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Research Article

EFFECT OF FEEDING GILOY (*TINOSPORA CORDIFOLIA*) AND FENUGREEK ON MILK MINERAL PROFILE IN JERSEY CROSSBRED COWS

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ABSTRACT

The study was conducted on Jersey crossbred lactating cows maintained at the Instructional Livestock Farm, College of Veterinary and Animal Sciences, CSKHPKV, Palampur (Himachal Pradesh), India. The lactating cows were randomly divided into four groups, each group having six animals. T_1, T_2 and T_3 group cows received Giloy stem powder (150 g), Fenugreek seed powder (150 g), and a combination of both the herbs (75 g of each), respectively, mixed with the concentrate feed for 60 days while the control group (T_0) received only the concentrate. Milk sampling was done fortnightly, from Day 0 to Day 75. Milk samples were analyzed for milk mineral composition (Ca, P, Fe, Cu and Zn). Milk phosphorus values in Giloy supplemented animals were significantly higher than the control group animals on day 60 of supplementation. Herbal supplementation had no significant influence on any other mineral elements (Ca, Fe, Cu and Zn) estimated in milk.

Key words: Fenugreek, Giloy, Jersey crossbred, Milk mineral profile

Giloy (*Tinospora cordifolia*), also known as *guduchi*, occupies the top spot in "*Ayurvedic Materia Medica*" and it has been designated as "*Rasayana*" (Bhattacharyya and Bhattacharya, 2013). Giloy with its lactogenic properties and other health benefits have been mentioned as indispensable herb in Indian system of medicine (Sehgal and Sood, 2013). Fenugreek (*Trigonella foenum-graecum*) is known to have several pharmacological effects which include hypoglycemic, hypolipidemic, carminative, gastric stimulant, antidiabetic and galactogogue activity (Toppo *et al.*, 2009). Minerals are essential for dairy cows, and the amounts found in most feeds normally are inadequate for milk production (Gabriela *et al.*, 2018), Giloy contains moisture 34.39 per cent, ether extract 0.912 per cent, crude protein 7.74 per cent, crude fibre 56.42 per cent, total ash 7.96 per cent, nitrogen free extract 26.97 per cent, cellulose 23.02 per cent and hemicellulose 3.70 per cent. The mineral concentration has been reported to be, calcium (102.23 ppm), phosphorous (24.81 ppm), iron (26.058 ppm), copper (3.733 ppm), zinc (7.342 ppm) and manganese (12.242 ppm) (Mahima *et al.*, 2014). Fenugreek contains dry matter, crude protein, lipids in the range of 84.85 to 86.70, 21.28 to 22.58 and 4.30 to 5.94 per cent, respectively. Dietary fibre constituents like crude cellulose vary from 9.27 to 12.09 per cent. Minerals, calcium and phosphorus varied from 2.89 to 3.04, 0.10 to 0.16 and 0.12 to 0.16 percent, respectively (Mohammed *et al.*, 2014).

MATERIALS AND METHODS

The study trial was conducted on Jersey crossbred, healthy cows in various stages of lactation, maintained at the Instructional Livestock Farm, College of Veterinary and Animal Sciences, CSKHPKV, Palampur (Himachal Pradesh), India. The experimental animals were maintained in loose housing system, under standard feeding and management conditions being followed at Livestock farm. The animals were fed twice daily and watered ad libitum. The major fodder provided to the cows during entire study consisted of Setaria, Maize, Sorghum, local grass. In addition, the animals were also offered concentrate during milking time.

Composition of concentrate feed supplied to dairy cows (per 100kg)

Ingredient	Quantity (kg)	Ingredient	Quantity (kg)
Maize	30	Mineral Mixture	3
Wheat Bran	10	Urea	1
Deoiled Rice Bran	15	Cottonseed Cake	8
Ground Nut Cake	10	Soya flakes	5
Lime Powder	1	Mustard Cake	9
Molasses	6	Bypass fat	1
Salt	1	Total	100

Research trial ingredients

The Giloy stem was collected from areas nearby Palampur, dried, ground and stored properly before the start of the experiment. The Fenugreek seeds were procured from the local market, dried, ground and stored.

Experimental research study

Twenty-four apparently healthy lactating cows were selected and divided into four groups, each group having six animals. Each of the group was formed on the basis of their average milk yield, average lactation number (2 cows of 2nd, 3rd and 4th parity in each group), and the average age of the cows. The herbal treatments were administered at a fixed time daily i.e. afternoon milking hours, to all the

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animals till day 60 of the experimental trial. T_0 group was kept as the control group which received only the concentrate. T_1 group cows were fed Giloy stem powder mixed along with the concentrate feed. T_2 group was fed Fenugreek seed powder mixed in the concentrate feed. T_3 group cows received a combination of both the herbs mixed in concentrate feed.

Herbal treatments administered to the experimental animals. (g/day/animal)

Group	Treatment & Dosage
T_0	Concentrate only
T_1	Giloy stem powder (150g) + Concentrate
T_2	Fenugreek seed powder (150g) + Concentrate
T_3	Fenugreek seed powder and Giloy stem powder (75g each) + Concentrate

Collection of milk samples

Milk samples from experimental dairy cows were collected at regular intervals of 15 days till Day 75 of the experiment. First sampling was done a day before the start (Day 0) of feeding trial. Milk samples were collected in clean screw capped 100 mL acid washed vials during morning and evening milking hours. Precautionary measures were taken to avoid any contamination and deterioration of milk samples. All samples were taken after proper plunging of the milk from each animal to avoid aberrant sample collection. The samples were then stored at -20ºC till further analysis.

Estimation of minerals in milk

The milk samples were digested in the di-acid mixture of perchloric acid and nitric acid in the ratio of 1:4. One mL of milk sample was taken in conical flasks and 10 mL of the di-acid mixture was added. The contents were digested on a hot iron plate under slow heat until a clear solution was obtained. The final volume was made to 25 mL with double distilled water. Mineral estimation in milk for Calcium (Ca), Iron (Fe), Copper (Cu) and Zinc (Zn) was done by wet digestion method (mentioned above) using Atomic Absorption Spectrophotometer (*Perkin Elmer 400*) as per the standard protocol. Phosphorus (P) was estimated by colorimetric method. 0.4 mL of acid digested milk sample (1:25 dilution) was used for phosphorus estimation. Protein precipitation was done using 12% Trichloroacetic acid (TCA). To 3.3 mL of TCA, 0.4 mL of acid digested milk sample was added, mixed and processed as per protocol.

The results so obtained in the study were analyzed using computer software 'SAS Enterprise Guide'. The data was analyzed by using ANOVA at 5% level of significance.

RESULTS AND DISCUSSION

Major minerals

The milk calcium and phosphorus of lactating cows treated with herbal supplements and control are tabulated in table 1.

The milk calcium levels in the lactating Jersey crossbred cows in the present study ranged between 101.42 ± 1.72 to 124.97 ± 3.61 mg/dL. These values are lower than the values of milk calcium reported by Chauhan (1999) in Jersey crossbred cows (121.60 ± 2.08 to 127.46 ± 2.35 mg/dL). Higher milk calcium values were observed in all the groups at the beginning of the trial. However, a decline in milk calcium values was observed as the trial progressed. As this pattern was seen in control as well as treatment groups, hence the fall cannot be attributed to herbal supplementation. The progress of lactation stage during the trial probably contributed towards the pattern seen in the values of milk calcium. Rook and Campling (1965) observed a fall in milk calcium values as the cows progressed from early to mid lactation.

The milk phosphorus content varied between 66.51 ± 4.15 and 96.76 ± 2.63 mg/dL in the present study. The values reported by Chauhan (1999) ranged between 87.25

Table 1
Calcium and Phosphorus (mg/dL) in the milk of lactating cows treated with herbal supplements and control group (Mean±S.E.)

Group	Mineral	Day 0	Day 15	Day 30	Day 45	Day 60	Day 75
T_0	C	122.40^{a}±3.13	116.25^{ab}±3.97	105.37^{c}±1.18	108.66^{bc}±3.66	105.03^{c}±0.38	106.15^{c}±1.52
	P	73.87^{ab}±1.87	70.46^{b}±1.27	85.74^{a}±8.07	85.07^{a}±5.54	82.54^{aby}±4.34	86.77^{a}±2.64
T_1	C	124.97^{a}±3.61	122.03^{a}±6.80	106.06^{b}±3.61	108.52^{b}±3.54	108.5^{b}±1.22	104.16^{b}±2.83
	P	77.88^{bc}±2.95	73.06^{c}±4.03	77.99^{bc}±4.57	87.99^{ab}±4.71	96.76^{ax}±2.63	89.73^{ab}±4.69
T_2	C	121.13^{a}±2.91	115.30^{ab}±4.81	107.82^{b}±4.07	108.34^{b}±4.47	108.01^{b}±3.29	105.81^{b}±4.85
	P	77.02^{bc}±4.36	66.51^{c}±4.15	76.67^{bc}±4.39	86.85^{ab}±4.70	93.42^{axy}±2.24	87.82^{ab}±3.84
T_3	C	118.43^{a}±2.44	117.80^{a}±3.48	102.82^{b}±2.20	103.17^{b}±2.62	105.75^{b}±1.09	101.42^{b}±1.72
	P	80.58^{ab}±4.76	68.83^{b}±3.61	76.94^{ab}±3.03	88.91^{a}±6.37	89.18^{axy}±5.46	91.67^{a}±5.31

1. Figures with different superscripts (a, b, c) differ significantly ($p<0.05$) between rows for respective mineral.
2. Figures with different superscripts (x, y, z) differ significantly ($p<0.05$) between columns for respective mineral.
3. T_0-Control, T_1- Giloy, T_2-Fenugreek, T_3-Both (Fenugreek+Giloy)

± 1.94 to 92.60 ± 1.51 mg/dL in Jersey crossbred animals. Forar *et al.* (1982) reported an average of 75 mg/dL of inorganic phosphorus in the milk of Holstein cattle. The milk phosphorus values in the case of control (T_0) group with a slight decline on day 15 showed an increase towards completion of the experimental trial. In treatment groups (T_1, T_2 and T_3), the milk phosphorus levels showed a similar trend and continued to rise during supplementation of herbal treatments. The significantly higher values on day 60 in T_1, T_2 and T_3 groups were observed in comparison to day 15 values within respective groups. The T_1 group had a significantly higher phosphorus level in comparison to T_0 group on day 60 of herbal supplementation. The milk phosphorus values in T_2 and T_3 groups on day 60 were also higher. The values remained higher in treatment groups on day 75 also. The increase in milk phosphorus content may be attributed to higher milk yield in Giloy fed group as compared to other groups. Chauhan (1999) reported a higher phosphorus concentration in high yielding Jersey crossbred cows as compared to low yielder cows indicating a relationship between milk yield and milk phosphorus values.

Trace mineral content of milk

The milk iron, copper and zinc (µg/mL) of lactating cows treated with herbal supplements and control are tabulated in table 2.

The milk iron content varied between 1.46 ± 0.06 to 1.89 ± 0.12 µg/mL in the present study. The values reported by Chauhan (1999) ranged between 1.22 ± 0.22 to 1.81 ± 0.24 µg/mL in Jersey crossbred animals. Phukan *et al.* (2002) reported milk iron content as high as 2.57µg/mL in early lactation, which was found to decline with the advancement of the lactation in the Jersey crossbred animals. The milk iron values in control (T_0) and treatment (T_1, T_2 and T_3) groups were marked with a slight decline around the end of the first month and tended to return towards day 0 values during the second month of experimental trial. No effect in treatment groups could be attributed to herbal supplementation.

The milk copper content varied between 0.71 ± 0.08 and 0.89 ± 0.02 µg/mL in lactating cows in the present study. Chauhan (1999) documented a range of 0.51 ± 0.04 to 1.02 ± 0.12 µg/mL for milk copper levels in Jersey crossbred cows. Lonnerdal *et al.* (1981) observed values less than 1 µg/mL for milk copper in cows. Copper values in the case of control (T_0)group were found to be in the range from 0.75 ± 0.02 to 0.89 ± 0.01 µg/mL and were statistically similar within the group. The treatment groups (T_1, T_2 and T_3) group showed a similar trend in milk copper values. There was no significant difference between treatment groups and control during entire study duration. Thus, no change could be attributed to the supplementation of herbal treatments.

Milk zinc content varied between 4.06 ± 0.36 and 5.63 ± 0.20 µg/mL in the present study. Chauhan (1999) reported a range of 3.97 ± 0.16 to 5.92 ± 0.29 µg/mL for milk zinc levels in Jersey crossbred cows. Milk zinc levels were observed in the range of 1-5µg/mL for cows (Lonnerdal *et al.* 1981). Zinc values in the case of control (T_0) group were found to be in normal range and slight variation was observed during the study. However, no specific pattern could be identified. The treatment groups (T_1, T_2 and T_3) group showed a similar trend in milk zinc values. As this pattern was seen in control as well as

Table 2
Iron, Copper and Zinc (µg/mL) in the milk of lactating cows treated with herbal supplements and control group (Mean±S.E.)

Group	Mineral	Day 0	Day 15	Day 30	Day 45	Day 60	Day 75
T_0	Fe	1.89^{a}±0.04	1.66^{a}±0.15	1.62^{a}±0.15	1.75^{a}±0.20	1.83^{a}±0.08	1.89^{a}±0.12
	Cu	0.89^{a}±0.01	0.82^{a}±0.15	0.88^{a}±0.01	0.83^{a}±0.07	0.75^{a}±0.02	0.78^{a}±0.04
	Zn	5.12^{ab}±0.20	5.63^{a}±0.20	5.31^{ab}±0.04	5.30^{ab}±0.21	5.56^{a}±0.24	4.83^{b}±0.15
T_1	Fe	1.84^{a}±0.07	1.72^{a}±0.09	1.50^{a}±0.07	1.80^{a}±0.26	1.62^{a}±0.10	1.66^{a}±0.11
	Cu	0.80^{a}±0.03	0.76^{a}±0.09	0.89^{a}±0.02	0.79^{a}±0.07	0.82^{a}±0.03	0.78^{a}±0.09
	Zn	5.03^{ab}±0.35	5.02^{ab}±0.22	5.01^{ab}±0.32	4.93^{ab}±0.34	5.14^{a}±0.29	4.06^{b}±0.36
T_2	Fe	1.70^{a}±0.11	1.49^{a}±0.12	1.46^{a}±0.06	1.74^{a}±0.15	1.80^{a}±0.09	1.78^{a}±0.12
	Cu	0.87^{a}±0.07	0.75^{a}±0.09	0.87^{a}±0.04	0.75^{a}±0.12	0.82^{a}±0.07	0.71^{a}±0.08
	Zn	5.20^{a}±0.20	5.44^{a}±0.13	5.60^{a}±0.28	5.17^{a}±0.31	5.18^{a}±0.19	4.50^{b}±0.18
T_3	Fe	1.80^{ab}±0.10	1.56^{ab}±0.11	1.52^{b}±0.14	1.62^{ab}±0.18	1.98^{a}±0.19	1.83^{ab}±0.09
	Cu	0.86^{a}±0.01	0.80^{a}±0.09	0.83^{a}±0.02	0.77^{a}±0.03	0.77^{a}±0.10	0.85^{a}±0.17
	Zn	5.06^{ab}±0.14	5.65^{a}±0.25	4.95^{ab}±0.28	5.11^{ab}±0.27	5.42^{a}±0.32	4.49^{b}±0.24

1. Figures with different superscripts (a, b, c) differ significantly ($p<0.05$) between rows for respective mineral.
2. Figures with different superscripts (x, y, z) differ significantly ($p<0.05$) between columns for respective mineral.
3. T_0-Control, T_1- Giloy, T_2-Fenugreek, T_3-Both (Fenugreek+Giloy)

treatment groups, hence the variation cannot be attributed to herbal supplementation.

Conclusively, the increase in milk phosphorus content in Giloy fed group on Day 60 could be attributed to comparatively higher milk yield. Rest of the milk minerals were not much affected by the supplementation of either herb.

REFERENCES

Bhattacharyya, C. and Bhattacharyya, G. (2013). Therapeutic potential of Giloe, Tinosporacordifolia (Willd.) Hook. f. & Thomson (Menispermaceae): The magical herb of Ayurveda. *Int. J. Pharma. Biol. Arch.* **4(4)**: 558-584.

Chauhan, S.S. (1999). Studies on some factors affecting milk minerals in Jersey and crossbred cows. M.V.Sc. Thesis submitted to CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India.

Forar, F.L., Kincaid, R.L., Preston, R.L. and Hillers, J.K. (1982). Variation of inorganic phosphorus in blood plasma and milk of lactating cows. *J. Dairy Sci.* **65**: 760-763.

Gabriela, M.M., Juan, F.M., Victor, H.S., Diana, E.R. and Guillermo, A.M. (2018). Mineral profile of grazing dairy cows feeding in Tobaccoor dairy farms in North western of Argentina. *Dairy Vet. Sci. J.* **6(2)**: doi:10.19080/2018/555684.

Lonnerdal, B., Keen, C.L. and Hurley, L.S. (1981). Iron, Copper, Zinc and Manganese in milk. *Annual Rev. Nutr.* **1**: 149-174

Mahima, R.A., Prakash, A., Verma, A.K., Kumar, V. and Roy, D. (2014). Proximate and elemental analyses of Tinosporacordifolia stem. *Pakistan J. Biol. Sci.* **17(5)**:744-747.

Phukan, M., Baruah, A., Sharma, B.C. and Baruah, K.K. (2002). Mineral concentrations in milk of crossbred (Jersey x Assam Local) cows during different days of lactation. *Indian J. Anim. Res.* **36(1)**: 74-75.

Mohammed, R., Laid, H., Fawziya, T.B., Miloud, A., Mustapha, M.D.I.F. and Mimoun, H. (2014). Proximate composition, crude cellulose and minerals of Trigonella Foenum-Graecum L. seeds cultured in West Algeria. *Global J. Med. Plant Res.* **2(4)**: 1-4.

Rook, J.A.F. and Campling, R.C. (1965). Effect of stage and number of lactation on the yield and composition of cow's milk. *J. Dairy Sci.* **32**: 45-55.

Sehgal, A.B. and Sood, S.K. (2013). Ethnoveterinary practices for herbal cure of livestock used by rural populace of Hamirpur, (H.P.) India. *J. Agri. Vet. Sci.* **3(1)**: 7-14.

Toppo, F.A., Akhand, R. and Pathak, A.K. (2009). Pharmacological actions and potential uses of Trigonellafoenum-graecum: A review. *Asian J. Pharm. Clin. Res.* **2(4)**: 29-38.