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Effect of herbal feed supplement *Shatavari (Asparagus racemosus*) on milk production and composition in crossbred cows

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Crossbred cows are the most favourable and productive dairy animals in organized dairy farms. Susceptibility of crossbred cattle to environmental stress, diseases and infertility is of much concern vis-à-vis economics. To overcome these constraints attempts have so far been focused on the use of veterinary medicines and hormones, which have residual effects and are not safe to animals and human beings (Anderson and Valdes 2007). Whereas herbal substitutes are considered safe and at the same time improve performance of the cows (Kumar *et al.* 2010).

Shatavari, a woody climber growing 1–2 m in height, has leaves like pine needles, small uniform and white flowers, and small spikes. This plant belong to *Liliaceae* family, is common at low altitudes in shade and in tropical climates throughout India, Asia, Australia and Africa. *Shatavari (Asparagus racemosus)* is the most commonly used traditional medicine in human beings and its supplementation is recommended during last trimester of pregnancy to first trimester of post-parturition to the mother to boost milk quality and immunity of both mother and fetus. Keeping in view these benefits *Shatavari* herb was selected to study its role as supportive management intervention in crossbred cows for augmenting milk production and composition.

The present investigation was conducted on 10 Karan Fries (Holstein Friesian × Tharparkar) crossbred cows maintained at National Dairy Research Institute, Karnal (Haryana) to assess the effect of *Shatavari* supplementation, during different stages from prepartum to postpartum on milk production and its composition. Based on most probable milk production ability, parity, body weight and supplementation during different stages, the animals were classified in to 2 groups with 5 animals in each group, viz. G1- control (MPPA 3841.0±83.83, parity 2.6±1.12 and initial body weight 434.02±33.35 kg) and G2 - prepartum (i.e. 50 to 60 days dry period) to postpartum period (up to 90 days postpartum) (MPPA 3864.2±81.46, parity 3.2±1.01, initial body weight 435.0±22.02 kg). During prepartum, the cows in group G2 were supplemented with *Shatavari* root powder @100 mg per kg live body weight and during postpartum period @200 mg per kg live body weight. The dose of *Shatavari* during postpartum period was specified as per Berhane (2000), who supplemented *Shatavari* to the freshly parturited crossbred cows @100 g/animal at alternate days irrespective of animal's body weights. Considering homogeneity in the groups and refinement in the doses at per kg body weight, *Shatavari* was supplemented considering body weight of animals. Since the crossbred periparturient cow is highly susceptible to various diseases which impair its productive and reproductive performance postpartum, supplementation of *Shatavari* is recommended during last trimester of pregnancy to first trimester after parturition. So, we explored the possibility of augmenting the performance of crossbred cows through supplementation of *Shatavari* at the rate equivalent to half the dose supplemented postpartum. *Shatavari* was procured commercially. All animals were fed as per NRC (1989) during dry and lactation period. During prepartum period cows were fed chaffed (1–2 cm) green *Sorghum (Sorghum bicolor*) and concentrate based total mixed ration with minimum 3.5 kg concentrate/day/cow. Depending upon the requirement of cows during postpartum lactation period all animals were fed with berseem *(Trifolium alexandrinum*), oat *(Avena sativa*) and wheat straw (1–2 cm particle size) as a roughage and concentrate. During lactation period ratio of concentrate and roughage in the total mixed ration was 55: 45. Composition (%) of the concentrate mixture was: maize grain 33, groundnut cake 21, mustard cake 12, wheat bran 20, deoiled rice bran 11, mineral mixture 2 and common salt 1. Leftover, if any, was weighed next morning. DM content of

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forage and left over was determined to calculate the daily DMI. Fresh and clean water was provided free choice to each cow. Milking was done by machine milking thrice daily (morning, noon and evening). The time of milking was at 4:30AM, 12:30PM and 7:30PM at the Institute. Daily milk yield was recorded. Milk sample were collected and analysed for milk fat, protein, lactose, SNF, total solids and incidence of mastitis fortnightly, while milk fat total cholesterol were analysed monthly. The milk constituents such as fat, protein, lactose and SNF were analyzed by automatic milk analyzer. The total solid values of milk sample were estimated by addition of SNF and fat value. The total cholesterol in milk fat (ghee) was estimated as per Reddy (2007). The total phenolics and total tannin content in *Shatavari* was estimated according to Makkar (2003). The total phenolics and total tannin in *Shatavari* was observed 4.57 and 3.68% respectively. The least squares technique was applied to estimate the mean daily milk yield and differences of mean between group were compared by Duncan's multiple range test (Harvey 1975). Student's t test was employed to estimate the effect of treatment on feed intake, milk composition, milk fat total cholesterol and economics of milk production (Snedecor and Cochran 1989).

Feed intake: Shatavari supplementation during prepartum to postpartum did not affect the dry matter intake. Average dry matter intake during different fortnight of postpartum supplementation in G1 and G2 was 13.00±0.26 and 13.19±0.32 kg/d, respectively.

Milk production: Average daily milk yield per animal per day during 90 days of supplementation period in control and supplemented group were 19.53±0.22 and 23.40±0.22 kg/d respectively with significant (P<0.01) differences between the groups. Overall average daily milk yield (kg/d) was higher in supplemented group G2 by 19.82% over that of control group. Mean values of daily fat corrected milk yield (4%) during supplementation period in G2 was 25.14±0.22, while in control the value was 20.07±0.22 kg/day which was higher

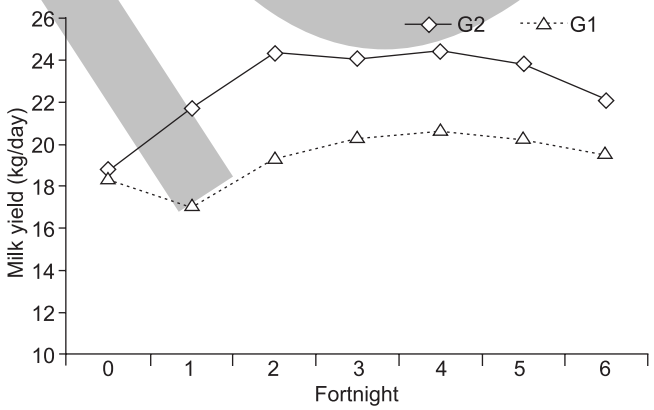

Fig. 1. Fortnightly average daily milk yield (kg) in Karan Fries cows supplemented with and without *Shatavari* herbal feed supplement

Table 1. Milk yield, milk constituents and economics of milk production in Karan Fries cows supplemented with and without *Shatavari* herbal feed supplement

Particular	Group 1 (control)	Group 2
Average milk yield (kg/d)	19.53^{A}±0.22	23.40^{B}±0. 22
Average FCM (kg/d)	20.07^{A}±0.22	25.13^{B}±0.22
Average fat (%)	4.19^{a}±0.18	4.53^{b}±0.26
Average protein (%)	3.38^{a}±0.09	3.47^{b}±0.08
Average lactose (%)	4.98^{a}±0.11	4.87^{b}±0.12
Average SNF (%)	8.68^{a}±0.16	9.19^{b}±0.13
Average total solids (%)	12.87^{a}±0.24	13.72^{b}±0.27
Economics of milk production on 4% FCM basis (₹)		
Cost/ L	7.09^{a}±0.26	5.91^{b}±0.23 (–1.18)
Net income/animal/day	145.00^{a}±10.16	205.69^{b}±11.60 (+60.69)
Income/L	6.91^{a}±0.26	8.09^{b}±0.23 (+1.18)

Means with different superscripts A, B in a row differ significantly (P<0.01); means with different superscripts a, b in a row differ significantly (P<0.05).

by 25.21% (P<0.01) in G2 than that of control G1 group (Table 1).

Graphical representation of mean daily milk yield (kg/d) revealed that the milk yield trend (lactation curve) in supplemented groups was normal whereas it was abnormal in control group which could be due to mastitis incidence in early lactation in control group (Fig. 1). The significant improvement in milk production on supplementation of *Shatavari* is in line with the findings of many researchers. Mishra *et al*. (2008) and Tanwar *et al*. (2008) reported that supplementation of *Shatavari* at the rate of 50 g/day/animal increased milk production significantly (P<0.05) in crossbred cows.

Higher milk production in *Shatavari* supplemented groups could be attributed to certain active components in *Shatavari* which stimulate the hypothalamus or pituitary gland leading to release of prolactin hormone (Sabnis *et al*. 1966, Ghosh *et al*. 1987), estrogenic effect of *Shatavari* on mammary gland stimulating the alveolar secretary epithelial cell division, and proliferation in the lumen of the duct of mammary gland (Sabnis *et al*. 1966, Pandey *et al*. 2005) which could have resulted in higher milk synthesis and secretion. *Shatavari* supplementation increased DM intake (Berhane and Singh 2000) and improved digestibility of feed nutrients (Gupta *et al*. 2004), furthermore, prevention from mastitis incidence (Sharma 2009) could also be attributed to higher milk production in *Shatavari* supplementation in crossbred dairy cow.

Milk constituents: The % milk constituents, viz. fat, protein, lactose, SNF and total solids are presented in Table 1.

The overall average % milk fat during supplementation period in G1 and G 2 were 4.19±0.18 and 4.53±0.26

respectively. The fat content was significantly (P<0.05) higher in group 2 than the control group. Supplementation of *Shatavari* in G2 increased milk fat by 8.11% over control group. Results of present study on *Shatavari* supplementation and its effect on milk fat content were unparalleled to findings of some workers. Berhane and Singh (2002), Mishra *et al*. (2008) and Tanwar *et al*. (2008) reported that *Shatavari* supplementation only during postpartum period did not alter the milk fat content in crossbred dairy cows.

The overall average of % milk protein during 90 days of supplementation period in G2 was 3.47±0.08%; while in G1 were 3.38±0.09%. The% milk protein content was significantly (P<0.05) higher in G2 than that of G1. There is disagreement of views on effect of *Shatavari* supplementation in freshly calved cows on milk protein content, as some workers reported no significant increase of milk protein content (Berhane and Singh 2002, Mishra *et al*. 2008 and Tanwar *et al*. 2008). Presently, very scanty literatures are available to explain the positive effect of *Shatavari* supplementation during prepartum continued to postpartum on the milk protein level in dairy animals. *Shatavari* which contains saponin and tannin might have modified the rumen ecosystem as was reported earlier. Wallace *et al*. (1994), Sen *et al*. (1998), Abreu *et al*. (2004), Hess *et al*. (2004) and Alexander (2005) reported that saponin supplementation reduced rumen ammonia-N concentration and formed complexes of protein that protect protein from degradation in the rumen and finally increased the duodenal flow of microbial-nitrogen. Similarly beneficial effects of low level tannins are increases rumen un-degradability 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 sustaining higher milk protein in milk (Wu *et al*. 1994). The mechanism through which *Shatavari* might improve milk protein content deserves further studies.

The average milk lactose content in the group G1 and G2 during 90 day of lactation period were 4.98±0.11 and 4.87±0.12%, respectively. There was no significant difference between G1 and G2.

During supplementation period the average milk SNF content in the G1 and G2 were 8.68±0.16 and 9.19±0.13%, respectively. The mean SNF content of milk for group G2 was significantly higher (P<0.05) than that of G1.

The average total solids content up to sixth fortnight in groups G1 and G2 were 12.87±0.24 and 13.72±0.27%, respectively. The total solids content was significantly higher (P<0.05) in groups G2 than that of control group G1.

Milk fat total cholesterol: Mean values of milk fat total cholesterol in un-supplemented group G1 and supplemented group G2 were 415.0±25.4 and 364.9±17.5 mg/100 g, respectively (Table 2) with significant (P<0.05) differences between the groups. The% reduction in total cholesterol level in G2 was to the tune of 12.07%. The result of present study indicates that the milk fat total cholesterol during colostrum stage was higher in all groups as compared to post colostrum period. The average value of total cholesterol in milk fat at day 5 of calving indicates that *Shatavari* supplementation during colostrum period reduced the total cholesterol level and it was also evident in subsequent days of lactation. Factors leading to low milk fat total cholesterol level in supplemented group are not well understood. However, the present study revealed that *Shatavari* supplementation reduced average plasma total cholesterol level significantly in both prepartum and postpartum supplemented group G2. The average values of plasma total cholesterol in group G1 and G2 were 309.3±22.0 and 220.0±15.2 mg/dL, respectively. The evidence does, however, suggest that the milk fat total cholesterol depression might be due to reduced plasma total cholesterol level which is a major source of milk fat cholesterol (Barbara *et al.* 1975). The present investigation also revealed that mastitis incidence was absent in supplemented group whereas in control group 2 animals (40%) suffered from mastitis. Bindal and Jain, (1973) observed that butterfat total cholesterol content was significantly higher in butterfat prepared from milk of mastitic crossbred cows than the normal crossbred cows.

Table 2. Means (±SE) of monthly milk fat total cholesterol content in ghee

Month	Group 1	Group 2
0 (5th day)	603.0±17.8	495.1±10.9
1	353.4±11.5	317.6±6.3
2	355.4±2.4	324.4±3.9
3	348.2±4.9	322.6±4.2
Average	415.0^{a}±25.4	364.9^{b}±17.5

Means with different superscripts a, b in a row differ significantly (P<0.05).

Economics of fat corrected milk yield (FCM): Based on FCM the estimates of average cost of milk production per litre during supplementation period in groups G1 and G2 were found to be ₹ 7.09±0.26, and 5.91±0.23, respectively (Table 1). In comparison to control group G1, the per litre cost of milk production was significantly (P<0.05) reduced in supplemented group G2, by 16.64,%. Further, the net returns per animal per day in control group G1 and supplemented group G2 were ₹ 145.00±10.16 and 205.69±11.60, respectively. Net return per day per animal was observed to be the highest in group G2 and was significantly (P<0.05) higher than that of control group G1. The net return per day per animal was improved in supplemented group G2 by 41.85% (₹ +60.69) over control group. Similarly per litre return was also found significantly higher (P<0.05) in group G2 by 17.07%.

SUMMARY

The study was undertaken to evaluate the effect of

Shatavari supplementation on milk production and its composition. Our results indicated that supplementation of *Shatavari* root powder prepartum (60 days) @100 mg per kg live body weight to continue postpartum period (90 days) @200 mg per kg live body weight improved milk production, its composition. Besides improving the milk fat content it reduced milk fat (ghee) total cholesterol and increased net return per litre milk significantly in crossbred cows. Therefore, it is concluded that *Shatavari* supplementation is economically viable and beneficial, and it could serve as potential management tool to improve milk production, composition and net returns from lactating crossbred cows.

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