

## FEEDING EFFECTS OF FENUGREEK SEEDS (*Trigonella Foenum- Graceum* ) ON LACTATION PERFORMANCE, SOME SERUM CONSTITUENTS AND PROLACTIN HORMONE LEVEL IN DAMASCUS CROSSBRED GOATS

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### ABSTRACT

This study was conducted to evaluate the effect of fenugreek feeding on milk production , serum constituents and prolactin hormone in lactating Damascus crossbred goats. Eighteen lactating goats in early lactation were divided randomly into three groups . First group was left without treatment as control group . The second and third groups received 4% and 6% fenugreek seeds powder respectively . Milk yield was recorded daily and blood samples were collected weekly . Milk yield was found to be significantly higher ( $p < 0.05$ ) while there was a significant decrease ( $P \leq 0.05$ ) in the milk fat percentage in the treated groups as compared with control group. Fenugreek fed goats exhibited significantly lower serum glucose ( $p < 0.05$ ) and urea ( $p < 0.01$ ) as compared to control group. Mean serum levels of total protein and prolactin hormone were significantly higher ( $p < 0.05$ ) in the fenugreek treated goats as compared to control . It could be concluded that Fenugreek feeding increased milk production in Damascus crossbred goats and this effect might be mediated via prolactin hormone stimulation.

**Key word** : Fenugreek seeds , Milk production , Goats , Prolactin hormone

### INTRODUCTION

Fenugreek (*Trigonella Foenum- Graceum* ) 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 ( Shapiro and Gong , 2002). The seeds of this herb have been used in traditional medicine to promote lactation in lactating women (Shane-McWhorter , 2001 ; Tiran, 2003 ) . Also, this herb has been shown to influence the lactation performance in ruminants. In buffaloes, feeding fenugreek seeds increased milk yield , without any effects on milk compositions except for a tendency of lower fat content(El-Alamy, *et al.* 2001 ) . In goats, feeding 10 g day<sup>-1</sup> of fenugreek seeds increased milk yield ( Khohf and Abd El-Gawad, 2001). Despite the confirmation of its effect on milk production, the mechanism by which fenugreek increase milk production is not elucidated (Khohf and Abd El-Gawad , 2001) . Therefore, this study was designed to evaluate the effect of fenugreek seed on lactation performance and some blood attributes in Damascus crossbred goats and to determine the possible mechanism of action of fenugreek on milk production through the determination of prolactin hormone level.

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## MATERIALS AND METHODS

The experiment was carried out at the Department of Animal Resources/College of Agriculture/ University of Tikrit,. The study was done during spring (April and May), 2009. Eighteen lactating goats of Damascus crossbred breed of 2-3 years of age and average body weight of  $26.97 \pm 0.77$  kg were used in this study . 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 milked handly daily at 07:00 h Am. Milk production was recorded at each milking. Milk samples were collected every two weeks for fat determination (Fleet and Linzell , 1964 ) . Each doe was fed with 1000 g of commercially formulated concentrate (Table 1) , in addition to roughage and to grazing in the Department fields.

**Table 1:** *The composition of dietary ingredients .*

Items	Diets Groups		
	Control	First	Second
Barley (%)	٤٧	٤٥	٤٤
Wheat bran (%)	٤٢	٤١	٤٠
Soya Beans Meal (%)	٨	٧	٧
Fenugreek seeds (%)	Zero	٤	٦
Calcium carbonate (%)	٢	٢	٢
salt (%)	١	١	١
Crud protein (%)	١٤.٥٧	١٣.٧٧	١٣.٥٢

Goats were divided randomly into three equal groups , The first group was left without treatment as control group , with the second and third groups received 4 % and 6 % of fenugreek seeds respectively .

Blood was collected via jugular vein weekly and the serum was immediately harvested and stored at  $-18^{\circ}\text{C}$  until analysis.. Blood glucose was estimated using enzymatic colorimetric kit (Randox, U.K.) according to Coopers method ( 1973 ). Blood urea was estimated by using enzymatic colorimetric method (Berthelot modified method) by using an enzymatic kit Biomagreb-Morocco. Serum total protein was measured colorimetrically by a kit supplied from ( Biomerieux, France) according to Green *et al.*( 1982 ). The serum prolactin hormone were measured by radioimmunoassay using prolactin for iodination and standards and prolactin antisera supplied by NIADDK.

The statistical analysis system (SAS, 2001) was used for least square of variance for repeated measures of milk yield, milk composition, parameters and data of blood serum analysis. The following model was applied:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

$\mu$  = Grand mean of treatment population .

$T_i$  = Effect of treatment (First group = Control ; Second group = 4% Fenugreek seed ; Third group = 6% Fenugreek seed ) .

$e_{ij}$  = Experimental error .

## RESULTS

Milk yield in was similar in all groups during the pre-treatment period ( $300.00 \pm 31.81$  ,  $325.00 \pm 36.33$  and  $355.83 \pm 30.23$  ml day<sup>-1</sup> for control , first and second

**Table 2 :** *Effect of fenugreek feeding on milk yield ( ml / day ) in lactating Damascus crossbred goats ( Mean  $\pm$  S.E. ) .*

Treatment week	Groups		
	( n = 6) Control	( n = 6) First	( n = 6) Second
First	$300.00 \pm 31.81$ a	$325.00 \pm 36.33$ a	$355.83 \pm 30.23$ a
Second	$303.33 \pm 33.34$ a	$401.67 \pm 83.85$ a	$430.83 \pm 29.02$ a
Third	$307.50 \pm 28.86$ b	$415.66 \pm 86.77$ ab	$520.00 \pm 58.03$ a
Fourth	$304.17 \pm 23.40$ b	$427.50 \pm 88.33$ ab	$519.17 \pm 70.86$ a
Fifth	$312.50 \pm 24.25$ b	$439.17 \pm 89.39$ ab	$525.00 \pm 64.21$ a
Sixth	$310.83 \pm 21.70$ b	$451.66 \pm 89.10$ ab	$537.50 \pm 62.37$ a
Seventh	$306.67 \pm 21.72$ b	$462.50 \pm 89.22$ ab	$545.00 \pm 64.72$ a
Eighth	$319.17 \pm 20.67$ b	$475.83 \pm 92.51$ ab	$570.83 \pm 69.01$ a

Means with different superscripts within each row were significantly different ( $p < 0.05$ ).

groups respectively ). However, initiation of 6% fenugreek feeding produced a clear effect on milk yield from the third week ( $415.66 \pm 86.77$  and  $520.00 \pm 58.03$  ml day<sup>-1</sup> for first and second groups respectively ) as compared with control group ( $307.50 \pm 28.86$  ml day<sup>-1</sup> ), which continued throughout the treatment period (Table 2).

Therefore, the average milk yield in the treated Second group was significantly higher ( $P \leq 0.05$ ) than to the control from Second to eighth weeks , while there was a significant decrease ( $P \leq 0.05$ ) in the milk fat percentage in first and second groups ( $3.88 \pm 0.03$  ,  $3.88 \pm 0.03$  ;  $3.77 \pm 0.02$  ,  $3.77 \pm 0.02$  % second and fourth week respectively ) as compared with control group ( $3.92 \pm 0.02$  ,  $3.91 \pm 0.02$  % in second and fourth week respectively ) . while there was a significant decrease ( $P \leq 0.05$ ) in the milk fat percentage in second group as compared with first and control groups in the sixth and eighth weeks (Table 3) . There was a tendency of lower milk fat percentage with increase of percentage of the fenugreek seed in diet .

**Table 3 :** Effect of fenugreek feeding on milk fat percentage ( % ) in lactating Damascus crossbred goats ( Mean  $\pm$  S.E. ) .

Treatment week	Groups		
	( n = 6) Control	( n = 6) First	( n = 6) Second
Second	$3.92 \pm 0.02$ a	$3.88 \pm 0.03$ a	$3.77 \pm 0.02$ b
Fourth	$3.91 \pm 0.02$ a	$3.88 \pm 0.03$ a	$3.79 \pm 0.02$ b
Sixth	$3.67 \pm 0.05$ a	$3.43 \pm 0.22$ ab	$3.08 \pm 0.22$ b
Eighth	$3.40 \pm 0.01$ a	$3.02 \pm 0.21$ ab	$2.78 \pm 0.21$ b

Means with different superscripts within each row were significantly different ( $p < 0.05$ ).

Apparently fenugreek has affected the circulating serum glucose concentrations since it was significantly ( $p < 0.05$ ) lower in fenugreek treated (Table 4). Serum urea concentration followed the same trend, as it was significantly lower ( $p < 0.01$ ) in the fenugreek treated goats. The serum total protein level has a increased ( $P \leq 0.05$ ) in treated groups as compared to control group (Table 4). Mean serum prolactin hormone concentrations were found to be significantly higher ( $p < 0.05$ ) in the fenugreek fed goats compared to control (Table 4).

**Table 4** : Effect of fenugreek feeding on some serum constituents in lactating Damascus crossbred goats ( Mean  $\pm$  S.E. ).

Parameter	Groups		
	( n = 6) Control	( n = 6) First	( n = 6) Second
Glucose ( mg dl <sup>-1</sup> )	59.01 $\pm$ 1.31 a	57.00 $\pm$ 1.17 a	41.40 $\pm$ 2.71 b
Total protein ( g dl <sup>-1</sup> )	6.73 $\pm$ 0.31 b	7.30 $\pm$ 0.43 ab	8.23 $\pm$ 0.36 a
Urea ( mg dl <sup>-1</sup> )	60.45 $\pm$ 1.98 a	54.62 $\pm$ 1.93 b	44.85 $\pm$ 1.62 c
Prolactin hormone ( ng ml <sup>-1</sup> )	2.71 $\pm$ 0.41 b	3.26 $\pm$ 0.47 ab	4.48 $\pm$ 0.50 a

Means with different superscripts within each row were significantly different ( $p < 0.05$ ).

## DISCUSSION

In this study, it is shown that fenugreek feeding resulted in an increase in milk yield as compared to control group. Although, the effect was modest, but it was clear that treated groups maintained their yield above that of control. These results were agree with those of other researchers, who reported that fenugreek feeding increased milk production in buffaloes (Tomar *et al.*, 1996) and goats (Al-Shaikh *et al.* 1999). Several attempts have been made to elucidate the mechanism by which fenugreek seed affect milk production. It has been proposed that the galactopoietic effect of fenugreek might be mediated through an increase in feed intake (Tomar *et al.*, 1996). Nonetheless, others did not observe any changes in feed intake with fenugreek feeding (Abo EL-Nor, 1999). In the latter study, feed intake was rather reduced by fenugreek, it 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 (Abo EL-Nor, 1999). However, the role of this hormone in the lactating ruminant is not clear enough to understand (Hart, 1973; Forsyth and Lee, 1993). Present results indicate that prolactin hormone might be a possible candidate as a mediator of fenugreek action on milk production. The increase in prolactin hormone levels represents a possible endocrine mechanism for the galactopoietic effect of fenugreek.

The results of this study showed that fenugreek feeding resulted in a decrease in serum levels of glucose. Several reports have indicated that fenugreek treatment resulted in a hypoglycemia in different species such as humans (Vasanthamani and Savita, 2001), rats (Ajit *et al.*, 2003) and rabbits (Satayanarayana *et al.*, 2003). 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 (Shane-McWhorter , 2001 ).That the fenugreek seeds posses an insulin – like compounds may due to the presence of several compounds in fenugreek seeds which enhances its effects in this regard (Sauvaire *et al.* , 1998) . The increase in total protein may be due to nourishing effect and improved digestion effect for fenugreek seeds (EL-Ashry *et al.* 2006 ) .

Serum urea was maintained at a lower level in the treated groups throughout fenugreek feeding. Others could not detect any changes in this blood metabolite with fenugreek treatment (Abo EL-Nor , 1999 ) . The observed decrease in serum urea levels during fenugreek feeding in this study cannot be explained presently . 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 (Tekeli *et al.* , 2007 ) .

## CONCLUSIONS

Fenugreek seed supplementation could be recommended as new tool ( feed additives ) for improving milk production and compositions lactating goats .

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## تأثير التغذية ببذور الحلبة (*Trigonella Foenum- Graceum*) على إنتاج الحليب وبعض مكونات مصل الدم ومستوى هرمون البرولاكتين لدى الماعز المضرب الشامي .

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### المستخلص

أجريت هذه الدراسة لتقييم تأثير التغذية ببذور الحلبة على إنتاج الحليب وبعض صفات الدم ومستوى هرمون البرولاكتين لدى الماعز المضرب الشامي استخدمت ثمانية عشر من الماعز في بداية موسم الحليب ، قسمت عشوائياً إلى ثلاث مجاميع عدت إحداها مجموعة سيطرة بدون إضافة في حين عوملت المجموعتين الأولى والثانية بإضافة بذور الحلبة إلى علائقها بمستوى ٤ و ٦ % على التوالي .سجل إنتاج الحليب سجل في حين جمعت عينات الدم أسبوعياً .ارتفع إنتاج الحليب معنوياً ( $p<0.05$ ) بينما حصل انخفاض معنوي ( $p<0.05$ ) في نسبة دهن الحليب في المجاميع المعاملة ببذور الحلبة مقارنة بمجموعة السيطرة . كما أظهرت النتائج انخفاض معنوي ( $p<0.05$ ) في مستوى الكلوكوز ويوريا الدم ( $p<0.01$ ) لدى الحيوانات المعاملة مقارنة بمجموعة السيطرة وبينت النتائج أيضا ارتفاع معنوي ( $p<0.05$ ) في مستوى البروتينات الكلية وهرمون البرولاكتين في مصل الدم لدى الحيوانات التي غذيت على بذور الحلبة . يمكن الاستنتاج إن التغذية ببذور الحلبة تزيد من إنتاج الحليب في الماعز المضرب الشامي وقد يكون هذا التأثير من خلال تحفيز هرمون البرولاكتين .

**الكلمات المفتاحية :** بذور الحلبة ، إنتاج الحليب ، الماعز ، هرمون البرولاكتين .