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Research Article

EFFECT OF FEEDING GILOY (*TINOSPORA CORDIFOLIA*) AND FENUGREEK (*TRIGONELLA FOENUM-GRAECUM*) ON BLOOD 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 in treatment groups received herbal supplementation mixed with the concentrate feed for 60 days while the control group received only the concentrate. Blood sampling was done fortnightly, from Day 0 to Day 75 and were analyzed for blood mineral composition (Ca, P, Fe, Cu and Zn). Herbal supplementation was not found to impart any significant influence on any of the mineral elements (Ca, P, Fe, Cu and Zn) in the blood plasma of lactating cows.

Keywords: Blood mineral profile, Fenugreek (*Trigonella foenum-graecum*), Giloy (*Tinospora cordifolia*), Jersey crossbred

The Himalayas are a rich repository of medicinal herbs. However, the areas with rich biodiversity remain potentially unexplored. The traditional knowledge about wild and cultivated veterinary medicinal plants used by indigenous people has not been much documented in the state. The present study was conducted with an aim of studying the effect of Giloy (*Tinospora cordifolia*) stem powder and Fenugreek (*Trigonella foenum-graecum*) seed powder on mineral composition (Ca, P, Fe, Cu and Zn) of blood of dairy cows. Calcium serves an important structural function. Intracellular and extracellular ionised calcium changes are often linked and have important secretory and excitatory roles. Phosphorous is needed for bone structure although it also has an important role in cell wall structure, energy storage as ATP, oxygen transport and acid-base balance (Baker and Worthley, 2002). Trace minerals play key roles in immune function, reproduction energy and protein metabolism, enzyme function, cellular repair, integrity and maintenance. Micro-minerals play a significant role in carbohydrate, protein and nucleic acid metabolism as a cofactor/metalloenzyme, thus any change in their level may alter the production of reproductive and other hormones (Kumar *et al.*, 2011).

The Giloy and Fenugreek herbal supplementation may pave the road as therapeutic supplementation for metabolic alterations in animal body system. In order to assess the mineral status in dairy cows after feeding of herbal supplements, it was necessary to conduct an investigation on blood plasma mineral content of cows.

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.

Research trial ingredients

The Giloy (*Tinospora cordifolia*) stem was collected from areas nearby Palampur and was dried, ground and stored properly before the start of the experiment. The Fenugreek (*Trigonella foenum-graecum*) seeds were procured from the local market and were 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 7 years for the cows in the group. The herbal treatments were administered at a fixed time daily i.e. afternoon

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

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

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milking hours, to all the animals till day 60 of the experimental trial as per details given in the table below:

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

Group	Treatment and 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 blood samples and analysis

Blood samples were collected in clean screw capped heparinised centrifuge tubes by aseptic venipuncture technique. Blood 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. The harvested blood plasma was then stored at -20 ºC till further analysis.

The concentration of Calcium (Ca) and Phosphorus (P) in blood were estimated using commercially available kits (Agappe Diagnostics Ltd., Agappe Hills, Distt. Ernakulam Kerala, India) by automatic blood chemistry analyzer (Mispa Nano, Agappe) using the plasma samples of experimental animals. Iron (Fe), Copper (Cu) and Zinc (Zn) were determined by using Atomic Absorption Spectrophotometer (Perkin Elmer 400) as per the standard protocol.

The results 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

The plasma calcium values obtained in the present study (Table 1) were found to be in a normal range of 8.0–11.4 mg/dL (Kahn *et al.*, 2010). The values ranged between 8.05±0.08 and 8.67±0.22 mg/dL.The obtained values were in normal physiological range in the present study. The calcium values in blood plasma of control (T_0) and treatment groups (T_1, T_2 and T_3) were statistically similar and no particular trend was observed in any of the groups during the trial. No significant change was observed to have occurred due to herbal supplementation. The plasma phosphorus values obtained in this study (Table 1) were also found to be falling in the normal range (5.6 to 6.5 mg/dL) as given by Kaneko *et al.* (2008). The blood phosphorus values in the case of control (T_0) and treatment groups (T_1, T_2 and T_3) varied in normal range and were found to be statistically similar. Thus, no change was observed in blood phosphorus levels due to supplementation of herbal treatments.

The plasma iron values obtained in present study (Table 2) ranged between 1.87±0.06 and 2.30±0.08µg/mL. The reference range as given by Kaneko *et al.* (2008) for plasma iron value in cattle is between 0.57 and 1.62 µg/mL. The values of plasma iron values found in the present study is more in agreement with those reported by Bais (2009) in Jersey crossbred heifers (1.91±0.15 to 2.09±0.10 µg/mL). The blood plasma iron values in control (T_0) and treatment groups (T_1, T_2 and T_3) were observed to follow no particular trend during the supplementation of herbal treatments. The plasma copper values obtained during the experimental trial (Table 2) were found to be between 0.43±0.02 and 0.57±0.02 µg/mL. These values are higher than the range (0.328 to 0.352 µg/mL) observed by Kaneko *et al.*, 2008. Bais (2009) reported a range of 0.60±0.02 to 0.84±0.04 in Jersey crossbred heifers. No specific trend was discernible in the blood plasma copper values in control (T_0) and treatment groups (T_1, T_2 and T_3). Bais (2009) reported blood zinc levels between 0.87±0.01 and 1.01±0.04 µg/mL in Jersey crossbred heifers. Hussain *et al.* (2003) reported the mean value for serum zinc to be1.25±0.13 µg/mL. Pankaj *et al.* (2003) documented that serum zinc levels in buffaloes were found to be 1.25±0.13 µg/mL. The values obtained in this study were lower than the reported values. The blood plasma zinc values in control (T_0) and treatment groups (T_1, T_2 and T_3) did not show any particular trend

Table 1

Calcium and Phosphorus (mg/dL) in the blood plasma of 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	Ca	8.28^{a}±0.04	8.15^{a}±0.07	8.35^{a}±0.16	8.20^{a}±0.04	8.15^{a}±0.06	8.43^{a}±0.11
	P	6.20^{a}±0.16	6.25^{a}±0.25	6.05^{a}±0.30	6.25^{a}±0.32	6.15^{a}±0.20	6.23^{a}±0.12
T_1	Ca	8.05^{a}±0.16	8.40^{a}±0.18	8.53^{a}±0.22	8.50^{a}±0.25	8.47^{a}±0.19	8.67^{a}±0.22
	P	6.12^{a}±0.09	6.07^{a}±0.15	6.10^{a}±0.07	6.03^{a}±0.25	6.32^{a}±0.20	6.22^{a}±0.32
T_2	Ca	8.05^{b}±0.08	8.23^{ab}±0.14	8.20^{ab}±0.13	8.20^{ab}±0.13	8.40^{ab}±0.14	8.58^{a}±0.08
	P	6.07^{a}±0.29	6.10^{a}±0.26	6.17^{a}±0.33	6.10^{a}±0.32	6.12^{a}±0.37	6.33^{a}±0.14
T_3	Ca	8.28^{ab}±0.13	8.10^{ab}±0.29	8.16^{b}±0.12	8.14^{ab}±0.12	8.13]±0.22	8.48^{a}±0.13
	P	6.03^{a}±0.42	6.03^{a}±0.39	6.12^{a}±0.30	6.13^{a}±0.21	6.17^{a}±0.23	6.25^{a}±0.34

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	1.91^{a}±0.02	1.87^{a}±0.06	2.03^{a}±0.07	2.09^{a}±0.14	2.09^{a}±0.14	1.93^{a}±0.05
	Cu	0.43^{b}±0.02	0.48^{abxy}±0.03	0.53^{a}±0.00	0.48^{ab}±0.01	0.48^{ab}±0.02	0.50^{a}±0.02
	Zn	0.53^{ab}±0.01	0.57^{a}±0.02	0.51^{b}±0.01	0.53^{ab}±0.02	0.50^{b}±0.02	0.52^{aby}±0.02
T_1	Fe	1.91^{a}±0.12	1.91^{a}±0.09	2.02^{a}±0.24	2.19^{a}±0.05	2.05^{a}±0.07	1.96^{a}±0.09
	Cu	0.48^{a}±0.03	0.55^{axy}±0.05	0.54^{a}±0.04	0.49^{a}±0.04	0.49^{a}±0.05	0.53^{a}±0.04
	Zn	0.53^{a}±0.03	0.53^{a}±0.04	0.57^{a}±0.07	0.52^{a}±0.06	0.58^{a}±0.04	0.63^{ax}±0.03
T_2	Fe	2.06^{a}±0.09	2.09^{a}±0.17	2.23^{a}±0.07	2.30^{a}±0.13	2.30^{a}±0.08	2.28^{a}±0.17
	Cu	0.48^{b}±0.02	0.57^{ax}±0.02	0.56^{a}±0.02	0.45^{b}±0.01	0.48^{b}±0.03	0.51^{ab}±0.03
	Zn	0.55^{a}±0.03	0.62^{a}±0.06	0.64^{a}±0.06	0.56^{a}±0.04	0.56^{a}±0.06	0.61^{ax}±0.02
T_3	Fe	2.01^{bc}±0.09	1.93^{c}±0.07	1.98b^{c}±0.09	2.32^{a}±0.04	2.22^{ab}±0.06	2.29^{a}±0.12
	Cu	0.44^{b}±0.02	0.45^{aby}±0.03	0.51^{a}±0.02	0.46^{ab}±0.02	0.43^{b}±0.02	0.45^{ab}±0.01
	Zn	0.53^{b}±0.02	0.60^{a}±0.02	0.57^{ab}±0.03	0.52^{b}±0.02	0.58^{ab}±0.03	0.63^{ax}±0.02^{a}

1. Figures with different superscripts (a, b, c) differ significantly ($p<0.05$) within rows for respective mineral.
2. Figures with different superscripts (x, y, z) differ significantly ($p<0.05$) within columns for respective mineral.

T_0-Control, T_1- Giloy, T_2-Fenugreek, T_3-Both (Fenugreek+Giloy)

during the experimental trial.

Conclusively, no specific trend could be seen in the values of the blood plasma minerals (Ca, P, Fe, Cu and Zn). However, some variations in their values were observed during the course of experiment. The changes were similar in control as well as treatment groups. It is thus concluded that the supplementation of *Tinospora cordifolia* or *Trigonella foenum-graecum* did not lead to any significant changes in blood mineral profile of Jersey crossbred lactating cattle.

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