

Clinical evaluation for the diuretic effect of the alcoholic extract of *Trigonella faenum- gracum* seeds (fenugreek) on rabbits

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Abstract:

Fenugreek seeds has a wide range of pharmacological activities like hypoglycemic, hypolipidemic , galactogogue and diuretic activities. Most of these effects have been well studied. However there is no separate study that evaluate the diuretic effect of fenugreek. Therefore, this study was designed to evaluate clinically the diuretic effect of this herb. Fenugreek extract has been compared with equal volume of distilled water each has been given to a group of five healthy adult male albino rabbits. Both serum and 24-hr urine samples then analyzed weekly for electrolytes level, osmolality and pH for four weeks. It has been found that fenugreek, caused a significant increases in sodium and potassium excretion with a significant reductions in osmolality with respect to the control group. It had a significant hypocalciuric effect, in respect to the control group.. Serum values of sodium, potassium, chloride, calcium, pH and osmolality did not reveal any significant change compared with the control values. It was concluded that fenugreek has a very powerful diuretic effect and this effect is thiazide-like regarding urine flow and urine composition of electrolytes.

التقييم السريري للتأثير المدرر للمستخلص الكحولي لبذور الحلبة العراقية في الأرانب

لفتة العطوي

دائرة صحة النجف

الخلاصة:

تمتلك بذور الحلبة فعاليات دوائية عديدة مثل تأثيرها الخافض لسكر ودهون الدم وتأثيرها المدرر للحليب والمدرر. معظم هذه التأثيرات تم دراستها جيداً، لكن لا توجد دراسة منفصلة تقييم سريريا التأثير المدرر لبذور الحلبة. لذلك فقد صممت هذه الدراسة لتقييم استخدام هذه العشبة كمدرر. أعطيت مستخلص بذور الحلبة لمجموعة من خمس ارانب مختبرية (Albino) ذكور بالغة وقورن بمجموعة سيطرة أعطيت حجم مماثل من الماء المقطر مرتين يوميا لمدة أربع أسابيع . تم تحليل عينات مصل الدم وادرار 24 ساعة اسبوعياً لمدة اربعة اسابيع لمعرفة مستوى الكهارل، الاوزمولاليتي و الاس الهيدروجيني (pH). لوحظ ان مستخلص بذور الحلبة أدى إلى زيادة معنوية في طرح الصوديوم والبوتاسيوم مع نقصان معنوي في الاوزمولاليتي. كما أدى مستخلص بذور الحلبة إلى نقصان معنوياً في طرح الكالسيوم مقارنة بقيم السيطرة. قيم مصل الدم

لكل من الصوديوم والبوتاسيوم، الكالسيوم، الكلورايد ، pH والاوزمولاليتي لم توحى باي تغير معنوي خلال اربعة اسابيع من هذه الدراسة مقارنة بقيم السيطرة. يستنتج من هذه النتائج ان بذور الحلبة تمتلك تأثير مدرراً قوياً وان هذا التأثير مشابه لتاثير الثايزايد من حيث حجم الادرار ومستوى الكهارل فيه.

Introduction:

Fenugreek [*Trigonella foenum-graecum*, family *leguminosae*] is one of the important medicinal plants used in folk medicine⁽¹⁻⁵⁾ It has a wide range of therapeutic activities like hypolipidemic,^(6,7) hypoglycemic,^(8,9) galactogogue⁽¹⁰⁾ and diuretic⁽¹¹⁾ activities. Many of these effects have been well studied regarding the mechanism of action, clinical evaluation and the specific constituent behind each effect. However there is no clinical data that support the traditional use of fenugreek as a diuretic . Therefore the aim of this study is to evaluate the diuretic effect of fenugreek and rationalize its folkloric use.

Materials and Methods:

Ten healthy male adult albino rabbits (1500 ± 150mg) were allowed free access to food and water during the entire period of treatment. Two groups, of five rabbits each, were used. The control group (group I) was given an oral vehicle of distilled water. The second group (group II) was given 1.375gm of fenugreek extract dissolved in 7.5 ml distilled water per 12hrs. This dose of fenugreek was choosed according to

the result of the dose response curve which showed that the dose that gave the best diuretic effect without causing a clinically significant hypoglycemia was 1.375gm/12hrs dissolved in 7.5ml water (fig.1).

Both blood and urine samples were analysed for sodium, potassium, chloride, calcium, pH and osmolality. Blood samples were collected from the middle ear artery after 1, 2, 3 and 4 weeks of treatment. Each rabbits were placed in an individual metabolic cage for 24-hr urine collection. Urine samples were immediately refrigerated to avoid any microbial growth.⁽¹²⁾ Serum sodium, potassium, chloride, calcium and pH were measured by using a blood gases, pH and electrolytes analyzer (Eschweiler GmbH & Co. KG, Germany).

Sodium and potassium concentration in the urine samples were determined by flame photometry [Corning, Model 400, England]. Calcium and Chloride were analyzed using calcium and chloride kits (France). The pH of the urine was detected by pH-meter (Genwey, U.K). The osmolality was estimated by the equation:

$$Osmolality = 1.86[Na+] + \frac{[Glu\ cos\ e]}{18} + \frac{Urea}{2.8} (mOsm/ kg.H_2O)^{(14)}$$

Glucose was measured using glucose kit (LABKIT, Spain) and urea was determined using urea kit (LABKIT,

Spain). The data were analyzed statistically by student -t-test.

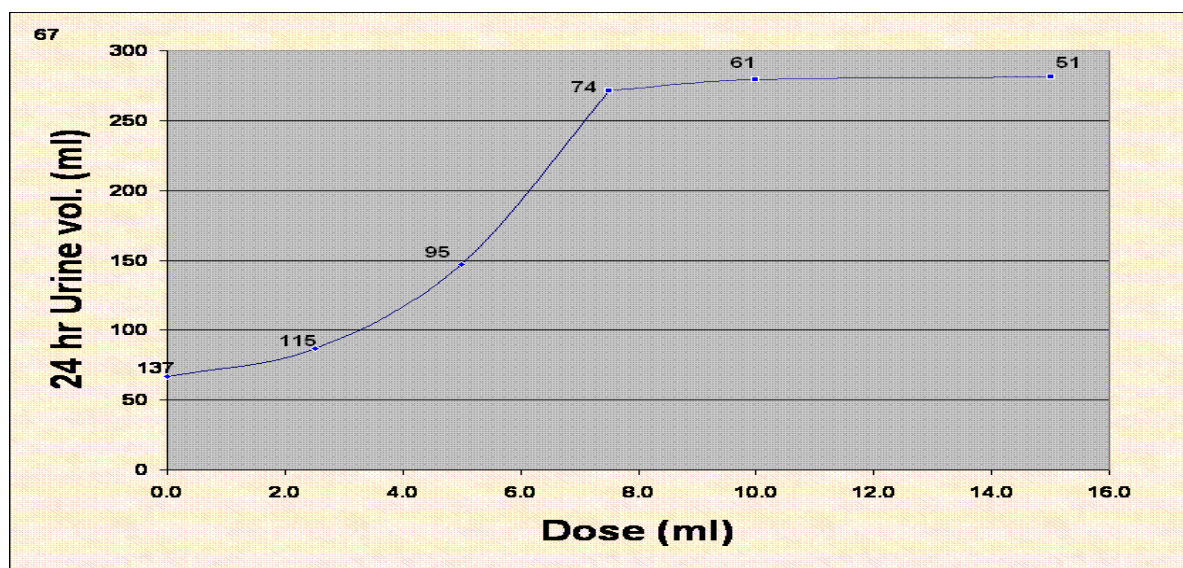


Fig (3-1): Effect of 2.5 ml, 5 mg 7.5ml 10 ml and 15 ml of fenugreek extract on 24 hr urine volume of healthy adult male albino rabbits (Dose –Response Curve). Values that appeared on the curve represent the serum glucose level at this point.

Results:

It has been found that fenugreek extract significantly increased urine flow, sodium, potassium and chloride excretions in respect to the control

values ($P < 0.05$), with significant reductions in calcium excretion, urine osmolality and urine pH with respect to the control values ($P < 0.05$). Table I and II summarized all these results.

Table I: Effect of Fenugreek extract [1.375gm/12hrs P.O.], on the rate of excretion of sodium, potassium, chloride and calcium in the urine of healthy adult male albino rabbits after four weeks treatment.

Animal group	Sodium (mEq/day)	Potassium (mEq/day)	Calcium (mg/day)	Chloride (mEq/day)
I	14.7 ±4.7	9.4 ±2.1	41.3 ±4.6	10.6 ±1.82
II	26.36*±5.9	25.9* ±4.3	26.3*1 ±5.2	15.3* ±4.2

* Significant difference in respect to the control values ($P < 0.05$)

Results are expressed as mean ± standard deviation ($M \pm SD$) I: control, II: received fenugreek extract.

Table II: Effect of Fenugreek extract [1.375gm/12hrs P.O.], on the urine volume, urine osmolality and urine pH of healthy adult male albino rabbits after four weeks treatment.

Animal group	24-hour urine vol. (ml)	Urine osmolality (mOsmo/kg. H ₂ O)	Urine pH
I	86 ± 13.2	729 ± 67	6.35 ± 0.72
II	271* ± 19.5	487* ± 33	5.2* ± 0.52

*Significant difference in respect to the control values (P<0.05)

Results are expressed as mean ± standard deviation (M±SD) I: control , II: received fenugreek extract . Serum values of sodium potassium,

chloride, calcium, pH and osmolality did not significantly affected by all above treatments (p>0.05). Table (III).

Table III : Effect of Fenugreek extract [1.375 gm/12hr P.O.], on some serum electrolytes, pH and osmolality of healthy adult male albino rabbits after four weeks treatment.

Animal group	Sodium (mEq/L)	Potassium (mEq/L)	Calcium (mg/day)	Chloride (mEq/L)	Serum osmolality (mOsmo/kg.)	Serum pH
I	143.6 ± 4.7	4.52 ± 0.36	1.26 ± 0.22	89.3 ± 7.3	282 ± 6.7	7.44 ± 0.21
II	140.3 ± 3.5	4.0 ± 0.51	1.32 ± 0.22	83.3 ± 7.5	276.7 ± 6.8	7.41 ± 0.25

Results are expressed as mean ± standard deviation (M±SD)

I: control, II: received fenugreek extract .

Discussion:

In the present experiment, fenugreek increased urine flow, sodium, potassium and chloride excretion with a concurrent decrease

in the osmolality, calcium excretion and urine pH.

The same effect has been reported to a thiazide diuretic, chlorthalidone.

Thiazide diuretics inhibit NaCl reabsorption from luminal side of epithelial cells in the distal convoluted tubule leading to increase the excretion of sodium and chloride in the urine. In contrast to the situation in the loop of Henle, where loop diuretics inhibit calcium reabsorption by abolishing the lumen positive electrical potential, thiazides actually enhance calcium reabsorption in the distal convoluted tubule⁽¹³⁾ This enhancement resulted from a lowering of cell sodium levels upon blockade of sodium entry by thiazides which might then enhance Na⁺/Ca⁺ exchange in the basolateral membrane, increasing overall reabsorption of calcium.⁽¹³⁾ Fenugreek yielded an acidic urine due to the increase excretion of H⁺. By the integration of the results of our study with the reported pharmacological activities of other groups of diuretics , it is concluded that fenugreek has a very powerful diuretic effect and it has a thiazide-like effect regarding urine flow and electrolytes urinary composition.

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