

EFFECT OF FENUGREEK SEEDS (*Trigonella foenum-graecum* L.) AS FEED ADDITIVE ON GOAT MILK PRODUCTION AND COMPOSITIONS IN THE NORTH WESTERN COAST OF EGYPT

Attia-Ismail, S.A.

Department of Animal and Poultry Nutrition, Desert Research Center,
P.O. Box 11753, Matareya, Cairo, Egypt

ABSTRACT

As a consequence to the ban to be imposed on the use of chemical rumen modifiers, researchers started to look for natural ones

This work is an attempt to use the seeds of a natural herb in animal nutrition. The effect of fenugreek seeds (*Trigonella foenum*) on milk production and compositions of lactating goats was targeted in this study. Twenty seven lactating goats in their early lactation were divided into three groups according to live body weight (29.2 ± 1.310 , 29.40 ± 1.756 and 29.00 ± 1.432 Kg for 1st, 2nd and 3rd groups, respectively) of nine animals each. Two groups randomly received either 10 or 30 g/h/d of fenugreek seeds, while the first group was the control. The experiment lasted for 70 days. Feed intake of ration ingredients and total dry matter intake (1585.4, 1600.4 and 1610.8 g/h/d for 1st, 2nd, and 3rd groups, respectively) did not differ among the three groups. Milk production increased as a result of supplementing rations with fenugreek seeds. The lower level of seeds (10 g/h/d) showed the highest level of milk production (684 ml/h/d) followed by the 30 g/h/d seeds level (526.2 ml/h/d). Efficiency of feed conversion into milk (Kg feed DM/ Kg milk) was the highest for the 10 g/h/d seeds level. It appears that fenugreek seeds increased milk production by improving feed efficiency. Milk composition was not affected by the addition of fenugreek seeds.

It is concluded that fenugreek seeds as a potential feed additive may exert a positive effect on milk production, yet further studies are warranted.

Keywords: herbal plants, fenugreek seeds, milk production, goats

INTRODUCTION

As a consequence to the ban to be imposed on the use of chemical rumen modifiers, researchers all over the world started to look for natural ones. Herbal medicinal plants were the first option for their widespread use in human nutrition and medicine. Fenugreek seeds are traditionally used in Egypt for women after birth on the believe that it increases milk secretion. Fenugreek, however, is a leguminous plant rich in protein. The seeds contain alcoholic compounds that act like Oxytocin hormone (Petit et al, 1995) which may increase milk secretion. Fenugreek increases feed conversion efficiency (Attia-Ismail, 2000 and Abo-Donia, 2003).

This study was carried out as a preliminary study to examine the use of the herbal plant fenugreek seeds when fed to lactating goats in the North Western Coast of Egypt.

MATERIALS AND METHODS

This experiment was conducted at Maryout Experimental Station, DRC, 35 Km south of Alexandria. Twenty seven pregnant mountainous Syrian goats were randomly selected. Once animals gave birth, they were divided into three similar groups according to live body weight (29.2 ± 1.310 , 29.40 ± 1.756 and 29.00 ± 1.432 Kg for 1st, 2nd and 3rd groups, respectively) of nine animals each. Animal groups were kept in large pens. Experimental groups were randomly allocated in pens. Animal groups were, then, assigned randomly to experimental treatments for 70 days.

Requirements of animals (for both maintenance and milk production) were provided according in a group feeding system. Additional 10% of feed over the requirements were allowed to animals. First group was considered as a control group, second had 10 g/h/d of fenugreek seeds, while the third group had 30 g/h/d of fenugreek seeds. Animals were fed on traditional diet. Concentrate to roughage ratio was 60:40. Concentrate portion consisted of 60% concentrate feed mixture (CFM) and 40% barley grains. The roughage portion (40%) was berseem (*Trifolium alexandrinum*) hay. Table (1) shows the chemical composition of ration ingredients. Diets were formulated on TDN and DCP basis for lactating goats according to Kearn, (1982) and were given twice daily at 7.00 and 15.00. Water was available at all times for animals. Feed refusals were collected on daily basis, weighed, therefore, feed intake was recorded. Fifty ml of milk was reserved for analysis.

Milk production was recorded on weekly basis and 50 ml was reserved for analysis. Kids were separated for two consecutive milkings (morning and evening). Dams were milked by hand and milk production was measured. The hand-milked milk was fed, then, to kids by plastic bottle.

Feeds and orts as well as milk samples were analyzed according to A.O.A.C. (1990). The GLM procedures of SAS package (SAS, 1985) were employed to statistically analyze the obtained data.

Table 1. Chemical composition of ration ingredients

Feed ingredient	DM, %	DM basis, %					
		CP	ADF	NDF	EE	NFE	Ash
Berseem hay	88.21	13.11	49.05	65.01	2.44	43.41	13.93
CFM*	89.13	13.41	27.96	69.85	3.41	58.77	11.19
Barley grains	89.40	8.28	13.99	34.78	2.79	77.54	3.00
Fenugreek seeds	92.11	27.01	22.16	50.91	6.49	53.02	4.12

*CFM = concentrate feed mix consisted of yellow corn 10%, undecorticated cotton seed meal 10%, wheat bran 22%, rice bran 38%, extruded sun flower meal 10.5%, venasses 6%, and vitamins and minerals 4.5%

RESULTS AND DISCUSSION

Table (2) shows the feed intake of goats. None of the experimental animal groups showed significant differences. Intakes of different ration ingredients were almost identical. Similar body weights of animals could be attributable.

Table 2: Feed intake of lactating goats fed rations containing two levels of fenugreek seeds

	Experimental treatments			Sig.
	Control	10 g seeds	30 g seeds	
Average BW, Kg	29.2±1.310	29.40± 1.756	29.00±1.432	
CFM, g/h/d	543.67	544.29	544.29	NS
g/BW ^{0.75}	43.28	43.45	43.55	
Barley grains, g/h/d	363.98	364.78	359.69	NS
g/BW ^{0.75}	28.98	29.12	28.78	
Berseem hay, g/h/d	677.74	682.13	679.23	NS
g/BW ^{0.75}	53.96	54.46	54.35	
Fenugreek seeds, g/h/d	--	9.20	27.60	NS
g/BW ^{0.75}	--	0.73	2.30	
Total DMI, g/h/d	1585.39	1600.4	1610.81	NS
g/BW ^{0.75}	125.22	127.77	128.9	

NS= not significant

Milk production of lactating goats fed both levels of fenugreek seeds is shown in Table (3). Examination of the milk production data reveals that the goats responded positively when fed fenugreek seeds. Both levels of seeds (10 and 30 g/h/d) showed improvements in average milk production.

Table 3. Milk production of lactating goats fed rations containing two levels of fenugreek seeds

Lactation period (days)	Experimental treatments		
	Control	10 g seeds	30 g seeds
	70	70	70
Average daily milk production ml/h/d	489.9b	684.00a	526.20b
ml/BW ^{0.75}	39.90b	54.51a	42.11b
% increment in milk production	--	39.6%	7.41%
Efficiency of milk production, Kg DM/Kg milk)	3.24	2.34	3.06
% increment in milk production efficiency	--	27.78%	9.64%

a,b values bearing different superscripts differ significantly (P<0.05)

The higher level of fenugreek seeds was not as effective as the low level. Fenugreek seeds have trypsin inhibitors (El-Mahdy and El-Sebaiy, 1982). In additions, fenugreek seeds have some anti-nutritional factors such as phytic acid, tannic acid and trypsin inhibitor (Mansour and El-Adawy, 1994), saponins (Bedour et al, 1964), and alkaloids trigonilline and choline (Chopra, 1958).Therefore, the inefficiency of using the higher level of fenugreek may be due to increased trypsin inhibitors. Milk production of goats fed the higher level of fenugreek seeds (30g/h/d) did not differ significantly from that of control. The lower level of fenugreek seeds yielded significantly (P<0.05) higher milk than control. Milk production of the goats fed 10 g/h/d fenugreek seeds increased by 39.6% over that of control, whereas those fed

the 30 g/h/d fenugreek seeds increased by 7.4%. However, the increase in milk production was not a direct reflection of feed intake as the feed intake of goats was almost identical (Table 2). Feed intake (g/Kg^{0.75}) was similar to that found by Agriculture Research Institute (1977). They reported that Damascus goats consumed 128.655 and 129.75 g/Kg^{0.75}. However, the low level of fenugreek seeds increased the efficiency by which feed was converted into milk (Table 3). Upon the calculations, it was clear that 3.24 Kg of feed DM were required to produce one kilogram of milk in control group (Table 3), whereas only 2.34 Kg of feed DM were needed to produce a kilogram of milk when animals were fed the 10 g/h/d fenugreek seeds. The 30 g/h/d fenugreek seeds fed animals exhibited a medium value (2.96 Kg feed DM/Kg milk). Zied (1998) obtained similar results when fenugreek seeds were introduced to lactating goats. Balady goats were fed 10 g/h/d fenugreek seeds or 5 g/h/d *Nigella sativa* seeds (Kholif, 2000). Fenugreek seeds fed goats showed higher milk production than either control or the *Nigella sativa* seeds fed animals. The author attributed the superior effect of fenugreek seeds on milk production of goats to the appetite enhancing galactopeptic effect of fenugreek seeds. Additionally, the increased efficiency by which feed was converted into milk might be attributable as well. In this respect, Attia-Ismail, (2000) found that sheep fed 10 g/h/d fenugreek seeds had higher feed conversion efficiency (Kg feed DM/Kg body weight gain). Abo-Donia et al, (2003) found that fenugreek seeds tended to increase feed conversion (Kg DM/Kg gain) of steers over that of monensin. Petit et al, (1995) reported that fenugreek seeds contain alcoholic compounds that act like Oxytocin hormone. This could be an additional factor for the increased milk production upon feeding fenugreek seeds. The examination of the overall average of milk composition as affected by the addition of fenugreek seeds (Table 4) to the diets of the lactating goats, reveals no differences among treatments. All the values (fat, protein, lactose, and ash %) were almost similar among the treatments. Fenugreek seeds showed no influence on milk compositions. Kholif (2000) and Zeid (1998) obtained similar results when fenugreek seeds were fed to lactating goats.

Table 4. Overall average of milk compositions of lactating goats fed rations containing two levels of fenugreek seeds

Milk compositions, %	Experimental treatments		
	Control	10 g seeds	30 g seeds
Fat	3.84	3.68	3.73
Protein	3.33	3.16	3.10
Lactose	3.15	3.25	3.31
Ash	0.78	0.74	0.82
Solid Not Fat	7.09	6.98	7.11
Total Solids	11.19	10.99	10.86

Conclusively, fenugreek seeds are a potential source as a natural feed additive to livestock. It is a good area for future investigations. Replacing synthetic rumen modifiers with the natural herbs is worthwhile.

REFERENCES

- Abo-Donia, F.M.A.; G.H. Zaza and A.M. Mansour. 2003. Effect of using natural non-traditional growth promoters : 2- Effect of fenugreek and monensin as growth promoters on beef steers performance. Proc. 9th Conf. Anim. Nutr. 14-17 Oct. 2003. Hurghada, Egypt. Pp 1081-1093
- Agricultural Research Institute. 1977. Annu. Rep. Ministry of Agric. And Natural Resources, Nicosia, Cyprus
- AOAC. 1990. Official methods of analysis of the Association of Official Agricultural Chemists. Wash., D.C., USA.
- Attia-Ismael, S.A. 2000. Effect of fenugreek seeds (*Trigonella foenum graecum* L.) as feed additive on sheep performance in the Western Coast of Egypt. Proc. 3rd All Africa Conf. Anim. Prod. and 11th Conf. Egyptian Soc. Anim. Prod., Alex., Egypt, 6-9 Nov. 2000, 275-279
- Bedour, M.S.; El-Munajjed, D.; Fayez, M.B.E. and Girgis, A.N. 1964. Steroid Saponins. VII. Identification and origin of 25-D-Saponin-3,5-diene among the fenugreek saponins. *Journal of Pharmaceutical Sciences*, (53) 1276-1278
- Chopra, R.N. 1958. *Indigenous drugs of India*. 2nd ed. U.N. Dhur and Sons Private limited. Calcutta-12, India. Pp. 256
- El-Mahdy, A.R. and El-Sebaiy, L.A. 1982. Effect of germination on the nitrogenous constituents, protein fractions in vitro digestibility and anti-nutritional factors of fenugreek seeds (*Trigonella foenum-graecum* L.). *Food Chemistry*, (8) 253-262.
- Kearl, L.C. 1982. Nutrient requirements of ruminants in developing countries. International Feedstuffs Institute. Utah Agric. Exp. Str., Utah State University, Logan, Utah, USA
- Kholif, A.M. 2000. Medicinal plant seeds supplementation to lactating goats diets and their effect on milk yield and milk composition. Proc. 3rd All Africa Conf. Anim. Prod. and 11th Conf. Egyptian Soc. Anim. Prod., Alex., Egypt, 6-9 Nov. 2000, 197-200
- Mansour, E.H. and El-Adawy, T.A. 1994. Nutritional potential and functional properties of heat-treated and germinated fenugreek seeds. *Lebensmittel-Wissenschaft Und Technologia*, (27) 568-572
- Petit, P.; Y. Sauvaire; M.H. Jllaire; G. Ponsin and G. Ribes. 1995. Steroid saponins from fenugreek seeds. Extraction, purification and pharmaceutical investigation on feeding behavior and plasma cholesterol. *Steroid*, 60:74
- SAS. 1985. *SAS User's Guide: Statistics (version 5 ed.)*. SAS Inst. Inc., Cary, N.C.
- Zeid, A.M.M. 1998. effect of using medicinal plants on goat performance. Ph.D. Thesis. Cairo University.

تأثير بذور الحلبة كإضافة غذائية على إنتاج ومكونات لبن الماعز الحلابة فى
الساحل الشمالى الغربى لمصر
صلاح عبدالعاطى عطيه إسماعيل
قسم تغذية الحيوان والدواجن - مركز بحوث الصحراء - المطرية - القاهرة

بدأ الباحثون فى البحث عن إضافات غذائية بعد الحظر الذى سيفرض قريبا على الإضافات الغذائية الكيماوية. وهذا البحث هو محاولة لاستخدام احد الأعشاب الطبيعية (بذور الحلبة) فى تغذية الحيوان و دراسة تأثيرها على إنتاج ومكونات لبن الماعز الحلابة ولقد استخدم فى هذا البحث ٢٧ ماعز فى مرحلة مبكرة من الحليب (متوسط الأوزان كان $٠,٣١ \pm ٢٩,٢$ و $١,٧٥٦ \pm ٢٩,٤$ و $١,٤٢٢ \pm ٢٩,٠$ للمجاميع الأولى والثانية والثالثة على التوالى) واستمرت التجربة لمدة ٧٠ يوم حيث كانت المجموعة الأولى هى الكنترول والثانية أخذت ١٠ جم حلبة للرأس فى اليوم والثالثة أخذت ٣٠ جم حلبة للرأس فى اليوم بجانب العلائق الأساسية المكونة من العلف ودريس البرسيم.

وأظهرت النتائج أن المأكول من مكونات العليقة والمأكول الكلى من المادة الجافة ($١٥٨٥,٤$ و $١٦٠٠,٤$ و $١٦١٠,٨$ جم لكل رأس فى اليوم للمجاميع ١ و ٢ و ٣ على التوالى) لم يختلف معنويا بين المجاميع الثلاثة ولم تؤثر بذور الحلبة على المأكول.

ولقد زاد إنتاج اللبن كنتيجة للتغذية على بذور الحلبة وأعطى المستوى المنخفض من بذور الحلبة (١٠ جم للرأس فى اليوم) أعلى إنتاج من اللبن (٦٨٤ مليلتر للرأس فى اليوم) تلاها المستوى الأعلى من بذور الحلبة (٥٢٦,٢ مليلتر لكل رأس فى اليوم).

تحسنت كفاءة تحويل الغذاء إلى لبن (كجم مادة جافة / كيلو جرام لبن) بإضافة بذور الحلبة إلى العلائق وكانت أحسن كفاءة تحويل الغذاء إلى لبن هى لمستوى ١٠ جم بذور حلبة للرأس فى اليوم ولم تتأثر مكونات اللبن باستخدام بذور الحلبة فى العلائق المختبرة و يتضح من النتائج أن زيادة إنتاج اللبن تعود إلى أن بذور الحلبة تحسن الاستفادة من الغذاء مما سبق يمكن استنتاج أنه يمكن استخدام بذور الحلبة كإضافة غذائية للماعز الحلابة