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Effect of Supplementation of *Asparagus racemosus* on Milk Production in Jersey Crossbred Cows during Peripartum Period

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ABSTRACT: The impact of *Asparagus racemosus* supplementation on milk yield and composition in Jersey crossbred cows during the peripartum period was studied. Twelve crossbred cows in the last trimester of pregnancy were randomly assigned into two groups, as control and experiment. Experimental animals were given 100mg/kg body weight for 4 weeks before parturition and @200mg/kg body weight post-partum for 4 weeks after parturition of *Asparagus racemosus* root powder. The research was carried out over a period of three months. The amount of milk produced was recorded daily. The composition of each animal's milk was analyzed on a weekly basis. The mean milk yield and mean milk protein were increased significantly ($p<0.01$) in the experimental group. The mean milk fat and milk SNF were increased significantly ($p<0.05$) in the experimental group. The mean milk lactose increased in the experimental group non-significantly. Supplementation with *Asparagus racemosus* substantially improved milk yield and milk composition in the present study. It can be used to alleviate the metabolic stress in lactating Jersey crossbred cows during the peripartum period.

Keywords: Galactagogue, Herbal, Lactation, Shatavari, postpartum, Metabolic, Stress.

INTRODUCTION

Peripartum period is a key time for dairy cows' health (Ingvartsen and Andersen 2000). The performance of dairy cows during this time is subjected to severe metabolic stress, which disrupts their homeostasis and puts them at risk of sickness (Miller *et al*., 1993; Ronchi *et al*., 2000).

Therapeutic use of *Asparagus racemosus* has been recorded in the Indian and British Pharmacopoeias and in indigenous medical systems (Bopana and Saxena 2007). The roots are the part that finds use in various medicinal preparations. *Asparagus racemosus*has been mentioned in Siddha texts like Gunapadam (Mooligaivagupu) and Indian Siddha Materia Medica has evidently stated that *Asparagus racemosus* promotes maternal health and noted its meticulous use as a galactagogue (Kiruthika and Ramkumar 2019). *Asparagus racemosus* contains around 50 organic chemical components of various categories, including steroidal saponins, glycosides, alkaloids, polysaccharides, mucilage, racemosol and isoflavones, all of which have therapeutic qualities. (Thomson, 2002). In modern pharmacology, this plant has demonstrated significant medicinal potential, including adaptogenic activity, antibacterial activity, antioxidant activity, phytoestrogenic properties, galactogogue action, neuroprotective effect, and so on (Singh and Geetanjali 2016).

The usage of drugs in the livestock sector is causing growing public concern. Much of this has resulted from the evolution of drug resistance. The use of antibiotics as growth promoters, and the accompanying risk of antibiotic resistance in human infections, has received considerable scrutiny (Barton, 2000). As a result, a supportive management intervention with herbal supplements is required to improve overall well-being, alleviate stress, and improve productivity. By considering above mentioned points the study was conducted by supplementing the root powder of

Asparagus racemosus to investigate the quantity of milk production and quality of milk composition during the peripartum period.

MATERIAL AND METHODS

The experiment was conducted at the Livestock Farm Complex, Veterinary College and Research Institute (VCRI), Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Orathanadu, Thanjavur, India, which is located in the Cauvery Delta area of Tamil Nadu. The trial was conducted between November 2019 and January 2020. Twelve healthy Jersey crossbred cows in the last trimester of pregnancy were randomly chosen and divided equally into groups control and experimental based on, parity (C =3.33, E =3.00) and body weight (C =380.67 Kg, E =378.33 Kg). The animals were given formulated rations based on the farm's requirements (ICAR, 2010) and feeding schedule. Clean drinking water was provided *ad libitum*. Prophylactic steps against infectious diseases and parasites were implemented according to the farm's health calendar. The animals were housed in sheds. Animal sheds were well-ventilated with concrete floors and asbestos roofing. *Asparagus racemosus* roots were harvested and powder prepared at Herbal garden, Ethno veterinary Herbal Research Centre, VCRI, TANUVAS, Orathanadu, Thanjavur, India. The experimental group was supplemented with *Asparagus racemosus* root powder@100mg/kg body weight for 4 weeks before parturition and @200mg/kg body weight post-partum for 4 weeks after parturition (Kumar *et al*., 2010). Milk output was calculated two times a day and averaged over the course of a week. Once in a week, the milk composition was examined using a milk analyser (AMA, Mini -40, AKASHGANGA®). Statistical analysis of experimental data was performed using the independent student "t" test (Snedecor and Cochran's 1994).

RESULTS AND DISCUSSION

Milk Yield. The mean milk yield levels in both the control and experimental groups of animals during the postpartum period of the study have been presented in Table 1. The milk yield reported in the current investigation was within the normal range in all the groups (Table 1) and was in agreement with the earlier reports (Saini *et al*., 2018; Bhinda *et al*., 2020). In the control and experimental groups, milk yield was lowest in the first week after parturition and highest in the fourth week after parturition. Three weeks after parturition, the mean milk yield was significantly increased in the experimental group ($p<0.05$). Four weeks after parturition, the mean milk yield was significantly increased in the experimental group ($p<0.01$).

The improvement in milk production might be due to the better udder health and galactopoietic effect of *Asparagus racemosus* in milch animals. Active ingredients like steroidal saponins and sapogenin present in the *Asparagus racemosus* activate the hypothalamus or pituitary gland, causing the release of prolactin hormone and thereby increasing milk production. *Asparagus racemosus's* phytoestrogenic action on mammary glands promotes alveolar secretory epithelial cell division and proliferation (Sabnis *et al*. 1968; Pandey *et al*., 2005) which helps in the sustenance of increased milk production.

Milk Composition. The mean milk fat, milk protein, lactose and milk solids not fat (SNF) levels in both the control and experimental groups of animals during the postpartum period of study have been presented in Table 1 and Table 2. The milk fat, milk protein, lactose and milk solids not fat (SNF) levels reported in the current investigation were within the normal range in all the groups (Table 1) which were in agreement with the earlier reports (Saini *et al*., 2018; Bhinda *et al*., 2020).

Milk fat. In the control group, milk fat was highest in the first week after parturition and lowest in the second week after parturition. In the experimental group, milk fat increased gradually from the first week and was high in the second week after parturition and lowered from the fourth week after parturition. Two weeks after parturition, the mean milk fat was significantly increased in the experimental group ($p<0.05$). There was no significant difference found within the control group and within the experimental group.

Increased production and comparatively high milk fat in the treatment group supplemented with *A. racemosus* could be attributed due to higher dry matter intake and its better digestibility by fortification of the diet with *Asparagus racemosus* and no incidence of inflammation. The present study of high milk fat in the treatment group was refuted by the previous work explained by Santosh *et al*. (2011).

Milk Protein. The mean milk protein was significantly increased in the experimental group ($p<0.05$). Two weeks after parturition. Three weeks after parturition, the mean milk protein was significantly increased in the experimental group ($p<0.01$). Four weeks after parturition, the mean milk protein was significantly increased in the experimental group ($p<0.05$). In the control group, milk protein was highest in the first week after parturition and lowered in the third week after parturition. In the experimental group, milk protein was low during the second week and reached a peak in the fourth week after parturition. There was no significant difference found within the control group and within the experimental group.

In the present study, the increase in milk protein could be attributed to the *Asparagus racemosus* supplementation. *A. racemosus* might increase rumen protein production and improves the efficiency of rumen microbial protein production and assimilation, which provides more dietary protein availability after post-rumen digestion for contribution to milk production. This potentially facilitates the sustained higher milk protein in milk (Wu *et al*., 1994).

Milk Lactose. In the first three weeks after parturition, the mean milk lactose was decreased in the experimental group non-significantly. Four weeks after parturition, the mean milk lactose increased in the experimental group non-significantly. There was no significant difference found within the control group and within the experimental group. In the control group, milk lactose was highest in the first week after parturition and lowered in the fourth week after parturition. In the experimental group, milk lactose was higher in the first week after parturition and lowered in the third week after parturition.

The glucogenic property of *Asparagus racemosus* in cows might be due to the presence of saponin. High milk sugar (lactose) in the treatment group might be due to saponin in *Asparagus racemosus*. *A. racemosus* might have increased the rumen propionate production, which was generally considered to be the major substrate for gluconeogenesis (Wiltrout and Satter 1972), which resulting in improved blood glucose level (Kumar *et al*., 2010).

Milk Solids Not Fat (SNF). In the control group, milk SNF was higher in the first week after parturition and lowered on the third week after parturition. In the experimental group, milk SNF was higher in the first week after parturition and lowered in the second week after parturition. In the first three weeks after parturition, the mean milk SNF was increased in the experimental group non-significantly. Four weeks after parturition, the mean milk SNF was significantly increased in the experimental group ($p<0.05$). There was no significant difference found within the control group and within the experimental group.

The increase in milk SNF percent in the present study could be attributed to *Asparagus racemosus* root powder which increases rumen protection of protein, maintained gluconeogenesis, and enhances the efficiency of microbial protein production and its assimilation from the intestine, thus making more feed protein available post ruminally for production purposes which could facilitate sustained higher milk SNF (Wu *et al*., 1994).

Table 1: Effect of *Asparagus racemosus* on milk parameters (milk yield and milk fat) of postpartum control and experimental Jersey crossbred cows (Mean±SE).

Week	Milk Yield L		Milk Fat %	
	Control	Experiment	Control	Experiment
1	5.71±0.29	5.40±0.36	4.10±0.27	4.15±0.24
2	6.70±0.28	7.20±0.31	3.72±0.19	4.48*±0.28
3	7.14±0.26	8.16*±0.42	3.88±0.28	4.15±0.27
4	7.53±0.28	9.14**±0.47	3.97±0.27	4.10±0.12

Mean bearing '*' Mark as superscript within the row, within the parameter differ significantly ($p<0.05$).
Mean bearing '**' mark as superscript within the row, within the parameter differ significantly ($p<0.01$).

Table 2: Effect of *Asparagus racemosus* on milk parameters (milk protein, lactose and SNF) of postpartum in Jersey crossbred cows (Mean# ±SE).

Week	Milk Protein %		Milk Lactose %		SNF %	
	Control	Experiment	Control	Experiment	Control	Experiment
1	3.73±0.08	3.93±0.08	4.25±0.08	4.07±0.12	8.68±0.17	8.70±0.16
2	3.68±0.10	3.92*±0.05	4.10±0.13	3.95±0.06	8.46±0.25	8.55±0.08
3	3.52±0.07	3.95**±0.08	4.07±0.07	3.92±0.09	8.24±0.15	8.61±0.08
4	3.65±0.08	4.00*±0.08	3.97±0.08	3.98±0.06	8.28±0.12	8.69*±0.10

Mean of 6 observations.
Mean bearing '*'Mark as superscript within the row, within the parameter differ significantly ($p<0.05$).
Mean bearing '**' mark as superscript within the row, within the parameter differ significantly ($p<0.01$).

CONCLUSIONS

Asparagus racemosus can be supplemented to alleviate metabolic stress and maintains productivity in lactating Jersey crossbred animals during the peripartum period.

FUTURE SCOPE

The *Asparagus racemosus* can be subjected to further molecular study to prove its benefits. *In-vitro* study can be done on its phytocomponents. Other applications of *Asparagus racemosus* on animal health in different age groups and different species can be studied.

Conflict of Interest. None.

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