a large cattle population, milk production per animal is still very low. This lower productivity can be attributed to a variety of factors, including biological and epigenetic factors such as a lack of high-quality feed resources, poor husbandry management practices, and dairy farm units. The purpose of this study was to see how the herbal feed supplement shatavari (*Asparagus racemosus*) affected the qualitative milk parameters and feeding cost in crossbred cows. The present trial was carried out at the Research Cum Development Project, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist- Ahmednagar, Maharashtra, India.

Method: Twenty lactating crossbred cows were randomly divided into four homogenous groups, five animals each. Experimental groups T2, T3, and T4 were fed a comparable diet plus 40 gm, 80 gm, and 120 gm/cow/day of shatavari root powder (SRP), respectively. The investigation lasted 60 days and a 7 days digestibility trial was conducted at the end. The amount of milk produced on a daily basis was also noted. Every fortnightly, the composition of each animal's milk was determined. Benefit cost ratio was also calculated at the end of the trial.

Results: SRP supplemented cows produce significantly higher (P<0.05) milk fat %, fat yield (kg), solid not fat %, solid not fat yield (kg), protein %, protein yield (kg), lactose %, lactose yield (kg), total solid %, milk total solid yield over control (T1) group.

Keywords: *Asparagus racemosus*, economics, feeding cost, milk composition, shatavari.

INTRODUCTION

Due to scarcity of green feed, dairy cows must rely on low-quality agricultural leftovers. Crop leftovers are an excellent source of energy. However, they are nutritionally deficient in protein, vitamins, and minerals, as well as being difficult to digest. As a result, the scientific feeding of dairy cows can only be accomplished by supplying sufficient amounts of nutritious feed and fodder, as well as enhancing the efficiency of nutrient consumption from low-grade roughages for economically feasible output. Traditionally, several native plants have been utilised to increase feed palatability, usage and animal production. Some significant herbs cultivated in India are widely used in the manufacture of herbal medicines to treat a variety of ailments. Using various herbs as a component of animal feed can also enhance animal productivity in terms of growth and milk output.

Several herbs have been reported to help humans and animals enhance their overall health, milk production, and reproduction. A special mention should be made of shatavari (*Asparagus racemosus*) among them. Pandey *et al.,* (2005) found that shatavari possesses galactogogue and mammogenic properties via increasing blood prolactin and cellular proliferation in the mammary gland to increase lactation. According to Patel *et al.* (2016), Galactogogues Shatavari (*Asparagus racemosus),* Jivanti (*Leptadenia reticulata*), and Methi (*Trigonella Foenum graecum*) promote alveolar tissue activity and secretory activity, resulting in milk production regulation and restoration.

Because of the greater availability of nutrients, *A. racemosus* might be a highly significant feed additive in the animal diet. The amount of crude protein, crude fibre, ether extract, nitrogen free extract, and ash was examined, and it was discovered that this plant is high in nitrogen free extract as well as minerals such as Ca, Mg, Fe, Cu, and Zinc. Shatavari is well documented for its immunomodulatory properties and its medicinal usage has been reported in Indian and British Pharmacopoeias and in traditional systems of medicine such as Ayurveda, Unani and Siddha. Shatavari potentiate the immune system; it enhances production of the macrophages and induces excess production of TNF-alpha and interleukin-1 (IL-1) increasing phagocytic activity of macrophages (Rege *et al.,* 1989; Thatte and Dahanukar 1989; Dhuley 1997; Ray 2004).

Ayurveda prescribes dried SRP for dyspepsia, indigestion, and dysentery. It has also been used to treat ulcerative diseases of the stomach in Ayurveda. Oral administration of powdered dried root of *A. racemosus* has been observed to improve digestibility and dry matter intake in both healthy and problematic animals, with a decrease in protozoan numbers, which function as predators for beneficial bacteria (Pradhan and Biswas 1994; Barhane and Singh 2002). Shatavari root has sarsasapogenin and oligospirostanoside glycosides that account for its immunomodulatory properties (Handa *et al.,* 2003). Presence of other phyto-chemicals are also responsible for its anti-inflammatory and antioxidant potentials (Wiboonpun *et al.,* 2004; Kamat and Venkatachalam 2004; Lalana *et al.,* 2011). The study was undertaken to explore the possibility of shatavari supplementation on qualitative milk parameters in crossbred cows.

MATERIALS AND METHOD

Twenty healthy lactating crossbred cows, weighing between 350 to 450 kg and in their 3rd to 5th lactation, were taken from the university herd. The animals were randomly divided into four uniform groups of five animals in each. The experiment was conducted at the Research Cum Development Project, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist Ahmednagar, Maharashtra province of India. The animals were kept in a loose housing system having standard feeding and watering facilities. The animals were fed twice daily at around 9 a.m. and 5 p.m. All the animals were fed standard seasonally available roughages and readymade concentrates to meet their nutritional requirements according to ICAR (2013) feeding standard and chelated minerals were also added to take care of any deficiency (Bhosale *et al.,* 2021). The cows in group 1 (T1) were not given shatavari herbal preparation and acted as control. The cows in group T2, T3 and T4 were given, in addition to normal routine feeds and fodders, shatavari root powder @ 40, 80, 120 gm/cow/day, respectively for sixty days. The chemical composition feed, readymade concentrate mixture and shatavari root powder is presented in Table 1. The chemical composition of the same was analyzed as per AOAC (1995) standard procedures. The chemical composition of concentrate mixture was within normal range (Ranjhan, 1998).

Table 1: Chemical composition of the feeds offered to lactating crossbred cows (% DM basis).

Attributes	Maize	Soybean straw	Concentrate	Shatavari root powder
DM	22.86	93.11	91.01	94.6
CP	9.68	4.95	25.05	6.19
EE	1.94	2.01	7.58	1.5
NFE	48.11	58.05	36.89	61.51
TA	9.05	10.12	4.18	6.8
OM	90.95	89.88	95.82	93.2
NDF	65.71	24.12	26.35	38.42
ADF	44.6	16.21	14.65	14.2

Daily milk yield (kg) was recorded and average fortnightly milk yield was calculated. Automatic milk analyzer FOSS Milkoscan ™ FT1 was used to measure fat, solid not fat, protein, lactose and total solid percentage in milk. The average milk fat yield, solid not fat yield, protein yield lactose yield and total solids yield in kg was recorded fortnightly by multiplying the fortnightly milk yield with each parameter per cent and divided by 100.

E.g. Formula: Milk fat yield (kg) = Milk yield × Milk fat percent/100

Statistical Analysis. Data related to milk quality were statistically analyzed using the SPSS statistical software program (SPSS version 22.0), one-way analysis of variance (ANOVA). All statements of significant differences were based on 0.05 probability level.

RESULTS AND DISCUSSION

Milk fat (%) & fat yield (kg). The average milk fat percent during the experimental period was 3.95±0.09, 4.20±0.08, 4.14±0.06 and 4.16±0.05; the average milk fat yield (kg) was 0.32±0.06, 0.46±0.03, 0.48±0.03 and 0.49±0.05 for T1, T2, T3 and T4 respectively it is also presented in Table 2. The milk fat per cent and fat yield (kg) differed significantly ($P<0.05$) compared to control while treatment T2, T3 and T4 was found statistically

non-significant (P>0.05) to each other. The findings are consistent with those of Soni *et al.,* (2016) and Kumawat *et al.,* (2017), who found that the shatavari supplemented group had a substantially greater fat per cent than the control group (P<0.05). Similarly, Saini *et al.,* (2018) found that the Shatavari supplemented group had substantially greater fat per cent than the control group.

As per (Dibya, 2010); (Saini, 2017), the growth in lipogenic actions may be causing the increase in milk fat content. Meals and the state of the methanogenic population in the rumen have a significant impact on fat percentage. Similarly, (Kumar *et al.,* 2014) investigated how *Asparagus racemosus* root powder fed with a balanced feed affected milk fat % and was utilised to produce herbal preparations and bio-enhancers.

Solid not fat (SNF %) & solid not fat yield (kg). The statistical analysis of data revealed non- significant (P>0.05) effect on SNF % in all treatment groups but in case of SNF yield (kg) it was found statistically significant (P<0.05) among the treatments. The average SNF % for T1 8.20±0.08, T2 8.35±0.10, T3 8.30±0.08 and T4 8.26±0.08; the average SNF yield (kg) for T1 0.64±0.11, T2 0.90±0.04, T3 0.97±0.07 and T4 0.96±0.10 and it is presented in Table 2. The results are in accordance with Imtiwati (2015) who reported higher SNF % in control over the SRP supplemented group. SNF content varied within the fortnights (P<0.05) as SNF content in milk remains inversely proportional to milk yield. In contrast with the present study, Saini *et al.,* (2018) reported a highly significant (P<0.05) effect on SNF % and SNF yield (kg) in shatavari treated groups.

Milk protein (%) & protein yield (kg). The milk protein increased significantly (P<0.05) in all treatment groups (Table 2), however there is no significant difference among all SRP treated groups. Increase in milk protein per cent in the present study could be attributed to shatavari root powder which increases rumen protection of protein and enhances the efficiency of microbial protein production and its assimilation from rumen, thus making more feed protein available post ruminally for production purposes which could facilitate sustained higher milk protein in milk (Wu *et al*., 1994). The findings are consistent with Birhanu (2019) who stated, feeding of *A. racemosus* in lactating buffaloes significantly improves protein percentage. According to (Kumar, 2014); (Dibya, 2010) were found in an experiment *in vitro* depicted the effect on rumen microbial metabolism, which improves protein synthesis and efficiency of milk protein. The impact of augmenting *A. racemosus* root powder indicates a favourable reaction that has been proven positive connections among herbal root and milk protein content, as stated by Saini, (2017); Marziali and Ng-Kwai-Hang, (1986).

Milk lactose (%) & lactose yield (kg). The average lactose per cent and yield in treatment groups differed significantly (P<0.05) and it is presented in Table 2. Highest milk lactose percentage was found in T4 followed by T2, T3 and lowest in T1 (control) whereas maximum lactose yield was observed in T4 followed by T3, T2 and T1. These results are in agreement with Saini *et al.,* (2018) who reported that significantly (P<0.01) higher lactose % in the shatavari supplemented group than the control group. Dangi *et al.,* (2011) found a significant increase in milk lactose content in shatavari supplemented buffaloes, which could be due to species differences or because buffalo have better digestibility for crude fibres than cattle and have higher lactose per cent. Sharma (2010) also reported significant (P<0.05) effect of supplementation of polyherbal on milk lactose yield in karan fries crossbred cows. Soni (2016) also observed a highly significant (P<0.01) effect of shatavari supplementation on milk lactose yield in kankrej cows.

Table 2: Effect of shatavari root powder supplementation on milk qualitative parameters.

Attributes	T1	T2	T3	T4	SEM	P Value
Fat %	3.95±0.09^{b}	4.20±0.08^{a}	4.14±0.06^{a}	4.16±0.05^{a}	0.071	0.388
Fat yield kg	0.32±0.06^{b}	0.46±0.03^{a}	0.48±0.03^{a}	0.49±0.05^{a}	0.042	0.053
SNF %	8.20±0.08	8.35±0.10	8.30±0.08	8.26±0.08	0.088	0.351
SNF yield kg	0.64±0.11^{b}	0.90±0.04^{a}	0.97±0.07^{a}	0.96±0.10^{a}	0.085	0.057
Protein %	2.92±0.04^{b}	3.12±0.04^{a}	3.06±0.05^{a}	3.06±0.04^{a}	0.044	0.287
Protein kg	0.22±0.04^{b}	0.33±0.02^{a}	0.35±0.03^{a}	0.35±0.04^{a}	0.032	0.061
Lactose %	4.92±0.04^{b}	5.19±0.02^{a}	5.14±0.04^{a}	5.19±0.04^{a}	0.038	0.049
Lactose kg	0.38±0.06^{b}	0.56±0.02^{a}	0.60±0.04^{a}	0.60±0.06^{a}	0.05	0.034
TS %	12.70±0.11^{b}	13.28±0.12^{a}	13.14±0.14^{a}	13.18±0.16^{a}	0.135	0.111
TS kg	0.99±0.17^{b}	1.43±0.07^{a}	1.53±0.11^{a}	1.53±0.17^{a}	0.137	0.056

^{ab}Within a column means without common superscript differs (P<0.05). T1, Control; T2, 40 gm; T3,80 gm; T4, 120 gm/cow/day shatavari root powder; T, Treatment; SEM, Standard error of mean; P, Probability.

Milk total solid (%) & total solis yield (kg). The impact of shatavari root powder on milk total solid per cent and yield differed significantly (P<0.05) among the groups. The peak total solid per cent was found in T2 followed by T4, T3 and T1 while highest total solid yield was observed in T4, T3, T2 and minimum in T1 (Table 2). Soni, (2016) found a highly significant (P<0.01) effect of shatavari supplementation in kankrej

cows on total solid per cent and yield in milk, which is consistent with the findings of this study. Shatavari has a substantial influence on percent milk total solids in indigenous cows, according to Divya *et al.,* (2015).

Feeding cost. The perusal of Table 3 revealed that total feeding cost (Rs./day/cow) for milk production was lowest in T1 (Rs. 145.50/day/cow) and highest in T4 (Rs. 191.58/day/cow). Total expenditure in T1, T2, T3 and T4 was Rs. 145.50, 160.67, 172.2 and 191.58 respectively. The net income (Rs./day/cow) was highest in both T3 is 23684.4 and 23582.4 in T4 followed by 21930 in T2 and 15748.8 in T1. The Benefit : Cost ratio of all treatment groups was 1:1.8 for T1, 1:2.27 for T2, 1:2.29 for T3 and 1:2.05 for T4. The B:C ratio between T2 (1:2.27) and T3 (1:2.29) was almost similar.

The results are in accordance with Saini *et al.,* (2018) who reported feeding shatavari root powder 40 gm/cow/day was most cost effective and beneficial over the control group.

Table 3: Economics of feeding shatavari root powder supplement to lactating crossbred cows.

Attributes	T1	T2	T3	T4
Feeding cost (Rs)/ animal (60 d)	8729.96	9640.14	10332.8	11494.22
Feeding cost/day/animal (Rs)	145.5	160.67	172.2	191.58
Milk yield kg/ animal (60 d)	463.2	645	696.6	693.6
Milk income/ animal (@ Rs. 34/kg)	15748.8	21930	23684.4	23582.4
B:C ratio	01:01.8	01:02.3	01:02.3	01:02.1

CONCLUSION

Generally the result indicates that the effect of shatavari root powder as fed with ration was statistically significant ($P<0.05$) affecting milk fat, protein, lactose and total solid per cent and yield (kg) while non-significant ($P>0.05$) effect on SNF %. It can be concluded from this study, feeding 40 to 80 gm/cow/day shatavari root powder to lactating crossbred cows is more beneficial, as it increases the nutritional value of the milk while also increasing the income of dairy producers. Feeding 40 to 80 gm/cow/day shatavari root powder as feed additives could also take care of any nutritional deficiency in the diet of cattle.

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Conflict of Interest. None.

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