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Effect of herbal feed supplement (*Shatavari*) on incidence of mastitis in crossbred cows

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Mastitis, inflammation of mammary gland, affects milk production and also causes huge economic losses to the farmers (Ahmadzadeh *et al*. 2010). Herbs and their derivatives are believed to be safer than the allopathic veterinary remedies (Hashemi and Davoodi 2011). *Shatavari* is well documented for its immunomodulatory properties and its medicinal usage has been reported in Indian and British Pharmacopeias and in traditional system 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). *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 mastitis incidence in crossbred cows.

The present investigation was conducted under similar environmental condition on 10 healthy pregnant Karan Fries (Holstein Friesian × Tharparkar) crossbred cows at National Dairy Research Institute, Karnal, Haryana during Sept. to March. The herbal feed supplement *Shatavari* was procured commercially.

Genetic potential of milk production, udder characteristics and parities are major factors that affects udder health. Pregnant and dry KF crossbred cows (10) around 60 days prepartum were selected and divided randomly in 2 groups according to most probable production ability (MPPA), parity, body weight, udder characteristics and supplementation. The animals groups were, viz. non-supplement control (NSC): (MPPA 3841.0±83.83, parity 2.6±1.12 and initial body weight 434.02±33.35 kg) and peripartum supplement (PPS): prepartum (i.e. 50 to 60 days dry period) and continued till postpartum 90 days period (MPPA 3864.2±81.46, parity 3.2±1.01, initial body weight 435.0±22.02 kg). In PPS group, 3 cows were having round shape udder with cylindrical teats and remaining 2 cows were having pendulous shape udder with conical shape teats. Four cows were having round shape udder with cylindrical shape teats and 1 cow with pendulous shape udder with conical shape teats in NSC group. The cows of PPS group were supplemented *shatavari* root powder @100mg/kg body weight prepartum to continued till postpartum 90 days@200mg/kg body weight.

The dose of *shatavari* during postpartum period was as per Berhane (2000). Considering the health benefit of supplementation of *shatavari* during last trimester of pregnancy to continued first trimester after parturition, we explored the possibility of reducing the incidence of mastitis in crossbred cows at the rate of half of the dose supplemented postpartum.

All animals were fed with mixed ration as per NRC (1989) and supplement group supplemented *shatavari* root powder with concentrate once at morning. During prepartum period cows fed chaffed (1–2cm) green *sorghum* (*Sorghum bicolor*) and concentrate based total mixed ration with minimum 3.5 kg concentrate per day per cow. Depending upon the requirement of cows during lactation period all animals fed with berseem (*Trifolium alexandrinum*), oat (*Avena sativa*) and wheat straw (1–2cm 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. DM content of forage and weighted left over, if any, was determined to calculate the daily DMI. Fresh and clean water

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was available free choice to each cow. All animals were continuously monitored up to 150 days of lactation to estimate the carry over effect of supplementation (90 days) on udder parameters.

Economic losses due to clinical mastitis were categorized into milk production loss and treatment loss. Under the treatment losses, cost of medicine and man power (veterinarian and labour) used were considered. Production loss depends on number of quarter affected and it included decrease in milk production during infection and discarding of the milk during the antibiotics used in a particular quarter. The average milk yield (AMY) of previous 3 days of particular animal was considered to calculate per day milk loss during the mastitis days. The value of production losses calculated by multiplication of milk quantity loss and sold price of milk/kg that was ₹14. Formulae used to estimate the economic losses due to clinical mastitis are -

Total loss due to clinical mastitis = production loss+treatment loss

Production loss = total milk loss (kg)×avg. price of milk/kg

Treatment loss = Avg. cost of treatment per day × Animal mastitis days

$$\text{Average cost of treatment per day} = \frac{\text{Total price of medicines used for treating mastics}}{\text{Animal mastitis day}}$$

The offered feed samples were analyzed for proximate principles and fibre fractionations as neutral detergent fibre (NDF) and acid detergent fibre (ADF) as per AOAC (1995) and Van Soest *et al*. (1991), respectively. The *shatavari* samples were also analyzed for total phenolic and tannin content as per Makkar (2003). Cows were managed under similar housing and milked under machine milking system thrice daily (morning, noon and evening) during entire period of experiment.

Milk (50 ml) from each cow was sampled once during the morning, noon and again during the evening milking. The morning and noon samples were collected and preserved, these 2 samples were later pooled with evening sample, and representative samples were used to calculate the somatic cell counts (SCC) fortnightly. The total number of somatic cells secreted per ml of milk was estimated as per IDF (1984). The status of sub-clinical mastitis was examined through modified California mastitis test (MCMT) score (Sastry 1978). The calculation of % teat ninfection and severity score per teat was done in a particular group by taking total teats as available from 5 cows. The reduction/increase of sub clinical mastitis (SCM) or severity score per teat was calculated taking the account of control group as based. The incidence of SCM was calculated based on number of teats infected as:

$$\text{Incidence of SCM (\%)} = \frac{\text{Number of teats infected during the period}}{\text{Number of teats present in the group during the period}}$$

Blood samples were collected postpartum period from the jugular vein of all experimental animals into heparinized (20 IU heparin/ml blood) tubes at monthly interval. Plasma total immunoglobulin were estimated by zinc turbidity method (McEwan and Fisher 1970).

All the values are expressed as mean±SEM or incidence of cases. The means of milk somatic cell counts, sub-clinical mastitis and mastitis associated economics were compared using student's t-test (Snedecor and Cochran 1994).

Concentrate, berseem, jowar and wheat straw containing organic matter 91.33, 89.93, 91.65 and 91.16; crude protein 20.46, 17.83, 7.14 and 3.13%; ether extract 4.23, 3.34, 0.85 and 0.96%; total ash 8.67, 10.07, 8.35 and 8.84%; NDF 43.49, 31.29, 60.05 and 68.82; ADF 13.50, 26.52, 44.27 and 54.16%, respectively; and respective values of OM, CP, EE, total ash, ADF, NDF, total phenolics and total tannin in *shatavari* were 90.70, 6.47, 0.35, 2.53, 8.14, 13.40, 4.57 and 3.68%, respectively, on dry matter basis.

Incidence of mastitis and somatic cell counts: None of the cows screened in the PPS group had clinical mastitis during the complete experimental period, however, 2 cows of NSC group had clinical mastitis up to first fortnight of lactation. The incidence of sub-clinical mastitis (SCM) among the quarters during supplementation period in NSC and PPS group were 27.33±2.29 and 13.46±1.23%, respectively. Incidence of SCM among the quarters during supplementation period was significantly ($P<0.01$) reduced in PPS group. Although, after withdrawal of *shatavari* supplementation, incidences of SCM increased and it was similar to NSC group. During supplementation period, mean of somatic cell counts of PPS group was significantly ($P=0.008$) lower than the NSC group. Reduced number of somatic cell counts in milk indicating low level of intramammary infection as it was also evident from the incidence of sub-clinical mastitis and MCMT score in PPS groups. After withdrawal of *shatavari* supplementation, milk somatic cell count was also increased gradually on the line of incidence of sub-clinical mastitis and score of mammary gland infection in PPS group (Table 1). Immunoglobulin has disease protecting effect and mean of plasma total immunoglobulin in PPS group was observed significantly ($P<0.05$) higher (23.31±2.09 *vs.* 32.08±1.84mg/ml) than the NSC group. *Shatavari* is an immunomodulator and its supplementation might be accountable for the improvement of immune system of cow.

Depressed immune system decreases the host-resistant subsequently increase in disease incidence. *Shatavari* is an immunomodulator, therefore strengthening the host resistant by the enhancing of phagocytosis and bactericidal capacity of neutrophils and macrophages (Mandal *et al.* 1998, Gautam *et al.* 2004, Gautam *et al.* 2009, Rekhate *et al.* 2010). However, to the best of our knowledge, literature on effect of *shatavari* on mastitis and immune system of crossbred cow are scanty therefore, results could not be compared. However, Sharma

Table 1. Effect of *Shatavari* on incidence of mastitis, sub-clinical mastitis and somatic cell counts

Parameters	NSC	PPS
Milk SCC during supplementation period ($\times 10^5$ cells/ml)	$1.55^a \pm 0.19$	$1.07^b \pm 0.11$
Milk SCC during residual period ($\times 10^5$ cells/ml)	1.22±0.18	1.66±0.35
MCMT score during supplementation period (per teat)	$0.70^a \pm 0.06$	$0.47^b \pm 0.05$
MCMT score during residual period (per)	$0.79^a \pm 0.09$	$0.62^b \pm 0.06$
Sub-clinical mastitis during supplementation period (%teats)	$27.33^a \pm 2.29$	$13.46^b \pm 1.23$
Sub-clinical mastitis during residual period (% teats)	31.82±2.90	30.62±3.11

Means with different superscripts a,b in row differs significantly

(2009) reported that 60 days peripartum supplementation of *shatavari* based polyherbal formulation@250mg/kg body weight, had reduced mastitis, sub-clinical mastitis incidence and milk somatic cell counts significantly (P<0.05) in crossbred cows either by enhancing the phagocytosis and bactericidal capacity of neutrophils and immunoglobulin G level or by reducing the peri-parturient stress.

Incidence of mastitis and its associative economics: Average per day and total cost of *Shatavari* supplementation including both pre- and post-partum period was ₹15.45 and 1390.50/cow, respectively. Instead of extra investment, net income was higher by ₹43.00/cow/day in PPS group over NSC group. Thus, during supplementation period net income/cow in the PPS group was ₹3870 more than the NSC group. In contrary to profit, total loss of milk due to mastitis incidence was 63.55 kg, incurred cost of mastitis treatment was ₹58.33/head/day, thus production loss and treatment losses were ₹889.70 and ₹700.0 respectively. Although, supplement group was void from losses however, total losses due to clinical mastitis were ₹1589.70 in NSC group.

SUMMARY

Shatavari herbal feed supplement was supplemented peripartum (@100mg/kg BW prepartum till postpartum 90 days@200mg/kg BW) to observe the effect on mastitis incidence. Supplementation of *shatavari* peripartum reduced the milk somatic cell counts, prevalence of sub-clinical and clinical mastitis. Supplementation of *shatavari* reduces the production losses and veterinary cost incurred on treatment, proved its therapeutics potentials and importance for the dairy farmers thus, mechanisms by which *Shatavari* reduces the incidence and associative losses of mastitis need to be further validation.

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