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Feeding Effects of Fenugreek Seeds (*Trigonella foenum-graecum* L.) on Lactation Performance, Some Plasma Constituents and Growth Hormone Level in Goats

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Abstract: This study was conducted to evaluate the effect of fenugreek feeding on milk production in lactating goats. Twelve lactating local Saudi goats from the Zumri breed in early lactation were divided into two groups depending on lactation week and parity. Six goats were fed with 60 g day⁻¹ of fenugreek seeds powder for seven weeks while the other six goats served as controls. Milk yield was recorded daily and blood samples were collected twice a week. Also, blood samples were taken every 15 min for 6 h during fenugreek treatment. Milk yield was found to be significantly higher ($p < 0.05$) in the treated group (1236±38 vs. 1093±43 mL day⁻¹). Fenugreek fed goats exhibited significantly lower plasma levels of glucose ($p < 0.05$) and urea ($p < 0.01$) compared to control group. Mean plasma levels of growth hormone during six hours bleeding were significantly higher ($p < 0.05$) in the fenugreek treated goats compared to control (0.27±0.09 and 0.21±0.02 ng mL⁻¹, respectively). It could be concluded that Fenugreek feeding increased milk production in goats and this effect might be mediated via growth hormone stimulation.

Key words: Fenugreek, milk production, goats, growth hormone

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is a member of a legume family that is cultivated in various parts of the world particularly in India, Middle East, North Africa and south Europ. The seeds of this herb have been used in traditional medicine to promote lactation in lactating women^[1,2]. Also, this herb has been shown to influence the lactation performance in ruminants. In buffaloes, fenugreek seeds feeding increased milk yield but without any effects on milk composition except for a tendency of lower fat content^[3]. In goats, feeding 10 g day⁻¹ of fenugreek seeds increased milk yield^[4]. Despite the confirmation of its effect on milk production, the mechanism by which fenugreek increase milk production is not elucidated. Therefore, this study was designed to evaluate the effect of fenugreek on lactation performance in goats and to determine the possible mechanism of action of fenugreek on milk production through the determination of growth hormone level.

MATERIALS AND METHODS

The experiment was carried out at the Agricultural and Veterinary Research and Training Station of King Faisal University in Alhassa area. The study was done

during spring (April and May), 2001. Twelve lactating goats of Zumri breed with different parities from the university herd were used. They were in their third to fifth week of lactation and with an average body weight of 28.4±1.3 kg. After kidding, kids were kept with their dams for 10 days before separating from each other. Then, they were kept in individual pens where they can be hand milked twice daily at 06:00 and 17:00 h. Milk production was recorded at each milking. Milk samples were taken every two weeks for fat determination^[5]. Each doe was fed with 500 g of commercially formulated concentrate (14.5% CP) with alfalfa hay and water provided *ad libitum* (Table 1).

This management system was maintained for two weeks. Goats were divided into two equal groups each consists of six goats based on their milk yield and parity. One group received 60 g of ground fenugreek that was replaced by an amount of concentrate mixture to provide

Table 1: Chemical composition of dietary ingredients

Items	Concentrate mixture	Fenugreek seeds	Alfalfa hay
Dry matter (%)	89.0	91.0	92.0
Ash (%)	09.7	04.2	09.8
Ether extract (%)	03.1	05.0	02.4
Crude protein (%)	14.5	26.0	14.6
Crude fiber (%)	03.1	-	25.0
Gross energy (Kcal)	03.8	03.0	03.7

a 74 g of crude protein. The diets in both groups were calculated to be isonitrogenous. The other group was served as a control which received a concentrate mixture of 72 g crude protein. Both groups were provided with 2 kg day⁻¹ of alfalfa hay. Goats were bled from the jugular vein into heparinized vacutainers twice each week and the plasma was immediately obtained and stored at -18°C until analysis. For serial blood sampling, they were collected by an indwelling jugular vein cannula during the fourth week of fenugreek feeding. They were bled every 15 min for 6 h in the morning time and a saline solution containing sodium citrate was used after each blood collection for flushing the cannula. Blood samples (weekly) were analyzed for glucose by commercial kit (glucose oxidase, Biosystems, Barcelona, Spain) and urea (United Diagnostics Industry, Dammam, Saudi Arabia). Total protein was determined by a refractometer (Schuco, Japan). Serial blood samples were assayed for growth hormone (GH) content. Plasma GH levels were measured by radioimmunoassay using oGH for iodination and standards and oGH antisera supplied by NIADDK^[6]. Inter and intra assay coefficients of variation were 7.3 and 6.9%, respectively.

Data were analyzed by General Linear Model (GLM) procedure of the statistical analysis system^[7]. The data are presented as means±SE

RESULTS

Milk yield in both groups during the pre-treatment period was similar (1365±131 and 1391±98 mL day⁻¹ for control and treated groups, respectively). However, initiation of fenugreek feeding produced a clear effect on milk yield from the first week, which continued throughout the treatment period (Table 2). Therefore, the average milk yield in the treated group was significantly higher compared to the control (1236±38 vs. 1093±43 mL day⁻¹; p<0.05). Fenugreek treatment did not affect milk fat percentage (Table 3) since there was not any difference between the two groups. However, there was

Table 2: Effect of fenugreek feeding on milk yield in lactating goats (n=6)

Treatment week	Groups	
	Control	Fenugreek treated
0	1365±131	1391±98
1	1219±112	1338±91
2	1256±103	1340±105
3	1168±122	1338±107
4	1127±112	1226±86
5	990±104	1173±86
6	980±119	1148±106
7	909±106	1091±117

Table 3: Effect of fenugreek feeding on milk fat percentage in lactating goats

Treatment week	Groups	
	Control	Fenugreek treated
0	3.49±0.11	3.08±0.17
1	2.65±0.23	2.30±0.19
3	3.40±0.10	3.23±0.13
5	2.86±0.26	2.58±0.22
7	2.97±0.16	2.68±0.28

Table 4: Effect of fenugreek feeding on some plasma constituents in lactating goats

Parameter	Groups	
	Control	Fenugreek treated
Glucose (mg dL ⁻¹)	57.5±1.0	54.2±1.0*
Urea (mg dL ⁻¹)	50.8±1.3	42.8±1.3**
Total protein (g dL ⁻¹)	6.7±0.05	6.8±0.08
Growth hormone (ng mL ⁻¹)	0.21±0.02	0.27±0.09*

*<0.05, **<0.01 vs. control group, n=6

a tendency of lower milk fat percentage during pre and post treatment in the fenugreek treated group. Apparently fenugreek has affected the circulating plasma glucose concentration since it was significantly (p<0.05) lower in the group that received fenugreek (Table 4). Plasma urea concentration followed the same trend, as it was significantly lower (p<0.01) in the fenugreek-treated goats. Plasma total protein was not affected by fenugreek feeding since there was no difference in plasma total protein levels between control and treated groups (Table 4). Mean plasma GH concentrations during the six hours of frequent bleeding were found to be significantly higher (p<0.05; Table 4) in the fenugreek fed goats compared to control.

DISCUSSION

In this study, it is shown that fenugreek feeding resulted in an increase in milk yield compared to the group without fenugreek. Although the effect was modest, but it was clear and the treated group maintained their yield above that of control. Results of this study agree with those of other researchers, who reported that fenugreek feeding increased milk production in buffaloes and goats^[8-11]. Several attempts have been made to elucidate the mechanism by which fenugreek affect milk production. It has been proposed that the galactopoietic effect of fenugreek might be mediated through an increase in feed intake^[9]. Nonetheless, others did not observe any changes in feed intake with fenugreek feeding^[9]. In the latter study, feed intake was rather reduced by fenugreek, yet this did not prevent the stimulatory action of this herb on milk yield.

Stimulation of endogenous hormone secretion could be hypothesized through a mechanism by which fenugreek exerts its action on milk yield. In buffaloes, fenugreek feeding increased plasma levels of prolactin^[9]. However, the role of this hormone in the lactating ruminant is not clear and far away from understanding^[12,13]. Present results indicate that growth hormone might be a possible candidate as a mediator of fenugreek action on milk production. This finding disagrees with other finding^[9] who could not detect any effect of fenugreek on growth hormone levels in the plasma. This might have been caused by inadequate blood samplings due to the pulsatile pattern of GH release. To our knowledge, this is the first report in which GH levels are reported to increase in response to fenugreek feeding. Unlike prolactin, GH is known to have a strong galactopoietic effect on lactation performance in ruminants since the exogenous administration of bovine somatotropin stimulates milk yield^[14].

The results of this study showed that fenugreek feeding resulted in a decrease in plasma levels of glucose. Several reports have indicated that fenugreek treatment resulted in a hypoglycemia in different species such as humans^[15], rats^[16] and rabbits^[17]. Therefore, this herb has been used in the control of blood glucose levels in diabetic subjects since it contains some constituents that possess hypoglycemic properties^[1].

Plasma urea was maintained at a lower level in the treated group throughout fenugreek feeding. Others could not detect any changes in this blood metabolite with fenugreek treatment^[9]. The observed decrease in plasma urea levels during fenugreek feeding in this study cannot be explained at the present time. However, this might suggest possible alterations of the rate of urea synthesis, recycling to the rumen or excretion that might have been induced by fenugreek feeding.

It could be concluded that feeding fenugreek seeds to lactating goats increased milk production by 13% and GH plasma levels was also increased. This increase in GH levels represents a possible endocrine mechanism for the galactopoietic effect of fenugreek.

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