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Effect of herbal feed supplements on milk yield and composition in crossbred cows in Tripura

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ABSTRACT

The study was conducted to evaluate the effect of feeding 5 herbal preparations on the milk yield and composition of crossbred cows. Thirty five lactating cows in their first-third lactation were taken for the experiment. The cows were divided into 7 groups with 5 cows in each group on the basis of average milk yield (8.70±0.08 kg/d). The experiment was conducted for 90 days, partitioned into pre-treatment period (15 days), treatment period (60 days) and post treatment observation period (15 days). The cows in group C_0 were not given any supplement and acted as control. In addition to normal routine feeds and fodders, cows in groups T_1 and T_2 were given either Restobal @ 50 ml twice daily for 5 days/month or Ruchamax @ 15 g/ day for 8 days/month, respectively for 60 days treatment period. The cows in groups T_3, T_4 and T_6 were given either Payaboon @ 500 g/ton, Payaboon @ 1 kg/ton, Optrium @ 500 g/ton/ day, respectively for 60 days treatment period. In group T_5, cows were given Payapro @ 4 bolus/day for 15 consecutive days commencing after 15 days pre-treatment period. T_5 group showed comparatively higher total milk yield than the control and other groups. Average milk yield (kg/d) during the supplementation period was slightly higher in T_5 followed by T_2 and T_6. T_5 group showed lowest trend of reduction in milk yield during treatment period. Average milk yield (kg/d) during post supplementation period was also higher in T_5. Milk protein and fat (%) were higher in T_1 and T_3 than the control and other treatment groups. Total solid and SNF (%) showed higher trend in T_1. At 15 day of supplementation, milk yield increased in all the treatment groups compared to control (8.38) and it was highest in T_5 (9.69). The milk yield decreased gradually thereafter but the rate of reduction was comparatively lower in T_4, T_5 and T_6 than the control. Milk constituents showed significant variations among different weeks in different groups. Hence it can be concluded that herbal preparations can increase the productivity in lactating dairy cows with no deleterious effect on general health.

Key words: Cow, Herbal, Milk yield, Milk composition

One of the most successful attempts accomplished in the last decade is using feed additives such as natural additives which help in improving animal productivity and increasing milk production (Wang *et al.* 2009). In order to restore the animal productivity and to optimize the milk production in individual animals for better profits, various drugs, herbal preparations, hormones, mineral supplements and feed additives have been tried with variable results (Ramesh *et al*. 2000). However, majority of these herbal preparations have not been scientifically evaluated but their traditional use suggests some safety and efficacy.

Certain combinations of herbs have proved useful in different functions to stimulate metabolism or even as therapeutic agents. Much of their use has been in vogue since centuries in humans as well as in animals. Ruchamax is a potent herbal formulation, which contains 28 different herbs. The ingredients of Ruchamax include *Allium sativum, Azadirachta indica, Calotrophis orocera, Centratherum anthelmenticum, Commiphora mukul, Eclipta elba, Embelica ribes, Picorrhiza kurora, Zinziber officinale* and *Piper longum*, etc. Payapro, a known galactagogue, is a combination of *Leptadenia reticulate (jivanti), Nigella sativa (kolonji), Foeniculam vulgare, Pueraria tuberose (vidarikand)*, *Glycerriza globra, Cuminum cyminum (jeera)* and *Asparagus racemosus (shatavari)* etc. Optrium, a herbal rumen function modulator, is a combination of *Phyllanthus emblica (amla), Zingiber officinalis (ginger)* and *Andrographis paniculata (kalmegh)*. Payaboon, a galactogenic and galactopoetic herbal formulation, contains *Asparagus racemosus, Leptadenia reticulate* and *Nigella sativa.* Restobal, comprises of herbs namely *Ocimum sanctum, Withania somnifera, Phyllanthus emblica* and many more in fixed concentration. Of these, some of the herbs have galactopoietics property while others possess stomachic action. Keeping in view the importance of herbal

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feed supplements, the present investigation was undertaken to know the efficacy of 5 herbal preparations (HP), viz. Ruchamax, Restobal, Payaboon, Optrium and Payapro in improvement of production performance of lactating crossbred cows.

MATERIALS AND METHODS

Healthy lactating crossbred cows (35; first to third lactation), weighing between 350 to 450 kg were taken for the experiment. The animals were allocated into 7 groups of 5 animals in each group based on average initial milk yield. The experiment was conducted at Regional Exotic Cattle Breeding Farm of College of Veterinary Sciences and A.H., R.K. Nagar, Tripura, India. The animals were maintained individually having regular feeding and watering facilities. The floor was washed and cleaned twice daily in the morning and evening. The animals were fed twice daily at around 6 AM and 3 PM. All the animals were fed standard seasonally available roughages and concentrates mixture throughout the study period of 90 days to meet nutrient requirement (NRC 2001) calculated on individual cow basis and fortnightly milk yields. Composition (%) of the concentrate mixture was maize grain (32), groundnut cake (21), mustard cake (13), wheat bran (20), deoiled rice bran (11), mineral mixture (2) and common salt (1). Leftover, if any, was weighed next morning. DM content of forage and leftover was determined to calculate the daily DMI. The experiment was conducted for 90 days divided into pre-treatment period (15 days), treatment period (60 days) and post treatment observation period (15 days). The cows in group C_0 were not given any herbal preparation and acted as control. The cows in group T_1 and T_2 were given, in addition to normal routine feeds and fodders, either Restobal @ 50 ml twice daily for 5 days/month or Ruchamax @ 15 g/day for 8 days/month, respectively, for 60 days treatment period. The cows in group T_3, T_4 and T_6 were given either Payaboon @ 500 g/ton, Payaboon @ 1 kg/ton, Optrium @ 500 g/ton/day, respectively, for 60 days treatment period. In group T_5, cows were given Payapro @ 4 bolus/day for 15 consecutive days commencing after 15 days pre-treatment period. The animals were hand milked (twice/day) and milk yield of each cow was recorded daily. Pooled milk samples (equal proportion of 2 milking) were used for determining the milk composition. Milk composition was analyzed on 15^{th}, 30^{th}, 45^{th} and 60^{th} day for fat, protein, lactose, SNF and total solid. Milk protein were analyzed by Kjeldahl method. Milk fat were analyzed by Gerber method. The total solid values of milk sample were estimated by addition of SNF and fat value.

The data were analyzed using 2-way ANOVA (Sigma Plot software, version 11.0; SPSS Inc., Chicago IL). The results were expressed as mean and pooled standard error of mean.

RESULTS AND DISCUSSION

Effect of herbs on DMI, milk yield, milk composition is presented in the Tables 1, 2. It was observed that all the herbal supplementation did not affect the DMI significantly (P>0.05) which was similar to the findings of Kumar *et al.* (2011), Mirzaei *et al*. (2011) and Thakur *et al.* (2006). But, the results were not similar to the findings of Berhane (2000) and Gupta *et al.* (2004). Total milk yield (kg) during the 90 days duration of the trial was statistically nonsignificant but T_5 group showed comparatively higher (P>0.05) milk yield than the control and other supplemented groups. T_5 and T_2 group showed 9.39 and 8.04% increase in total milk yield than the control group (Table 1).

Table 1. Effect of herbs on milk yield and milk composition

Groups	C_o	T_1	T_2	T_3	T_4	T_5	T_6	SEM	P value
DMI (kg/day)	9.41	9.47	9.39	9.22	9.16	9.18	9.19	0.06	NS
Initial BW (kg)	319.2	325.7	323.8	321.6	325.8	323.2	325.5	6.92	NS
Final BW (kg)	325.7	333.1	341.5	336.6	339.6	344.9	341.0	4.33	NS
Initial milk yield (kg/d)	8.73	8.77	8.79	8.80	8.80	8.77	8.80	0.26	NS
Total yield, kg (90 days)	701.15	716.22	757.51	696.79	722.47	767.05	744.27	26.67	NS
Milk yield (kg/d) during supplementation period	8.00	8.15	8.78	8.00	8.39	8.79	8.65	0.11	NS
Milk yield (kg/d) during post supplementation	7.64	7.82	7.74	7.52	7.53	8.18	7.54	0.29	NS

Table 2. Effect of herbs on milk composition

Milk composition	Control	T_1	T_2	T_3	T_4	T_6	SEM	P value
Protein (%)	3.54^{a}	3.96^{b}	3.52^{a}	3.89^{b}	3.51^{a}	3.56^{a}	0.05	0.01
Fat (%)	4.60^{a}	5.26^{b}	4.70^{a}	5.32^{b}	4.88^{ab}	5.03^{ab}	0.07	0.01
TS (%)	13.14	14.00	13.04	13.87	13.28	13.48	0.11	NS
SNF (%)	8.54	8.74	8.34	8.55	8.40	8.44	0.04	NS

Means bearing different superscripts in a row differ significantly (P<0.05). NS, Non-significant.

Table 3. Effect of Payapro herb on milk composition

Milk composition	Control	T_5	SEM	P value
Protein (%)	3.62	3.65	0.05	NS
Fat (%)	4.72^{b}	5.24^{a}	0.14	0.04
TS (%)	13.37	13.91	0.05	NS
SNF (%)	8.65	8.66	0.17	NS

Means bearing different superscripts in a row differ significantly (P<0.05). NS, Non-significant

Average milk yield (kg/day) during the supplementation period in the present study was slightly higher (P>0.05) in T_5 followed by T_2 and T_6. This observation was similar to the findings of Singhal (1995) and Khurana *et al.* (1996) who observed 30.1% increase in milk yield of Payapro fed cows. The data were not in agreement with the results cited by Kraszewski (2002) who had shown no effect of herbs supplementation of diet for cows on milk yield. T_5 and T_2 group showed lowest trend of reduction in milk yield during treatment period (Table 1). Comparatively higher milk production in T_5, T_2 and T_6 groups may be due to certain active components in the herbal formulations which stimulate the hypothalamus or pituitary gland leading to release of prolactin hormone (Singh 2010). Estrogenic effect of *Asparagus racemosus* on mammary gland stimulating the alveolar secretary epithelial cell division and proliferation in the lumen of the duct of mammary gland (Pandey *et al.* 2005) could have resulted in higher milk synthesis and secretion. Mirzaei *et al.* (2011) reported that the addition of polyherbal combination increased the net energy of milk, thus leading to an increase in milk yield. The relative improvement of milk production of herbs supplemented group might be due to its potent galactogogue herbal formulations and the associated effect between acetate and succinate on rumen microflora, which lead to improvement of feed efficiency and milk production (Abo El-Nor and Kholif 2005). Mishra *et al.* (2008) and Tanwar *et al*. (2008) also reported that postpartum supplementation of *Asparagus racemosus* increases milk production in crossbred cows.

Average milk yield (kg/day) during post supplementation period was also higher (P>0.05) in T_5 (Table 1) which might be due its potent combinations of herbal galactogogues.

Milk protein and fat (%) was reported higher (P<0.05) in T_1 and T_3 than the control and other supplemented groups (Table 2). Total solid and SNF (%) showed higher trend (P>0.05) in T_1 supplemented groups. As the T_5 group was supplemented for 15 days only, milk composition of that group was presented comparing only with control (Table 3). T_5 showed higher (P<0.05) milk fat (%) than the control. The findings were similar to Mirzaei *et al.* (2011), Kumar *et al*. (2011) and Grega *et al.* (2002) who reported higher milk yield, milk fat, protein on supplementation of herb mixture to crossbred cows. These findings conflicted with the views of some workers who reported no significant increase of milk fat and protein content (Mishra *et al*. 2008,

Table 4. Effect of herbs on fortnightly milk yield and milk composition

Attribute	Fortnights					
	I	II	III	IV	SEM	P value
			Group C_o			
Milk yield (kg/d)	8.38	8.10	7.86	7.67	0.19	NS
			Milk composition			
Protein (%)	3.57	3.48	3.39	3.72	0.05	NS
Fat (%)	4.75	4.50	4.53	4.63	0.09	NS
TS (%)	13.41	13.12	12.96	13.08	0.11	NS
SNF (%)	8.66	8.62	8.43	8.45	0.04	NS
			Group T_1			
Milk yield (kg/d)	8.80	8.36	7.90	7.55	0.47	NS
			Milk composition			
Protein (%)	4.22^{b}	3.70^{a}	3.80^{ab}	4.13^{ab}	0.09	0.035
Fat (%)	5.08	5.10	5.30	5.58	0.14	NS
TS (%)	14.03	13.78	13.84	14.37	0.26	NS
SNF (%)	8.96	8.68	8.54	8.79	0.13	NS
			Group T_2			
Milk yield (kg/d)	9.63	9.17	8.29	8.02	0.47	NS
			Milk composition			
Protein (%)	3.55	3.50	3.31	3.72	0.05	NS
Fat (%)	4.98	4.53	4.58	4.73	0.08	NS
TS (%)	13.47	12.75	12.89	13.07	0.12	NS
SNF (%)	8.49	8.23	8.31	8.34	0.06	NS
			Group T_3			
Milk yield (kg/d)	8.48	8.52	7.86	7.12	0.56	NS
			Milk composition			
Protein (%)	3.57^{a}	3.67^{a}	3.80^{a}	4.52^{b}	0.15	0.004
Fat (%)	5.30	5.18	5.10	5.70	0.27	NS
TS (%)	14.19	13.33	13.41	14.55	0.43	NS
SNF (%)	8.89^{b}	8.16^{a}	8.31^{ab}	8.85^{b}	0.18	0.028
			Group T_4			
Milk yield (kg/d)	8.68	8.49	8.20	8.18	0.32	NS
			Milk composition			
Protein (%)	3.61	3.30	3.41	3.72	0.07	NS
Fat (%)	5.60^{b}	4.43^{a}	4.95^{ab}	4.53^{a}	0.16	0.023
TS (%)	14.52^{b}	12.44^{a}	13.32^{ab}	12.84^{a}	0.27	0.020
SNF (%)	8.92^{b}	8.01^{a}	8.37^{ab}	8.32^{ab}	0.14	0.007
			*Group T_5**			
Milk yield (kg/d)	9.69	9.10	8.25	8.13	0.48	NS
			Milk composition			
Protein (%)	3.76	3.53			0.12	NS
Fat (%)	5.45	5.00			0.21	NS
TS (%)	14.28	13.46			0.36	NS
SNF (%)	8.83	8.46			0.17	NS
			Group T_6			
Milk yield (kg/d)	9.13	9.10	8.25	8.13	0.37	NS
			Milk composition			
Protein (%)	3.72	3.41	3.42	3.69	0.05	NS
Fat (%)	5.53^{b}	4.53^{a}	5.10^{ab}	4.98^{ab}	0.13	0.034
TS (%)	14.16	12.78	13.41	13.56	0.17	NS
SNF (%)	8.63	8.25	8.31	8.58	0.06	NS

Means bearing different superscripts in a row differ significantly (P<0.05). NS, Non-significant.

Tanwar *et al.* 2008, Berhane and Singh 2002). Qureshi (1999) not only observed an increase in milk yield but also an increase in the fat percentage of milk in dairy cows fed with Lectovet (a herbal combination). Kolte *et al*. (2008) reported that indigenous herbal preparations effectively restored the altered milk constituents and increased the milk production in crossbred cows. In the other studies, milk fat, protein and lactose contents were not affected by polyherbal supplementation (Erasmus *et al*. 2005, Campanile *et al*. 2008). Increase milk protein (%) in the present study, could be attributed to some components in the herbal formulation which increases rumen protection 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).

Effect of herbal product on fortnightly milk yield and milk composition is presented in Table 4. At first fortnight, milk yield increased in all the treatment groups compared to control (8.38) and it was highest in T_5 (9.69). Milk yield decreased gradually (P>0.05) thereafter but the rate of reduction was comparatively lower in T_4, T_5 and T_6 than the control. Milk constituents showed significant variations among different weeks in different groups which were similar to the findings of Mirzaei *et al*. (2011), Kumar (2009) and Beyan (2009).

Therefore, the results of this study suggest that supplementation of herbal feed additives improves the milk production and milk composition of lactating cows with no deleterious effects on general health.

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