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Research Article

EFFECT OF POLY-HERBAL MIXTURE SUPPLEMENTATION ON MILK COMPOSITION AND SOMATIC CELL COUNTS IN POST-PARTUM SAHIWAL COWS

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ABSTRACT

Present investigation was carried out to evaluate the effect of poly-herbal mixture supplementation on milk composition and udder health of post-parturient Sahiwal cows. Twelve post-parturient Sahiwal cows were selected and classified into two groups of six animals each *viz*., T1 as control and T2 as poly-herbal mixture supplemented group on the basis of body weight, parity, and expected milk producing ability. T1 was fed basal diet while T2 was fed 450 gm poly-herbal mixture from day of calving up to 7 days continuously, then on an alternate day up to day 21 and then at weekly interval up to day 60 in addition to basal diet. There was significantly ($p < 0.05$) higher milk fat, protein and lactose with reduced milk somatic cell count in T2 as compared to T1 which indicates improved udder health, milk production performance, and improved milk quality. There was increased blood glucose and decreased blood NEFA level in the supplemented group, indicating decreased negative energy balance. It was concluded that poly-herbal mixture supplementation in the diet of lactating Sahiwal cows resulted in significant improvement in milk composition and udder health.

Keywords: Milk composition, Polyherbal, Sahiwal, Somatic cell count

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Sahiwal is one of the most important dairy breeds of cattle. Various strategies are emerging worldwide to improve performance of dairy animals by using hormones, antibiotics, nutritional supplements, but many of them are associated with suppressing symptoms, less accessibility, higher cost and side effects. Hence, people are again oriented back to herbal and ayurvedic medicines having the holistic approach to improve performance of dairy animals. It was reported that *Anethum graveolens* has galactagogue and anti-inflammatory effect and *Foeniculum vulgare* promote milk ejection and production. Shatavari has been scientifically documented as reproductive system tonic, immunomodulator and anti-oxidant compound for dairy animals. *Trachyspermum ammi* and *Curcuma longa* are traditionally used as galactagogue in human. *Cuminum cyminum* linseed extract resulted in enhanced milk production in cow (Ghafari *et al.*, 2015). It has been observed that supplementation of polyherbal mixture improved performance of buffaloes (Chandra, 2015) and cows (Kuri *et al.*, 2019). Although few work have been conducted in past but very scanty literature is present regarding its effect on milk composition, udder health and metabolic parameters of cattle. Therefore, present work was conducted to assess the effect of supplementation of poly-herbal mixture on milk composition (protein, fat, lactose %) and SCC of Sahiwal cattle.

MATERIALS AND METHODS

Present study was conducted at Livestock farm of ICAR-National Dairy Research Institute, Karnal, Haryana, India.The experiment was approved and conducted under the established standard of the Institutional Animal Ethics Committee (IAEC). Twelve peri-parturient Sahiwal cows were selected and classified into two groups (n=6) as control and poly-herbal mixture supplemented on the basis of body weight, parity, and expected producing ability. The experimental animals of both groups were maintained as per standard conditions of feeding and management. Control group was fed only basal diet as per the standard feeding followed at NDRI farm (ICAR, 2013)and supplemented group was fed 450 gm poly herbal mixture per animal daily during first 7 days after calving, then at alternate day up to day 21 and then at weekly interval up to day 60 along with basal diet. Poly-herbal mixture was prepared by mixing 25 gm of various herb along with 50 mg of Shatavari making the total quantity of 175.05 gm (table 1). To this mixture, 25 gm of Himalayan black salt and 250 gm of jaggery were added to increase the palatability. Poly-herbal mixture was prepared freshly each time before feeding.

Milk samples were collected during morning and evening sessions at weekly intervals. Immediately after collection, samples were taken to the laboratory for milk fat, protein and lactose analysis by automatic milk testing machine i.e., Lactoscan-Model LA- Milk Analyser. The total number of somatic cells secreted per ml of milk and colostrum was estimated by the direct microscopic somatic cell count technique described by Schalm *et al.* (1971).

Blood samples were collected through the jugular vein at weekly intervals for estimating blood metabolites. Glucose was estimated in plasma samples by using GOD-PAP TRINDER'S kit purchased from Avecon Healthcare Pvt. Ltd (Item. no. AVGLU(2) 500(2) and estimation of Non-Esterified Fatty Acid (NEFA) was done by the copper soap solvent extraction method modified by Shipe *et al.* (1980).

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Statistical Analysis

Statistical analysis was done using student's t-test which was performed for comparison of various parameters between the control and treatment group using the SPSS statistical software program (version 21.0).

RESULTS AND DISCUSSION

1. Milk Protein: Milk protein (%) was significantly ($p < 0.05$) higher in treatment group of animals during 2nd to 5th week post-partum compared to control group (table 2) which may be due to several factors like increased milk yield (average milk yield (kg) production in T1 group animals (7.59±0.22 kg) was found to be higher than the control group (6.7± 0.26 kg) and supplementation of polyherbs. In present study, variable trends were observed for milk protein content in Sahiwal cows. Our results contradict with Patel *et al.* (2017) in cow and Chandra *et al.* (2017) in buffalo where there was no change in milk protein content by poly-herbal supplementation.

2. Milk Fat: Milk fat (%) was significantly ($p<0.05$) higher in treatment group than control group (table 2) during entire experimental period. Our results are in agreement with Chandra *et al.* (2017) who reported similar findings in Murrah buffaloes. Shah and Mir (2004) also reported that supplementation of Fenugreek (Methi) seeds enhances milk fat (%) in dairy cows. Our results suggested that polyherbal combination augments milk fat (%) in the early postpartum period.

3. Milk lactose: Milk lactose was significantly ($p<0.05$) higher in supplemented group of animals during 3rd to 5th week (table 2). The increased milk lactose (%) may be due to galactogogue effects of herbs like Sowa (Chandra *et al.*, 2017), Fenugreek (Fleiss,1988), Ajwain (Chandra *et al.*, 2017) and Shatavari (Tanwar *et al.*, 2008). Our results are in agreement with Imtiwati, (2014) who observed higher lactose (%) in Sahiwal cows and Chandrashekar *et al.* (2018) in Karan Fries cows. Higher lactose (%) in supplemented groups can also be associated with better udder health as indicated by lower somatic cell count and no incidence of clinical mastitis in the current study.

4. Milk Somatic Cell Count: Milk SCC ($x10^5$ cells/ml) was significantly ($p<0.05$) lower in supplemented group of animals compared to control during 3rd to 8th week (table 2). The lower values of SCC in supplemented group indicate that herbal mixture supplementation has boosted mammary health and improved quality of milk. Sharma *et al.* (2014) also reported that polyherbal supplementation at the rate of 200-250 mg/kg body weight reduced periparturient stress and improved immunity and udder health. This improved udder health status in the supplemented groups may be due to synergistic effect of *Foeniculum vulgare* which possess anti-bacterial, anti-oxidant and anti-inflammatory property which resulted in better udder heath and decreased SCC.

5. Plasma Glucose Concentration: There was a significant ($P<0.05$) increase in glucose concentration in supplemented group than control group during the early lactation (table 2). There was continuous increase in plasma glucose level in supplemented group due to the herbal mixture supplementation except during 5th and 6th week. The elevated level of plasma glucose concentrations in supplemented group may be contributed by the glucogenic properties of Shatavari and Jaggery which were the ingredients of herbal mixture. The presence of saponin in Asparagus racemosus boosted propionate production, which is generally regarded the primary substrate for glueoneogenesis (Wiltrout and Satter, 1972), eventually results in enhanced blood glucose levels. Our results are in agreement with Imtiwati *et al.* (2014) who observed an increased plasma glucose level by Shatavari supplementation in cow.

6. Plasma Non esterified fatty acid (NEFA) concentration: Plasma NEFA (μM)was significantly ($p<0.05$) lower in supplemented group of animals compared to control except 1st week (table 2) which might

Table 1. Composition and quantity of poly-herbal mixture

S. No	Name of Herb	Common Name	Scientific Name	Part of Herb Used	Quantity
1.	Ajwain	Carom	*Trachyspermum ammi*	Seed	25 gm
2.	Jeera	Cumin	*Cuminum cyminumlinn*	Seed	25 gm
3.	Methi	Fenugreek	*Trigonella foenum-graecum*	Seed	25 gm
4.	Sundh	Ginger	*Zingiber officinale*	Rhizome	25 gm
5.	Saunf	Fennel	*Foeniculum Vulgare*	Seed	25 gm
6.	Sowa	Indian dill	*Anethum graveolens*	Foliage	25 gm
7.	Haldi	Turmeric	*Curcuma longa*	Rhizome	25 gm
8.	Satavari	Shatavari	*Asparagus racemosus*	Root	50 mg
Other Ingredients					
9.	Kala Namak	Black salt	----		25 gm
10.	Gur	Jaggery	----		250 gm
Total					450.05 gm

Table 2. Mean±SE values of different parameters in control (T1) and treatment (T2) groups of Sahiwal cows

Weekly intervals	Milk protein (%)		Milk fat (%)		Milk lactose (%)		Milk SCC (10^5)		Glucose concentration (mg/dl)		Plasma NEFA concentration (μM,MDA)	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
1	$3.34^{A}\pm$ 0.18	$3.42^{A}\pm$ 0.14	$5.92^{A}\pm$ 0.71	$7.38^{B}\pm$ 0.63	$4.84^{A}\pm$ 0.19	$4.64^{A}\pm$ 0.11	$2.32^{A}\pm$ 0.08	$2.34^{A}\pm$ 0.09	$42.46^{A}\pm$ 5.76	$55.01^{B}\pm$ 1.35	$633.24^{A}\pm$ 3.38	$635.39^{A}\pm$ 2.37
2	$3.13^{A}\pm$ 0.12	$3.62^{B}\pm$ 0.17	$4.04^{A}\pm$ 0.42	$5.37^{B}\pm$ 0.32	$4.66^{A}\pm$ 0.29	$4.76^{A}\pm$ 0.12	$1.99^{A}\pm$ 0.04	$2.04^{A}\pm$ 0.05	$46.78^{A}\pm$ 3.45	$65.78^{B}\pm$ 4.61	$531.58^{A}\pm$ 3.12	$513.85^{B}\pm$ 2.26
3	$3.24^{A}\pm$ 0.12	$3.44^{B}\pm$ 0.11	$3.44^{A}\pm$ 0.28	$4.27^{B}\pm$ 0.16	$4.50^{A}\pm$ 0.15	$4.94^{B}\pm$ 0.09	$1.75^{A}\pm$ 0.06	$1.57^{B}\pm$ 0.06	$43.89^{A}\pm$ 5.7	$63.78^{B}\pm$ 3.01	$418.30^{A}\pm$ 4.16	$403.05^{B}\pm$ 3.80
4	$3.27^{A}\pm$ 0.07	$3.5^{B}\pm$ 0.13	$3.07^{A}\pm$ 0.17	$4.02^{B}\pm$ 0.19	$4.48^{A}\pm$ 0.16	$4.85^{B}\pm$ 0.09	$1.96^{A}\pm$ 0.06	$1.39^{B}\pm$ 0.10	$53.90^{A}\pm$ 5.72	$68.89^{B}\pm$ 1.21	$364.4^{A}\pm$ 6.95	$339.88^{B}\pm$ 3.39
5	$3.29^{A}\pm$ 0.07	$3.46^{B}\pm$ 0.13	$2.95^{A}\pm$ 0.12	$3.76^{B}\pm$ 0.07	$4.56^{A}\pm$ 0.19	$4.89^{B}\pm$ 0.07	$2.15^{A}\pm$ 0.06	$1.37^{B}\pm$ 0.08	$60.89^{A}\pm$ 3.06	$70.09^{B}\pm$ 11.78	$281.16^{A}\pm$ 6.21	$262.69^{B}\pm$ 7.85
6	$3.39^{A}\pm$ 0.12	$3.33^{A}\pm$ 0.10	$2.86^{A}\pm$ 0.17	$3.58^{B}\pm$ 0.15	$4.52^{A}\pm$ 0.28	$4.83^{A}\pm$ 0.11	$2.08^{A}\pm$ 0.09	$1.42^{B}\pm$ 0.04	$58.90^{A}\pm$ 2.89	$71.03^{B}\pm$ 15.46	$235.65^{A}\pm$ 7.11	$207.19^{B}\pm$ 5.66
7	$3.38^{A}\pm$ 0.02	$3.37^{A}\pm$ 0.10	$2.99^{A}\pm$ 0.08	$3.53^{B}\pm$ 0.08	$4.51^{A}\pm$ 0.22	$4.60^{A}\pm$ 0.14	$2.03^{A}\pm$ 0.08	$1.63^{B}\pm$ 0.03	$60.89^{A}\pm$ 1.66	$69.90^{B}\pm$ 1.42	$255.69^{A}\pm$ 4.16	$211^{B}\pm$ 9.21
8	$3.29^{A}\pm$ 0.15	$3.38^{A}\pm$ 0.12	$2.90^{A}\pm$ 0.07	$3.45^{B}\pm$ 0.14	$4.48^{A}\pm$ 0.28	$4.72^{A}\pm$ 0.18	$2.07^{A}\pm$ 0.07	$1.67^{B}\pm$ 0.05	$61.0^{A}\pm$ 1.41	$71.89^{B}\pm$ 2.06	$242.30^{A}\pm$ 3.90	$239.05^{A}\pm$ 4.19

^{A,B}Means having different superscripts within columns differ significantly ($p \leq 0.05$)

be due to transitional stress. In our study, increased NEFA levels observed in control group animals indicate that animals were under negative energy balance. Our findings are in agreement with Imtiwati (2014) who observed similar increase of NEFA concentration in control group of animals and lower NEFA values in Shatavari herbs supplemented group.

CONCLUSION

It was concluded that supplementation of polyherbal mixture during post-partum period improved performance of Sahiwal cows with increased milk protein, fat and lactose and reduced SCC. Increased level of blood glucose and reduced NEFA level in supplemented groups indicates better health conditions.

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