

Influence of Fenugreek Seeds (*Trigonella Foenum Graecum*) on Blood Parameters, Kidney, Liver and Mammary Gland Function for Parturited Aissi Ewes.

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Abstract

The fenugreek seeds in diet of parturited Aissi sheep (2-3 years age) are studied to determine their influence on blood parameters, liver, kidney, and mammary gland functions. Twelve experimental treatments are carried out, control group (T₁) is fed diet, composed of barely 50% wheat bran 25%, wheat flour 15% molasses 5%, urea 2% lima stone 1%, common salts 1% and nutrition complement 1%. Second group (T₂) is fed as (T₁) ration with 10gm fenugreek / head / day. Third group (T₃) is feeds as (T₁) in addition to 20gm fenugreek head / day. The results indicated that RBCs, WBCs and Hb conc. values are significantly (P<0.05) higher in (T₂) and (T₃) than control group (T₁). No significant differences among treatments are found in PCV and MCV. Total protein, albumin and globulin are significantly (P<0.05) effected by adding fenugreek in (T₂) and (T₃) comparing with control group (T₁). The results also show that glucose and cholesterol in (T₂) and (T₃) decrease significantly (P<0.05) as compared with control group (T₁). No significant difference among treatments are found in all AST, ALT enzymes, urea and creatinine. (T₂) and (T₃) recorded the best values milk quantity during sucking periods comparing with those control group (T₁). From previous results, it could be concluded that fenugreek seeds should be used as milk yield increasing agent.

Key words : Fenugreek seeds , Blood parameters, kidney, Liver and Mammary gland , Aissi ewes

Introduction

Identification of plant (fenugreek)
The fenugreek is a small annual legumin herb belonging to the family *fabceae*, of genus, *trigonella*, scientific name *trigonella foenum graecum*. Some of common name include greek – hay, mehti, birds foot and greek – clover. *Trigonella foenum graecum* (fenugreek) have been recovered from tell-halal-Iraq (dating to 4000 B C) as well as desiccated seeds from the tomb of tutankamen. The prophet Mohammed (ص) highly valued fenugreek, he remarked, if people

know what there is in fenugreek they would buy its weight in gold, reports list fenugreek as crops grown to feed cattle (Danie *et al.*, 2000).
Description of plant (fenugreek)
Fenugreek is a native to India and Southern Europe, it has grown in India, Mediterranean, North Africa and China Fenugreek producing countries are India, Iran, Pakistan, Turkey, Egypt, Morocco, Spain, France and China (Parthasarathy *et al.*, 2008). The plant grows up to about 1-2 feet in height, with light green color, tri-foliolate leaves and

white flowers, it bears long slender, yellow brown pods containing about 10-20 golden yellow color seeds, its seeds are small, hard, yellowish brown, angular and resemble multi faced stones (Thiruvellan, 2010). Fenugreek leaves per100gm contain carbohydrates 6.0g, protein 4.4gm, fat 0.9gm, minerals 1.5gm, calcium395mg, phosphors 51mg, Iron 1.93mg and total energy 49 kcal (Gopalan *et al.*, 2005). Fenugreek seed is an excellent source of protein, carbohydrate, vitamin, electrolytes, minerals as describe in

table (1). Fenugreek seeds are also a rich source of phytochemical compounds such as the non-starch polysaccharide galactomannan, alkaloids (cholin and trigonelline), steroid saponins (diosgenin, yamogenin, tigogenin and neotogenins), mucilage, pectin, hemicelluloses, tannin and volatile oil all these compounds are the major fiber contents in seeds, these compounds account of medicinal properties (Madar and Thorne, 1987).

Table (1) Nutritional value of fenugreek seeds per 100g.

Principle	Nutrient value	Percentage of RDA
Energy	323 kcal	16%
Carbohydrates	58.35 g	45%
Protein	23g	41%
Total fat	6.41 g	21%
Cholesterol	0 mg	0%
Dietary fiber	24.6 g	65%
Vitamins		
Folates	57µg	14%
Niacin	1.640 mg	7%
Pyridoxine	0.600 mg	46%
Riboflavin	0.366 mg	28%
Thiamin	0.322 mg	27%
Vitamin A	60 IU	2%
Vitamin C	3 mg	5%
Electrolytes		
Sodium	67 mg	4.5%
Potassium	770 mg	16%
Minerals		
Calcium	176 mg	18%
Copper	1.110 mg	123%
Iron	33.53 mg	419%
Magnesium	191 mg	48%
Manganese	1.228 mg	53%
Phosphorus	296 mg	42%
Selenium	6.3 µ g	11%
Zinc	2.50 mg	23%

(Source: USDA National Nutrient data base)

Medicinal uses of plant (fenugreek)
It has long been used in traditional medicine of India as topical treatment of skin problems such as abscesses, boils, burns, pimples, rash, eczema, gout and helpful in remove of dandruff and face black heads and dryness, fenugreek is enhancing feminine beauty, thinking process due to cholin compound, slow aging and substance swelling, muscle aches, arthritis, gout pain and reduce fever (Madar and Thorne, 1987). It has been used to treat bronchitis, asthma, sore throat and controlling bad breath due to accumulation of toxins in oral passed, it has ability to prevent breast and colon cancer due to block actions of certain enzymes, sluggish liver, flatulence, dysentery, diarrhea, dyspepsia, laxative and acid reflux (Barkhru, 2002). Mucilage compound helps soothe gastrointestinal inflammation by coating of mucus membrane of the stomach and intestine and prevent ulceration (Pandian *et al.*, 2002). Due to its estrogenic like properties by diosgenin compound, it has used to treatment of reproductive disorder, to induce lobar and childbirth by stimulates of uterine contraction, lessen not flashes and mood fluctuation (Jhon, 2011). It has ability to balance hormonal levels aids in treatment menopause, and increase libido (Amanda, 2011). Fenugreek steroids may decrease the sperm shape abnormalities, improve potential protective action of reproductive male system and maintain normal testosterone level (Hamden *et al.*, 2010). It has reduced the risk of atherosclerosis, heart

coronary disease and so no plaque formation in arteries due to its antioxidant property (Brdia *et al.*, 1997) and (Dixit *et al.*, 2005)

Availability

Fenugreek is often available as seeds powder, a spice, tincture, herbal tea bags, mixed with milk, juice or boiled water, added to bread, cereals or filled to gelatin capsule (Bakhru, 2001).

Safety and dosage

Fenugreek is generally safe when used moderately, but nausea, digestive discomfort and skin irritations may occurred (Wichtl and Bisset, 1994). It has used in pregnancy is not recommended, since it has the potential to induce labor (Ody, 1999), dosage may be with rang 10_30 gm. seeds powder each day .The purpose of this study is to determine the effect of fenugreek seeds on body metabolism, since there is no researches in the world to Investigated the effects of fenugreek on animal's production.

Material and Methods:

This study is conducted in the Akad agricultural secondary school – animal department –shattra -45km north of Nasiriya city, to evaluate the effect of fenugreek seeds powder on blood parameters, kidney, liver and mammary gland function for parturited Aissi ewes. Twelve animals are purchased from local market at age 2-3 years, after parturition immediately, the experimental animals are distributed into three similar groups as treatment (4 in each group) each treatment

lasted 8-weeks as an experimental period. The first group received diet, composed of barely 50%, wheat bran 25%, wheat flour 15%, molasses 5%, urea 2% lima stone 1% , common salt 1% and nutrition complement 1% without fenugreek additive which served as control groups(T1), while second and third groups are fed the same as in T1 but supplemented with 10gm of fenugreek seeds powder in(T2)and 20gm in(T3) daily, water, minerals block and green alfalfa daily are available for each animals. The blood sample are obtained from jugular vein of animals in morning, part of blood sample put in clean test tubes contained anticoagulant (EDTA).

Determination of total red blood (RBCs) and white blood cells (WBCs) by hemocytometer method, Hemoglobin concentration is determined by Sahli instrument, Hematocrite (PCV) % is determined by capillary method, all these measurements according to Jain (1986). $MCV \text{ (femto-liters)} = PCV \% \times 10 \div RBC \text{ (million)}$. Other part are left for 24hr in refrigeration and centrifuged at 3000rpm for 15 minute then frozen at $-20^{\circ}C$ until use. Serum total protein, albumin, glucose, cholesterol, AST(Asparate-aminotranfarse), ALT (Alanine amino-tranfarse), urea and creatinine conc. are estimated using

spectrophoto-metric instrument PD-303-APEI-Japan serial NO306083 with specialized kits (Biomagherb 24, Avenue IBN Khaldoun-Ariana 2080 Tanisia) (Wotton and Freeman, 1974). Globulin is calculated by subtraction albumin from total protein then A\G ratio is calculated. Daily milk yield is a measured once a week individually for each ewe starting from seven day of parturition to following seven week. Milk yield produced by each ewe is obtained by multiplying the daily milk yield by seven and calculated by difference between lamb weight before and after suckling. The statically analysis is computed using analysis of variance produced described in SAS (1985) and significant difference among means are separated by Duncans (1955) multiple rang test.

Results and Discussion

The present data in table(1) reveals to the nutritional values and bioactive constituents of fenugreek, which are described in previous introduction, that are essential nutrients for optimum cell body metabolism. Data in table (2) is show that count of RBCs, WBCs and Hb concentration in blood of parturited ewes are significantly ($p < 0.05$) by fenugreek treatment.

Table (2) effect of fenugreek seeds on blood parameters (RBC_s, WBC_s, Hb and MCV) of experimental ewes

Hematological Parameters	Control group	Second group	Third group
	T1	T2	T3
RBC _s (x10 ⁶ /mm ³)	8.90 ±1.52 ^b	9.14 ± 1.20 ^a	9.23 ±1.89 ^a
WbCs (x10 ³ /mm ³)	7.72 ± 1.66 ^b	7.84 ±1.35 ^a	8.03±1.22 ^a
Hemoglobin (g/100ml)	12.78 ±1.85 ^a	13.40±1.60 ^b	13.54 ± 1.42 ^b
Hematocrit (PCV %)	32.04±1.10 ^a	32.04± 1.62 ^a	32.52±1.91 ^a
Mean capsular volume (MCV) FL	36.00 ±0.035 ^a	35.05±0.034 ^a	35.23± 0.34 ^a

Means within the same row with different letters differ significantly ($p < 0.05$)
 Values are means ± standard error

The results indicated that the highest values of RBC_s, WBC_s and Hb conc. are recorded for (T3) then (T2), while the lowest values are recorded for (T1), these findings may indicate the beneficial effect of fenugreek seeds on blood count. The present count are within the physiological normal values reported by Jain (1986), this increase may be attributed to their release from spleen , RBC stimulating factor due to the relation between tissue oxygen demand and RBC oxygen and regulation of erythropoiesis process. These results are in agreement with those obtained by Yaduv and Sehyals (2003), they reported that adding the fenugreek seeds powder to diet cause increase RBC and Hb conc. due to effect of iron, folate, copper and B12 for releasing of RBC from bone marrow, Kaviarasan *et al.* (2004) reported that iron is essential to blood cell production and as co- factor for cytochrom - oxidases enzymes for hemoglobin production to prevent primary and

secondary anemia condition, where a low level of hemoglobin occur. Abu-El-Hamed (2003) found that RBC, WBC and Hb conc. are significantly ($P>0.05$) higher than those fed control diet in animal for protein diet. Hematocrit and MCV (RBC size) presented in table (2) revealed that, there is no significant differences among tested groups are recorded. Results in table (3) show also, the concentration of total protein, albumin and globulin increased significantly ($p>0.05$) in blood serum of ewes in (T3) then (T2) comparing with those of (T1), all values with normal ranges reported by Susan *et al.* (1998). Date indicated normal status of hepatic cells, since these cells are responsible for albumin synthesis and the high serum globulin concentration may indicated good immunity developed against many diseases after ewes parturition such as vaginitis, meteritis and salpenigitis, since globulin is essential for antibody formation,

humeral immunity development (interferon and interleukin -1-formation) , these result agree with Okelly (1973) noticed that total serum protein considered as index for reflecting health animal, and in agreement with kumar *et al.* (1980) reported that a good relationship between serum total protein and dietary protein represented by fenugreek (23gm) (table 1), and

supportive by El-Sayed *et al.* (2002) noticed the increase in dietary protein may be a causative factor for Increase serum total protein, and with Rowlands (1980) reported that dietary protein could affect the concentrate serum albumin and globulin. The A/G ratio in (T3) is significantly ($P < 0.05$) lower than those in (T1) and (T2).

Table (3) effect of fenugreek seeds on protein fraction for parturited ewes.

Protein fraction	Control group	Second group	Third group
	T1	T2	T3
Total serum protein (g/dl)	6.86 ±1.27 ^d	7.34 ±1.32 ^b	7.80 ±1.13 ^c
Albumin (g/dL)	3.80 ±1.80 ^b	4.26 ±1.36 ^a	4.28 ±1.90 ^a
Globulin (g/dL)	3.06 ±1.82 ^c	3.08 ±1.72 ^c	3.52 ±1.66 ^b
A/G ratio	1.24 ± 0.20 ^b	1.38 ±1.34 ^a	1.21 ±1.00 ^{bc}

Means within the same row with different letters differ significantly ($p < 0.05$) Values are means ± standard error

but it is important to note that the values of A/G ratio are higher than (1.0) through trial period which indicate the lambs did not suffering from any health problems and did not suffered from physiological status (Kithen *et al.*, 1975). Data in table(4) indicated that the plasma glucose concentration in (T3) and (T2) significantly ($p > 0.05$) decrease compared to control group in (T1), because of hypoglycemic, antioxidant and antinflammatory properties of fenugreek seeds, amino acid(4-hydroxyisoleucine which has been isolated from fenugreek seeds) have pancreatic beta cell activity, stimulating the insulin secretion and reduce insulin resistance (Broca *et al.*, 2004), these result in agreement

with those obtained by Raju *et al.* (2001), they reported that hepatic enzymes associated with glycolysis are all increase by fenugreek, while enzymes associated with glyconeogenesis are decrease by fenugreek, on other hand Mohammad *et al.*, (2002) reported that fenugreek has been associated with alteration in carbohydrate metabolism enzymes, and steroid saponin compounds in seeds have been shown to habit Na-dependant intestinal glucose uptake (Al- Habori *et al.*, 2001). Fenugreek seeds has been shown to decrease intestinal dissaccharidase activity and glucose absorption, together with increase gastrointestinal motility (Hannan *et al.*, 2007), and enhancing muscle,

liver and adipose cells glucose uptake (AL-Habori *et al.*, 2001)). Supplemented groups with fenugreek (T3) and (T2) had significantly lower cholesterol concentration than control group (T1) (table3), the variation is too high significant inhibition effect of fenugreek on cholesterol absorption, synthesis and normalizes the activity of lipid metabolizing enzymes, these result are in accordance with Thiruvellan (2010) reported that potential mechanism of fenugreek (galactomannan fiber and saponin contents) has believed to be responsible for intestinal cholesterol absorption and increase bile acid production, liver requires cholesterol to produce more bile, then more

cholesterol used up and then increase bile acid excretion, and also in agreement with Sharma *et al.* (1990) and Stark and Madar (1993), they noticed that the hypocholestermic and hypolipidemic activity of fenugreek seeds are due to antioxidant properties for prevent the oxidation of cholesterol, triglycerides and low density lipid (LDL), then reduce LDL level in blood and to treat obesity. And no significant differences for activity of AST (Asparate aminotransfarse) and ALT (Alanine aminotranfarse) Levels (table 4 –liver function), that can be used to diagnose liver damage, these results are within the physiological ranges reported in ewes by Awad (1966) .

Table (4) effect of fenugreek seeds on liver functions for parturited ewes

Items	Control group	Second group	Third group
	T1	T2	T3
Glucose (mg/dL)	64.86 ± 0.93 ^b	60.21 ± 0.46 ^a	51.52 ± 0.88 ^a
Cholesterol (mg/dL)	60.98 ± 1.04 ^c	54.94 ± 5.09 ^b	38.32 ± 5.70 ^a
AST (u/ml)	46.64 ± 0.34 ^a	47.16 ± 0.12 ^a	48.35 ± 0.14 ^a
ALT (u/ml)	21.31 ± 0.22 ^a	21.28 ± 0.42 ^a	20.82 ± 0.16 ^a

Means within the same row with different letters differ significantly ($p < 0.05$)
 Values are means ± standard error

Table (5) effect of fenugreek seeds on kidney function for parturited ewes

Items	Control group	Second group	Third group
	T1	T2	T3
Urea (mg/dL)	22.62 ± 0.19 ^a	22.98 ± 0.17 ^a	23.70 ± 0.16 ^a
Creatinine (mg/dL)	1.56 ± 0.40 ^a	1.76 ± 0.22 ^a	1.27 ± 0.23 ^a

Means within the same row with different letters differ significantly ($p < 0.05$)
 Values are means ± standard error

The present date in table (5) revealed that, there are no significant differences among all treatments on

urea and creatinine concentration (kidney function).

The average of milk yield of lactating ewes during study period are represented in table (6), the highest value of average daily milk yield is recorded with (T3) then (T2) as compared with control group (T1), and the differences are significant ($p > 0.05$) during suckling period (8 weeks) after parturition, due to protein intake as major constituent of fenugreek with other many vital vitamins and minerals, these results are in agreement with Al-Almay *et al.* (1987) reported that the protein intake play important role in milk production and in agreement with Turkyimaz *et al.* (2011) and

Chantry *et al.* (2004) they reported that fenugreek seeds are widely used as milk producing agent (galactogogue) to increase inadequate milk supply, studies had been shown that fenugreek is potent stimulator factor for milk yielding (Swarford and Bberens, 2002).

Conclusion:

Fenugreek should be used successfully in veterinary and animal production as cheaper, available in local markets and medicinal herbal substance, due to its ability as milk yield increasing agent.

Table (6) Average daily milk yield (gm) for Aissi ewes during suckling period

Week	Control group	Control group	Third group
	T1	T2	T3
1	—	—	—
2	774.08 ^a ± 30.30	778.40 ^a ± 28.82	778.50 ^a ± 35.70
3	760.02 ^a ± 30.76	850.00 ^a ± 24.30	874.5 ^b 26.60
4	920.78 ^b 11.00	930.21 ^b ± 14.13	978.13 ^a ± 14.99
5	999.90 ^b ± 17.25	1030.10 ^b ± 16.10	1070.10 ^a ± 14.64
6	860.42 ^b ± 18.22	878.80 ^a ± 14.72	939.34 ^a ± 15.40
7	706.20 ^b ± 20.66	740.40 ^a ± 16.70	800.20 ^a ± 17.50
8	520.90 ^b ± 20.40	568.70 ^a ± 16.50	620.52 ^a ± 17.20
Average	790.9 ^b ± 21.22	826.65 ^a ± 18.75	865.90 ^a ± 180.14

Means within the same row with different letters differ significantly ($p < 0.05$)

Values are means ± standard error

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تأثير مسحوق بذور الحلبة على خلايا الدم و وظائف الكبد والكلية و الغدة اللبنية في إناث الأغنام العواسية الولود.

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الخلاصة

تم دراسة مسحوق بذور نبات الحلبة المضافة لعليقة الأغنام الولود بعمر (2-3) سنة على الخلايا الدموية ، ووظائف كل من الكبد والكلية والغدة اللبنية . استخدم اثنا عشر من النعاج الولود ، قسمت بشكل

عشوائي إلى ثلاثة مجاميع (4 حيوان لكل مجموعة) كعاملات تجريبية ، المجموعة الأولى (T₁) غذيت على عليقه مكونة من 50% نسبة شعير 25% نخالة حنطة ، 5% مولات ، 2% يوريا 1% حجر كلس و 1% ملح طعام ، كمجموعة سيطرة المجموعة الثانية (T₂) غذيت على عليقه مجموعة السيطرة مع 10غم من مسحوق بذور الحلبة لكل حيوان يوم . المجموعة الثالثة (T₃) غذيت على عليقه مجموعة السيطرة بالإضافة إلى 20 غم من مسحوق بذور الحلبة لكل حيوان / يوم . أظهرت النتائج أن قيم كريات الدم الحمراء ، كريات الدم البيضاء و نسبة الهيموكلوبين تزداد معنوياً (P<0.05) في المجموعة (T₃,T₂) عند مقارنتها مع مجموعة السيطرة (T₁) . و عدم وجود فروقات معنوية بين المعاملات الثلاثة لكل من حجم الخلايا المضغوطة و نسبة حجم خلايا الدم الحمراء . كما أظهرت النتائج زيادة معنوية في تركيز كل من البروتين الكلي ، الألبومين و الكلوبولين في بلازما الدم للمعاملات (T₁,T₂) عند مقارنتها مع مجموعة السيطرة (T₁) . كما اتضحت النتائج أيضاً انخفاضاً معنوياً في تركيز الكلوكون و الكولسترول للمعاملين (T₃,T₂) و عدم وجود فروقات معنوية في تركيز أنزيمات الكبد، كما زادت كمية الحليب المنتج أسبوعياً زيادة معنوية (P<0.05) للنعاج المغذاة للمعاملتين (T₃,T₂) عن المعاملة (T₁) . و في ضوء النتائج السابقة نوصي باستخدام مسحوق بذور الحلبة في تحفيز المناعة الجسمية ضد العديد من الأمراض المعدية و عامل محفز لإنتاج الحليب.

الكلمات المفتاحية : مسحوق بذور الحلبة ، خلايا الدم ، وظائف الكبد والكلى والغدة اللبنية ، الاغنام العواسية .