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Effects of oral administration of *Trigonella foeum L.* (Fenugreek `seeds) on galactogoue, body weight and hormonal levels in Sudanese desert sheep

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Abstract:

Introduction: Herbal galactoues are widely used today in all cultures to stimulate milk production both in women and dairy animal.

Objective: This study was carried out to investigate the effect of (Multiple dose) of oral administration of *Trigonella foneum*-graeum. L. (Fenugreek) seeds on milk yield, body weight, and to clarify the hormonal effects on milk production of Sudanese desert sheep.

Materials and methods: Twenty-one adult, healthy, ewes in med lactation were randomly divided into three groups (n=7) and were given orally different doses of fenugreek (0, 2.5 and 5g/kg bwt) weekly for 7 weeks. Blood samples were collected and body weights were measured weekly but the milk yield was daily measured.

Results: Administration of (2.5 and 5g/kg bwt) for 7 week induced highly significant increase ($P<0.05$) in milk yield and body weight gain in all treated groups compared with control. This effect was associated with a significant enhancement of detectable levels in (ng/µl) of prolactin, T4 and TSH. The significant higher levels of prolactin (ng/ µl) and TSH (µl/ µl) were observed compared with control group ($P<0.05$).

Conclusion: the present study concludes that the *Trigonella foneum* can enhance milk yield and body weight and the effect of increasing milk yield is associated with the stimulating effect of prolactin and other thyroid hormones.

Key words: *Trigonella foneum*-graeum. L. (Fenugreek) seeds , Milk production.

Introduction:

Herbal galactoues are widely used today in all cultures to stimulate milk production both in women and dairy animal. There is lack of information in studies on safety and effectiveness of these herbs in lactation. Regarding, *Fenugreek (Trigonella foenum graecum* L.), is considered to be a good herb used as a galactogues it is an annual herb that belongs to family leguminose, sub family papilionaceae, tribe-Trifolreae[1]. The plant is cultivated in various parts particularly in Middle East, India, North Africa and south Europe. The seeds are highly valued as food for man, cattle and sheep and to promote lactation and lactation performance in woman and ruminant[2]. Fenugreek seeds are aromatic, bitter, carminative, galactogoue and antibacterial[3]. Bitter is mainly due to the oil, steroidal saponins and alkaloids. Fenugreek seeds have 20-27% crude protein and 7-10% fat and 0.21-0.75% saponins[4]. Sugars in Fenugreek seeds are glucose, galactose and Xylose. In traditional medicine, fenugreek increase milk after labour and promote milk production in buffaloes[5] cow[6]and goats[7]. The mechanism by which Fenugreek increase yield is not elucidated and the transfer of a characteristic smell into the milk and urine is unknown[8].

In addition, Fenugreek usually used to treat loss of appetite and to address weight. The significant improvement in body weight gain and dressing percentage in broiler chicks fed diets containing Fenugreek was reported by (Morsy, 1995)[9].

The aim of this study, to evaluate the effects of fenugreek on milk yield, lactation performance and body weight gain in Sudanese desert sheep and to determine the possible mechanism of action on milk production through the detection of prolactin and other related hormones levels.

Materials and Methods:

The present study was carried out at Soba Veterinary Research Institute (VRI), Khartoum-Sudan. The experiments were conducted on 28 lactating, healthy, adult mature Sudanese desert ewes, med lactation, aged (2-3 years old). The animals were individually housed within the premises of (VRI) at Soba, and were allowed 3 weeks for adaptation period during which they were clinically examined for freedom of diseases and reproductive disorders. All animals were adapted to feed green forage

and concentrate ration and provided drinking water *ad libitum*. The animals were weight and divided randomly into 3 groups. Group I was untreated and used as a control. Groups 2 and 3 were given *Trigonella foneum* orally in doses of 2.5 and 5g/kbwt/day respectively for 7 weeks. Weekly ewes were bled from the jugular vein into plain tubes, sera was immediately obtained and stored at -20°C until analyzed for detection of prolactin, T_3, T4 and TSH hormones levels by using Raidio-Immuno assay technique, the kits supplied by IAEA (China, Beijing, 1022413). All other chemicals and reagents used were of analytical agent grade purchased from international laboratory supplies.

The ewes in each group were hand milked twice daily and milk yield were measured and recorded throughout the duration of the experiment. Body weight was measured weekly until the end of the experiment for determination of body weight changes.

The data obtained from this study were subjected to statistical analysis by using a completely randomized design (CRD) using computer program statistical package for social science (SPSS version 10.5). All results are presented as mean ±SEM and the difference was determined by one-way ANOVA and the probability level of ($P<0.05$) was considered significant.

Results:

The data are represented in table 1 showed the mean values of weekly body weight which was found to be significantly increase ($P<0.05$) from 36.37±0.07 to 40.79^a ± 0.95 and 37.22±1.11/kg in G2 and G3 respectively, while G3 showed the highest values of body weight Comparison of the mean values of daily milk production (lb) in lactating ewes, the mean daily milk yield (lb) showed a significant different ($P<0.05$) among the three groups this was found to be 8.89±0.08, 12.72 ± 0.09 and 11.55±0.04 lb in group 1, 2 and 3 respectively.

Table 1. Means values ± SEM of body weight (kg) and total milk yield (lb/day) following oral administration of different doses of *Trigonella foneum* for 7 weeks.

Groups / Parameter	G1 (control)	G2 2.5g/kg Bwt/day	G3 5g.kg Bwt/day
Body weight (kg)	36.31^b ±0.07	40.79^a ± 0.95	37.22^b ± 1.11
Total milk Yield (lb/day)	8.89^b ± 0.08	12.72^a ± 0.09	11.55^a ± 0.04

Values are means ± SEM, values with different superscript letter in same rows were significantly different at $P<0.05$.

The mean values of weekly prolactin (ng/µl) levels were explained in table (2). The concentrations of prolactin were shown to be gradually increased from week 4 to 7 with significant difference in G2 and G3 compared to G1 (control). The highest level of prolactin profile was achieved in G2 at week 7.figure (1).

Table 2. Mean ±SEM of prolactin (ng/µL) levels in serum sheep dosed orally with 2.5 and 5g/kg bwt of *Trigonella foneum* for 7 weeks

Time in weeks	G1 Control	G2 2.5g/kg Bwt	G3 5g/kgBwt	P-value
W1	8.54±0.51^a	8.64±1.08^a	9.63±0.39^a	0.21
W2	7.95±0.44^b	9.25±0.89^a	10.38±0.49^a	0.01
W3	8.17±0.91^b	10.46±0.79^a	11.49±0.7^a	0.006
W4	8.50±0.71^b	12.32±2.41^a	11.89±1.40^a	0.05
W5	8.45±0.66^b	13.88±1.55^a	13.67±1.93^a	0.007
W6	8.88±1.00^b	15.66±1.93^a	14.61±0.96^a	0.002
W7	8.64±0.70^b	17.81±2.26^a	16.29±1.37^a	0.001

Values with different small superscripts within same rows were significantly different.

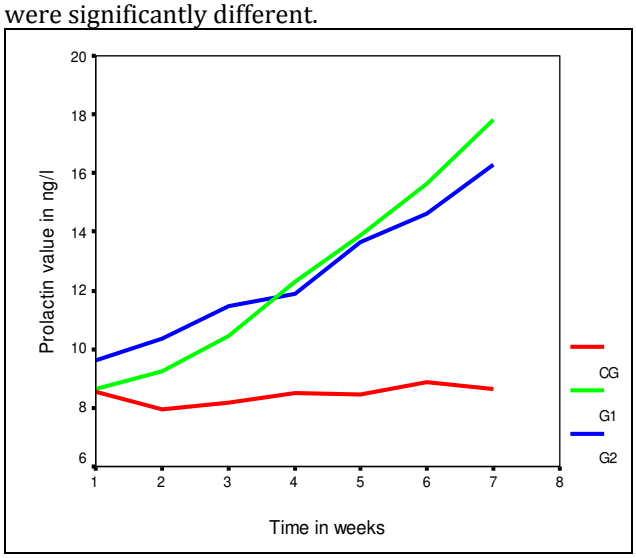

Figure 1. Mean ±SEM of prolactin (ng/µL) levels in sheep serum dosed orally with 2.5 and 5g/Kg Bwt of *Trigonell fonenm* for 7 weeks. [CG = Control Group, G1 = Treated group (2.5g) , G2 = Treated group (5g)]

On the other hand, a detectable levels of T_3 (nmol/l) in G3 were slightly lower than that of G1 (control). The mean levels showed significant decrease at in weeks 4, 6 and 7 after treatment while G3 showed the lowest levels of T_3 figure (2).

Table 3.Mean±SEM of T_3 (nmol/L) levels in serum sheep dosed orally with 2.5 and 5g/kg bwt of *Trigonella foneum* for 7 weeks

Time in weeks	G1 Control	G2 2.5g/kg Bwt	G3 5g/kg Bwt	P-value
W1	1.34±4.16^a	1.31±4.51^a	1.23±6.25^a	0.227
W2	1.33±5.86^a	1.30±6.00^a	1.23±5.77^a	0.404
W3	1.34±4.93^a	1.29±4.04^a	1.19±7.37^a	0.178
W4	1.34±6.25^a	1.26±5.69^a	1.13±1.53^a	0.018
W5	1.35±7.00^b	1.19±2.65^a	1.20±0.49^a	0.435
W6	1.35±5.13^b	1.13±3.51^a	0.94±9.45^a	0.003
W7	1.34±5.51^b	0.91±0.16^a	0.83±8.74^a	0.010

Values with different small superscripts within same rows were significantly different.

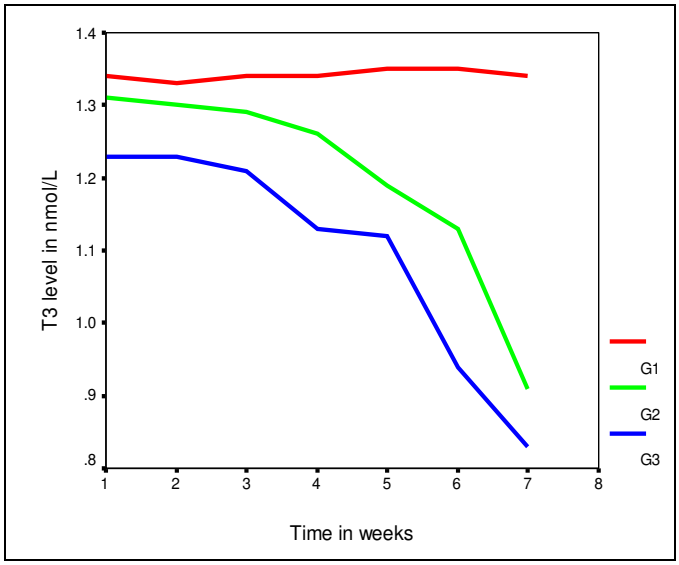

Figure 2. Mean ±SEM of T3 (nmol/L) levels in serum sheep dosed orally with 2.5 and 5g/Kg Bwt of *Trigonell fonenm* for 7 week. [G1 = Control Group,G2 = Treated group (2.5g) , G3 = Treated group (5g)]

Data in table 4. represent the mean values of weekly T4 (nmol/L) levels. The concentrations of T_4 level were higher significantly in G2 and G3 than the control. The maximum levels were observed in G2 in week 7. Figure(3).

Table 4. Mean ± SEM of T_4 (nmol/L) levels in sheep serum dosed orally with 2.5 and 5g/kg bwt of *Trigonella foneum* for 7 weeks

Time in weeks	G1 Control	G2 2.5g/kg Bwt	G3 5g/kg Bwt	P-value
W1	59.91±2.89[a]	60.73±2.89[a]	65.01±3.57[a]	0.182
W2	58.98±3.15[b]	62.71±3.34[a]	66.85±2.94[a]	0.050
W3	59.49±3.34[b]	69.27±2.57[a]	70.42±5.20[a]	0.025
W4	59.64±2.21[b]	72.66±2.85[a]	73.14±2.69[a]	0.001
W5	58.80±1.44[b]	77.61±2.01[a]	77.52±3.15[a]	0.000
W6	60.76±2.03[b]	81.24±5.17[a]	82.82±4.26[a]	0.001
W7	61.66±2.45[b]	83.76±2.95[a]	83.53±2.77[a]	0.000

Values with different small superscripts within same rows were significantly different.

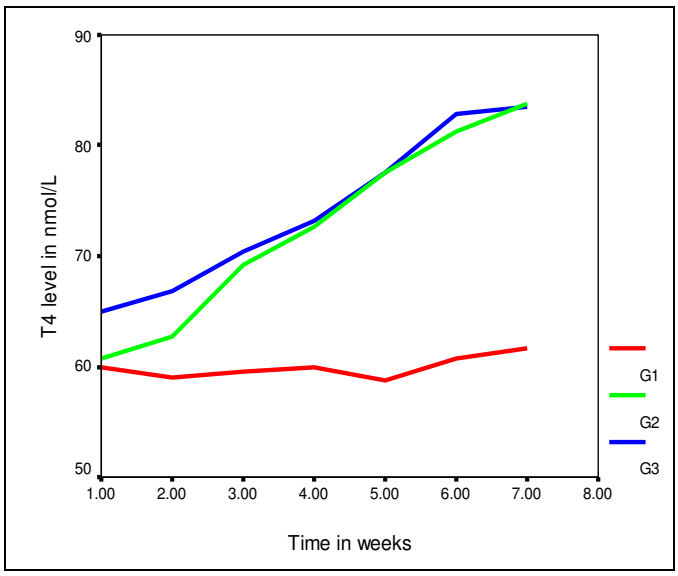

Figure 3. Mean ±SEM of T4 (nmol/L) levels in serum sheep dosed orally with 2.5 and 5g/Kg Bwt of *Trigonell fonenm* for 7 weeks. [G1 = Control Group,G2 = Treated group (2.5g) , G3 = Treated group (5g)].

Table 5. showed that the mean values of TSH (µl/ µl) concentrations. The values in G2 and G3 were significantly higher than that of control (G1). The highest concentration was observed in G3 in week 7.Figure (4).

Table 5.Mean ± SEM of TSH (ml/µl) levels in serum sheep given 2.5g/kg body weight orally for 7 weeks

Time in weeks	G1 Control	G2 2.5g/kg Bwt	G3 5g/kg Bwt	P-value
W1	0.37±2.65[a]	0.35±1.53[a]	0.36±1.00[a]	0.366
W2	0.37±2.08[a]	0.36±1.56[a]	0.36±1.00[a]	0.718
W3	0.36±5.77[a]	0.36±2.08[a]	0.38±3.22[a]	0.568
W4	0.34±1.16[a]	0.38±5.77[a]	0.38±5.77[b]	0.017
W5	0.33±1.53[b]	0.41±1.53[a]	0.42±3.51[a]	0.012
W6	0.33±3.06[b]	0.43±2.51[a]	0.44±4.51[a]	0.002
W7	0.33±1.53[b]	0.45±1.73[a]	0.47±1.00[a]	0.000

Values with different small superscripts within same rows were significantly different

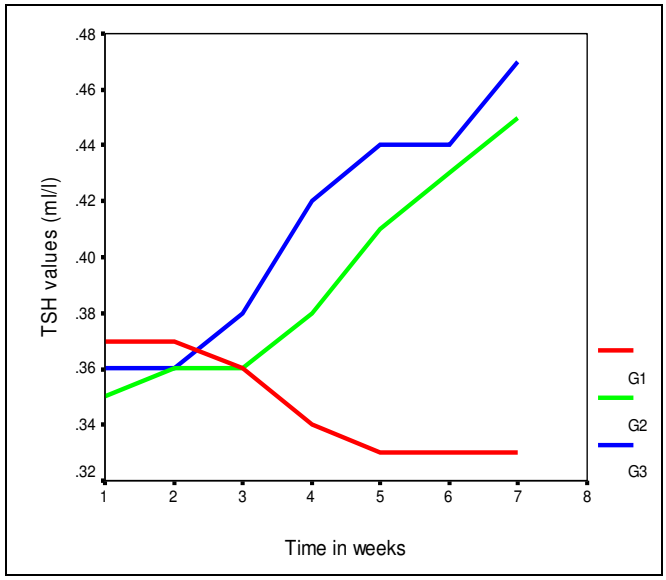

Figure 4. Mean ±SEM TSH (nmol/L levels in serum sheep dosed orally with 2.5 and 5g/Kg Bwt of *Trigonell fonenm* for 7 week. [G1 = Control Group,G2 = Treated group (2.5g) , G3 = Treated group (5g)]

Discussion:

The present data clearly demonstrated an increase in milk yield in al groups compared to the control group. The effect was maintained in treated groups above that of control throughout and after the duration of the experiments. The mean values of total milk yield in G3 and G4 were significant higher. This finding was similar with other previous studies[2,5,10-12] and may be attributed to stimulatory action of Fenugreek seeds on enhancing appetite and feed intake, resulted in an increase in milk production or by stimulation of endogenous hormone secretion. In our study increases the milk yield was confirmed by increase level of prolactin which is known to be have a strong galactopoietics effect on lactation performance. To our knowledge, this the first report documented an increase in prolactin levels in response to Fenugreek administration in Sudanese desert sheep. Increasing of prolactin levels affected by other hormones vital to lactogenesis such as thyroid hormones, and this shown by a significant reduction of T_3 levels accompanied by a significant increase in mean values of TSH, T_4 levels in all groups after administration of Fenugreek. This is may be explained by the stimulatory effects of Fenugreek on thyroid gland lead to lower the active thyroid hormone T_3, eventually will exert negative feedback mechanism on the hypothalamus and pituitary gland which in turrn increase thyroid stimulating hormone (TSH) that enhance prolactin secretion. This finding is closely related to other studies[13,14] but is not in agreement with that obtained by Reap *et al.*[15]

There is significant increase in the mean body weights among different treated groups of ewes, particularly G3 and this could be explained to high levels of protein of Fenugreek seeds which affecting in physiological status of animal resulted in feed consumption and body weight gain. This result is similar to results obtained by different authors,[6,9,16-18] But these findings were in contrast with (Udayasckhara and Sharma 1987)[19] who concluded that receiving different levels of Fenugreek seed is significantly lower body weight than that at control animals. In this study, G4 showed lower body weight gain and this may be

due to diarrhoea cause by oral administration of high dose of Fenugreek, which caused the decreased absorption of the nutrient materials. Also administration of high dose of Fenugreek leads to change in milk flavor and yellowish coloration which attributed to the aromatic acids and pigments present in Fenugreek seeds[20-21].

Conclusion:

The present study concludes that the *Trigonella foneum* is a highly nutritive seeds leads to increase the body weight and can enhance milk yield. The effect of increasing milk yield is also associated with the stimulating effect of prolactin and thyroid stimulating hormone. The values obtained were enough to allow its inclusion of *Trigonella foneum* in food industry and in the rations for dairy and fattening animals.

Reference:

1. Nagakura, T. Fenugreek (*Trigonella foenum-graecum* L.) farming Japan 1975; 9(2): 41-8.
2. Trian, D. The use of Fenugreek for breast feeding women. Complem. Ther. Nurs. Midwell 2003; 9:155-156.
3. Shakaracharya, N.B., Anan doraman, S. and Natorajan, C.P. Chemical composition of raw and roasted Fenugreek. J. Food Sci., Technol. 1973; 10: 179-181.
4. Yoshikawa, M., Murakami, T., Komats, H., Murakami, N., Yamahara, J. and Matsuda, H. Medicinal food stuffs. IV. Fenugreek seeds (1): structure of Trigoesides la, Ha, 11b and 111b new firostanol. Saponins from the seeds of Indian *Trigonella foenum graecum* L. Chemical and pharmaceutical Bulletin, 1997; 45(1):81.
5. El-Alamy, H.A., H., H.M. Khattab, S.A. El-Nor, F.A.F. Salam and M.M. Abdou. Milk production response to supplementing rations with some medical herbs of lactating buffaloe. 8th Egyptian Conference for Dairy Science and Technology 2001; Research papers II, pp. 675-686.
6. Jensen, R. Fenugreek. Overlooked but not forgotten. Online document at: www. breast feeding online.com/Fenugreek over looked.shtml September 19, 2008.
7. Kholif, A.M. and M. A.M. Abdel-Gawad. Medical plant seeds supplementation of lactating goat diets and its effects on milk and cheese quantity and quality. Egypt. J. Dairy Sci. 2001; 29:139-50.
8. Hale, T. Medication and Mothers' milk 10th Edition. Pharmasoft and Medical publishing 2002; pp. 277-279.
9. Morsy, M.M.A. The use of Fenugreek (*Trigonella foenum* greacum) clove (Syzygium Aromaticum) and cinnamon (Cinnamomum zeylamion) in broiler nutrition as feed additives. M.Sc. Thesis. Faculty of Agric-Alexandria Univ., Egypt, 1995.
10. Al-Shaikh, M.A., S.I.A. Al-Mufarre and H.H. Mogawer. Effect of fenugreek seeds (*Trigonella foenum graecum* L.) on lactational performance of dairy goat. J. Applied. Anim. Res. 1999; 16:177-83.
11. Swafford, S., Beren, B. Effect of fenugreek on breast milk production ABM News and Views 2000; 7(3): annual meeting abstracts.
12. Al-Shaikh, M.A., S.I.A. Al-Mufarre and H.H. Mogawer. Effect of fenugreek seeds (*Trigonella foenum graecum* L.) on lactational performance of dairy goat. J. Applied. Anim. Res. 1999; 16:177-83.
13. Panda, S., Tahiliani, P. Kar A.). Inhibition of triiodo thyronine production by Fenugreek seed extract in mice and rats J. Pharmacol. Res. 1999; 40(5):405-9.
14. Tahiliani, P. Kar, A. Mitigation of thyroxine –induced hyperglycaemia by two plant extracts. Phytother Res. 2003; 17(3):294-6.
15. Reap, M., Cass, C. and Hightower, D. Thyroxin and trilodothyronine levels in ten species of animals. Southwestern Vet. 1978; 31:341-344.
16. Xuewl, Lixs, Zhang, J. Livyh, Wang, Z.L. and Zhang, R.J. Effect of *Trigonella foenum*. Graecum (Fenugreek) extract on blood glucose, blood lipid and hermoheological properties in streptozotocin-induced diabetic rats. Asia Pac J. Clin. Nutri. 2007; 1:422-6.
17. Abdel-Nabey, A.A. and Damir, A.A. Changes in some nutrient of fenugreek seeds during water boiling plants foods for human nutrition. Plant food human nutrition 1990; 40(4): 267-4.
18. Manston, R.A., Rusell, A.M., Dew, S.M. and Payne, J.M. The influence of dietary protein upon blood composition in dairy cows. Vet. Record 1975; 96:497.
19. Udayasekhara Rao, P. and sharma, R.D. An evaluation of protein quality of Fenugreek seeds (*Trigonella foenum* graeum) and their supplementary effects. Food chemistry, 1987; 24:1-9.
20. Sauvair, Y. Brenac, P., Guichard, E., Foumier, N., Come, D. and Corbineau, F. Correlation between the amount of free amino acids in fenugreek seed and their organoleptic properties. Proceedings of forth international work shop on seeds: basic and applied aspect of seed biology, Angers, France, 20-24 July 1993; 1:201.
21. Watt, J.M. and Breyer, M.G. The medicinal and poisonous plants of southern and eastern Africa. 2nd edition, Eslivi, Livingstone LTD., Edinburgh and London. 1962.

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