Indian J Dairy Sci 76(6): 613-616
https://doi.org/10.33785/IJDS.2023.v76i06.014

SHORT COMMUNICATION

Effect of dietary supplementation of Shatavari on productive performance and fertility of crossbred cows

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Received: 24 January 2023 / Accepted: 15 July 2023 / Published online: 23 December 2023

Abstract: The aim of the present study was to demonstrate the effect of dietary supplementation of Shatavari (*Asparagus racemosus*) on milk yield, raw milk constituent indices and fertility of crossbred cows. Twenty healthy lactating crossbred cows with a close date of calving were randomly divided into two equal groups for control group (CG; n = 10) and supplemented group: Shatavari root powder 50 gm/cow/d (SG; n = 12) from 7 days post partum (dpp) until 90 dpp. Statistically analyzed data revealed that significantly (P<0.005) higher fortnightly milk yield from 45 to 90 dpp was found in the SG (10.735 to 12.396 kg/day) compared to the CG (9.802 to 10.541 kg/day). Differences in the fortnightly raw milk composition related to percent of milk fat, milk protein and milk lactose of both CG and SG cows were non-significant (P>0.005), but only fortnightly percent of milk solid not-fat from 45 to 90 dpp in SG cows (9.254 to 9.446%) than over to CG cows (8.877 to 8.999%) and percent of milk total solids from 60 to 90 dpp cows in SG (13.078 to 13.727%) than that cows in CG (12.617 to 12.648%) were significantly (P<0.005) higher. Occurrence of first post partum estrus interval was reduced significantly (P<0.005) in supplemented Shatavari group (SG: 52 dpp) compared to control group (CG: 77 dpp) cows. In this study, it was observed that the overall conception rate was higher (P<0.005) in SG: 60% (cows pregnant: 6/10) than CONT-group: 20% (cows pregnant: 2/10). The results of this study indicated that dietary supplementation of Shatavari (*Asparagus racemosus*) increased the milk yield, raw milk solid not-fat, milk total solids and improved fertility of crossbred cows.

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Keywords: Crossbred cows; Fertility; Milk yield; Raw milk constituent; Shatavari root powder

Productivity of dairy cows in India is extremely poor due to various factors including nutrient deficient, malnutrition, infertility, chronic diseases, stress, etc, which all impact negatively on the dairy industry's economics (Choudhary et al. 2020). Herbal medicine has a long history in Indian culture and these plants have been used for centuries since they are safe, inexpensive and widely available. They also have no side effects or residual effects in the body or on milk (Krishna et al. 2005; Sawant et al. 2016). Herbal feed boost nutrients utilization efficiency and stimulate the milk secreting tissues in the mammary glands, which helps to make dairy cows more prolific and fertile (Bakshi and Wadhwa, 2000). Supplementation of herbal feed additives as Shatavari (*Asparagus racemosus*) root increases mammary and adrenal gland weight and releases pituitary ACTH (Adreno Cortico Tropic Hormone) due to well developed lobulo-alveolar tissues in mammary gland by a direct action through pituitary or pituitary-adrenal axis, resulting in secretion of prolactin and ACTH (Behera et al. 2013). Peri-parturient secretion of prolactin is essential for maximal synthesis of milk in the post partum period. Prolactin plays a critical role in mammary cell differentiation, a key biochemical steps involved in lactogenesis. Oral administration of roots of *Asparagus racemosus* increased the milk yield in cows, buffaloes and goats (Kumar et al. 2008). In addition, *Asparagus racemosus* have been scientifically validated as reproductive system tonic and anti-stress (Kumar et al. 2008). *Asparagus racemosus* has rejuvenative properties and it stimulates the epithelial cell division resulting in early healing of the uterine wall and leads to early uterine involution and consequently an early initiation of the estrous cycle in supplemented groups (Pandey et al. 2005). According to Tsegaw and Singh (2019), supplementation of Shatavari in feed has advanced the age at puberty and age at first service. Keeping in view these benefits, supplementation of *Asparagus racemosus* herb was selected as supportive management intervention to improve the milk yield, raw milk constituent indices and fertility performance of crossbred dairy cows.

In February 2019, this study was conducted on lactating crossbred (H.F. × Sahiwal) cows maintained at Dairy Farm, Department of Dairy Science and Food Technology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during the summer season with total duration of the experiment as 90 days post partum (dpp). Twenty healthy lactating crossbreed Sahiwal cows with the beginning date of calving were randomly allotted into two homogeneous groups: control group (CG; n = 10; Milk yield = 9.41±0.35 kg/d; Body weight = 410.91±16.16 kg) and Supplemented group (SG; n = 10; Milk yield = 9.62±0.44 kg/d; Body weight = 410.02±17.56 kg). The experimental groups received a basal diet twice daily containing wheat straw (*Triticum aestivum*) *ad lib*, green lucerne (*Medicago sativa*) as a green fodder and concentrate mixture in a mixed-ration. Diets of lactating cows were formulated as per the nutritional requirements of NRC (2001). Only the SG-cows were orally supplemented with Shatavari root powder (50 gm/cow/d) during the entire experimental period, which lasted from 7 days after calving to 90 dpp. Cows were milked twice daily by hand milking at 05:00 AM and 04:00 PM. Yields of milk were measured using an automatically Electric digital scale weighing balance machine and individual cow's milk yields (kg/d) were recorded every day, however, individual raw milk samples (100 mL) were collected in clean and dry plastic bottles every 15 days interval (dpp on 0, 15, 30, 45, 60, 75 and 90) at 5.00 AM and again at 4.00 PM using a volumetric milk meter. Milk samples were analyzed in duplicates by EKOMILK ultra milk analyzer to work out the percent of milk fat, milk protein, milk lactose, milk solid not-fat (MSNF) and milk total solids (TS) in the dairy laboratory of the Department of Dairy Science and Food Technology.

Detection of estrus was performed twice daily, in the morning and evening, for at least 30 minutes. During the reproductive performance the following parameters were evaluated:

Estrus response = number of cows showing estrus ÷ number of total cows treated × 100

Conception rate = number of cows conceived ÷ number of total cows mated × 100

In addition, during the remainder of the day, any cows that showed estrus behaviour were reported to the inseminators by the farm workers. Artificial insemination (AI) was performed by well-trained inseminators and frozen semen was distributed by the Dairy Farm, Department of Dairy Science and Food Technology, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi.

Statistically, data related to milk yield, raw milk compositions and fertility were analyzed using the one-way analysis of variance (IBM SPSS software, version 21) for a completely randomized design. Significant differences ($P<0.005$) among treatment, within the experiment, were analyzed using Duncan's multiple range test.

The results (Table 1) showed that the fortnightly milk yield were similar from 0 to 30 dpp in cows of both groups CG (9.422 to 9.650 kg/d) and SG (9.634 to 10.153 kg/d). However, after 30 to 90 dpp in SG cows which provides additional Shatavari root powder were significantly ($P<0.005$) higher in fortnightly milk yield (10.735 to 12.396 kg/d) than CG cows (9.802 to 10.541 kg/d) respectively. the present finding is in agreement with Rawat et al. (2017) and Bhinda et al. (2020) where supplementation of Shatavari resulted in significant increase in milk yield of crossbred cows as compared to control group and Tanwar et al. (2008) observed that the daily and average milk production were significant increased in buffaloes and cows supplemented with 50 gm powder of Shatavari roots. Shatavari feeding could either stimulate the milk secreting tissues in the mammary glands, which helps to improve milk production in dairy cows (Bakshi and Wadhwa, 2000).

During experimental period from 0 to 90 dpp, there was no significant ($P>0.005$) difference in percent of milk fat, milk protein and milk lactose between the CG and SG cows. Whereas, after 30 dpp of the experimental lactation period, the MSNF percent was significantly ($P<0.005$) increased in SG cows (9.254 to 9.446%) than CG cows (8.877 to 8.999%) from 45 to 90 dpp. Statistically analyzed data revealed that fortnightly milk total solids percent was also significantly ($P<0.005$) higher from 60 to 90 dpp cows in SG (13.078 to 13.727%) when compared with cows in CG (12.617 to 12.648%), which corresponds with results of Kumar et al. (2014) who found that in Karan Fries crossbred cow's milk fat, protein and lactose content was not influenced, however milk solid not-fat and total solids were significantly higher in Shatavari supplemented group. However, milk fat and total solid contents were increased in *Asparagus racemosus* supplemented group as compared to un-supplemented group, whereas other composition values were unaffected in crossbred cows reported by Kumawat et al. (2017).

The effects of Shatavari (*Asparagus racemosus*) root powder supplementation on fertility rate in crossbred cows of both groups are shown in Table 2. In the current investigation, dietary supplementation of Shatavari root powder reduced the first post partum estrus interval from calving to first AI by about 24 days which was noted in SG cows. Variation in the interval from calving to first AI from 52 to 77 dpp was less ($P<0.005$) for cows of SC than that for cows of CG during the experimental period. The overall conception rate at first AI was 20% and 60% in cows of CG and SG. In this study, the overall conception rate at first AI was higher ($P<0.005$) for cows in SG i.e. 60% compared to the cows in CG i.e 20%. Our results also corroborate with that of Barhane and Singh, (2002) who reported that supplementation of Shatavari post partum alone led to 100% estrus and 75% conception in treatment group as compared to 50% in control crossbred cow within 90 days of calving. In comparison to the

Table 1: Effect of Shatavari (*Asparagus racemosus*) on fortnightly milk yield and raw milk constituent indices of crossbred cows

Parameters	Groups		SEM	P-value
	CG	SG		
MY (kg)				
0 d	9.422	9.634	0.187	0.586
15 d	9.532	9.788	0.399	0.758
30 d	9.650	10.153	0.270	0.366
45 d	9.802[a]	10.735[b]	0.184	<0.005
60 d	10.008[a]	11.540[b]	0.207	<0.005
75 d	10.284[a]	11.921[b]	0.226	<0.005
90 d	10.541[a]	12.396[b]	0.266	<0.005
MF %				
0 d	3.710	3.745	0.012	0.183
15 d	3.733	3.774	0.016	0.218
30 d	3.781	3.835	0.023	0.258
45 d	3.751	3.802	0.020	0.221
60 d	3.805	3.878	0.018	0.047
75 d	3.85	3.968	0.026	0.025
90 d	3.828	3.922	0.024	0.056
MP %				
0 d	3.359	3.404	0.013	0.105
15 d	3.425	3.471	0.017	0.202
30 d	3.485	3.445	0.025	0.455
45 d	3.478	3.509	0.008	0.081
60 d	3.408	3.444	0.011	0.136
75 d	3.439	3.537	0.013	0.024
90 d	3.465	3.506	0.008	0.009
ML %				
0 d	4.312	4.431	0.081	0.478
15 d	4.378	4.800	0.050	0.000
30 d	4.472	4.784	0.040	0.000
45 d	4.578	4.802	0.030	0.000
60 d	4.621	4.710	0.026	0.099
75 d	4.648	4.482	0.037	0.023
90 d	4.808	4.877	0.025	0.183
MSNF %				
0 d	8.649	8.687	0.008	0.015
15 d	8.778	8.976	0.031	0.000
30 d	8.838	8.912	0.014	0.008
45 d	8.877[a]	9.254[b]	0.044	<0.005
60 d	8.898[a]	9.048[b]	0.020	<0.005
75 d	8.920[a]	9.549[b]	0.073	<0.005
90 d	8.999[a]	9.446[b]	0.052	<0.005
MTS %				
0 d	12.496	12.579	0.012	0.000
15 d	12.728	12.827	0.014	0.000
30 d	12.804	12.781	0.010	0.294
45 d	12.667	12.887	0.028	0.000
60 d	12.617[a]	13.078[b]	0.057	<0.005
75 d	12.762[a]	13.358[b]	0.069	<0.005
90 d	12.648[a]	13.727[b]	0.125	<0.005

a,bMean values for each experiment within a row with different superscript letters differ significantly (P<0.005); MY = Milk yield; MF = Milk fat; MP = Milk protein; ML = Milk lactose; MSNF = Milk solid not-fat; MTS = Milk total solids; d = Day; CG = Control group; SG = Supplemented group; SEM = Standard error the mean

Table 2: Effect of Shatavari (*Asparagus racemosus*) on fertility rate of crossbred cows

Groups	No. of cows treated	Conception rate	
		Interval from calving to first AI D	At first AI % of cows pregnant
CG	10	77.50	(2/10) 20
SG(50 gm/cow/d)	10	52.83*	(6/10) 60*
Overall	20	65.16	(8/20) 40

*P<0.005, AI = Artificial insemination, D = Day, CG = Control group, SG = Supplemented group

control group, the cows who were supplemented with *Asparagus racemosus* root powder @200 mg/kg live body weight during post partum, resulted in a significant reduction in the first post partum estrus interval, days of service period, services per conception and rate of uterine involution reported by (Kumar et al. 2011). Tsegaw and Singh (2019) found that in the *Asparagus racemosus* supplemented group, puberty was reached earlier and the age of first service was lower than in the control group.

Conclusion

The results of this study indicated that dietary supplementation of Shatavari root powder increased the milk yield, raw milk solid not-fat, milk total solids along with improved fertility over cows with non-supplemented group.

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