

دراسة تجريبية لتأثير حبوب نبات الحلبة على وزن الجسم وعلى بعض مكونات الدم . في أنثى الفأر الأبيض

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الملخص

تم في هذا البحث اعطاء حبوب نبات الحلبة لاثاث الفئران :
ففي التجربة الاولى حقنت مجموعة من الفئران تحت الجلد بمقدار ٠.٢ سم بخلاصة
الحبوب الكحولية واستمر الحقن يوميا لمدة شهرين .

اما في التجربة الثانية فقد اضيفت الحبوب المجروشة لغذاء ثلاثة مجموعات من الفئران
بنسبة ٠.٤ ، ٠.٤ ، ٠.٤ جرامات للفأر الواحد يوميا لمدة شهرين .

وقد اظهرت النتائج أن اضافة حبوب الحلبة الى غذاء الفئران تسبب زيادة في وزن
الجسم وفي كمية الهيموجلوبين ونسبة السكر في الدم . اما اعطاء خلاصة الحلبة عن طريق
الحقن فقد تسبب عنها نقص في كمية السكر في الدم .

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**EFFECT OF PROLONGED ADMINISTRATION OF TRIGONELLA
FAENUMGRAECUM SEEDS ON THE BODY WEIGHT AND SOME
BLOOD CONSTITUENTS OF FEMALE ALBINO RATS**

(with 4 tables)

By

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Fenugreek seeds are widely used as a bitter stomachic, tonic and nutritive food for man and animals as they are rich in carbohydrates and proteins. The effect of prolonged administration of the seeds was studied on the body weight, RBCs count, Hb, PCV and blood sugar of female albino rats. Two experiments were made, in the 1st a dose of 0.2 ml of 20% alcoholic extract of Fenugreek seeds was subcutaneously injected daily in the rats for 2 months. In the 2nd experiment, crushed Fenugreek seeds were mixed with the diet of 3 groups of rats in the order of 0.04, 4 and 6 gram/rat/day for 2 months. Results revealed no characteristic changes in the estimated variables when Fenugreek was administered by injection except blood sugar which was decreased. The groups of rats fed Fenugreek seeds showed an increase in body weight, HB value and blood sugar level particularly when a dose of 4 gram/rat/day was used.

INTRODUCTION

Food plants have long been used in the diet therapy for various diseases as they contain different constituents which give them their therapeutic value, e.g. vitamins, minerals, enzymes and other pharmacologically active principles. In this respect, *Trigonella faenumgraecum* plant is well known all over the world, particularly in Egypt, where it constitutes a good source of seeds characterized by their nutritive and medicinal properties. HUERRE (1928) and others, claimed that Fenugreek is largely used in the treatment of human malnutrition. Moreover, FAHMY (1932) stated that *Trigonella faenumgraecum* is used as bitter stomachic, tonic and nutritive. In the field of veterinary practice, EDMUNDN and ELMER (1947) recorded that Fenugreek seeds are extensively used as nutritive for live-stock.

Literature denotes that this very important food plant has been extensively studied botanically and chemically, but its pharmacological characters are still a point of interest to be investigated. In a previous communication SHARAF, *et al.* (1975) reported on some pharmacological characteristics of Fenugreek seeds. It is proposed, moreover, to study the effect of prolonged administration of Fenugreek seeds on the body weight and blood components in female albino rats, since this has never been studied previously.

Experiment I:

MATERIALS AND METHODS

The dried seeds were finely powdered, extracted with 70% ethyl alcohol in Soxhlet apparatus till exhaustion. Alcohol was evaporated and the dry extraction was then suspended in distilled water in order to get 20% solution.

Twenty female white labino rats (34-40 gm each) were used in this experiment (10 controls and 10 for the test). Each of the tested animals was S/C injected with 0.2 ml (i.e. 40 mg) from 20% alcoholic extraction of Fenugreek seeds in distilled water. The control rats were injected with 0.2 ml distilled water. Injection of rats was continued daily for 2 months, thereafter, the weight of each rat was recorded and blood was collected by heart puncture for the estimation of R.B.C.-count, hemoglobin and the packed cell volume using SCHALM (1955) method. Blood sugar was also estimated following the Folin's micromethod described by GRADWOHL (1948).

RESULTS

Results obtained after 2 months daily injection of female rats with alcoholic extraction of dried Fenugreek seeds are shown in Tables 1 and 2.

Experiment II:

MATERIALS AND METHODS

In this experiment 40 female rats were divided into 4 groups of 10 animals each. The first group served as the control and the others were the test groups. Crushed dried Fenugreek seeds were added to the diet of the tested groups daily for 2 months in order of 0.04, 4 and 6 gram/rat/day for the 1st, 2nd and 3rd groups, respectively. After 2 months administration, animals were weighed and blood samples were taken. Technique of sampling and tests performed were the same as in experiment 1.

RESULTS

The experiment showed that crushed dried Fenugreek seeds fed to female rats daily for 2 months had the following effects (Tables 3 and 4).

TABLE 1. Mean values for body weight in grams in control and injected rats before and after the end of experiment.

Group	Body weight in gm.		increase in gm.	Difference from control in gm.
	Before the test	After 2 months		
Control	37.4 ± 0.651	140.5 ± 2.161	103.1	—
Injected	38.0 ± 0.587	142.4 ± 3.377	104.4	1.3

TABLE 2. Changes in R.B.Cs, HB, PCV and blood sugar in rats subcutaneously injected with 0.2 ml of 20% alcoholic extraction of Fenugreek seeds for 2 months.

Variables	Mean values and standard errors		"t" value
	Control	Injected	
RBCs million/cmm	2.62 ± 0.354	6.40 ± 0.296	0.476
Hb gm%	12.25 ± 0.378	11.45 ± 0.189	1.891
PCV%	34.30 ± 0.648	33.00 ± 0.574	1.511
Blood sugar mg%	156.0 ± 3.732	123.0 ± 7.064	4.117**

++ Significantly different at 0.01 level of probability.

TABLE 3. Mean values for body weight in grams in control rats and those fed Fenugreek seeds

Group	Body weight in gm.		Increase in gm.	Difference from control in gm.
	Before the test	After 2 months		
Control	37.1 ± 0.617	116.0 ± 1.490	78.9	—
I (0.04 gm rat)	36.7 ± 0.703	139.6 ± 1.963	102.9	24.0
II (4 gm/rat)	38.1 ± 0.673	146.3 ± 1.122	108.2	29.3
III (6 gm/rat)	37.9 ± 0.674	135.9 ± 1.787	98.0	19.1

TABLE 4. Changes in R.B.Cs, Hb, PCV and blood sugar in rats taking crushed Fenugreek seeds in their diet daily for 2 months.

Variables	Mean values and standard errors				"t" values		
	Control C	Group I 0.04 gm/ rat	Group II 4 gm/rat	Group III 6 gm/ rat	C-I	C-II	C-III
R.B.Cs million/ cmm	7.43 ±0.219	7.76 ±0.458	7.83 ±0.035	7.23 ±0.294	0.649	0.950	0.544
Hb gram %	12.50 ±0.035	14.70 ±0.981	16.50 ±1.068	13.90 ±0.330	2.104	3.552 ^{**}	2.459 [*]
PCV %	35.40 ±0.449	35.90 ±1.011	36.80 ±1.412	35.60 ±0.391	0.451	0.944	0.335
Blood sugar . . mg %	131.70 ±1.352	180.80 ±2.522	160.40 ±4.373	150.00 ±3.095	13.535 ^{**}	6.284 ^{**}	6.349 ^{**}

* Significantly different at 0.05 level of probability.

** Significantly different at 0.01 level of probability.

DISCUSSION

The importance of Fenugreek seems to depend on its chemical nutritive components, as it contains appreciable amounts of carbohydrates, proteins and fat. FAHMY (1932), and WALLIS (1962) reported that Fenugreek contains 22% proteins and 28% mucilage which yields by hydrolysis the sugars mannose and galactose. Moreover, WUNSGHENDORFF (1914) stated that the seeds contain 28.92% proteins, 40.72% carbohydrates and 7.36% fat.

Experimentation performed on white albino female rats denotes that Fenugreek seeds are of blood tonic and growth promoting effects. The subcutaneous injection of alcoholic extract of Fenugreek seeds produced no change in body weight (Table 1) but, on the other hand, animals fed diet enriched with 0.04, 4 and 6 gram/rat/day for 8 weeks showed an increase in body weight by 24.0, 29.3 and 19.1 gram, respectively, over the control. It is evidently noticed that an amount of 5 gram rat/day Fenugreek gave the higher increase in body weight, and it is recommended to be used to increase the growth rate.

The hematological picture of Fenugreek received no previous attention in spite of its extensive use as a remedy for anaemia and malnutrition. Results in this present work revealed that Fenugreek has no effect on the estimated

hematological variables when injected in the form of an alcoholic extract (Table 2). However, rats taking Fenugreek in their diet showed an increase in their Hb values specially the 2nd group taking 4 gram/rat/day (Table 4).

The increase of body weight and hemoglobin observed after addition of Fenugreek seeds to the ration of rats agrees well with the wide use of Fenugreek as a tonic for stimulating the general metabolism and for treatment of malnutrition and anaemia (HUERRE, 1928, FAHMY, 1932; EDMUNDSON and ELMER, 1947 and MORCOS and EL-BARADIE, 1959). This fact, about the nutritive value of Fenugreek, could be explained on the ground that it contains large amounts of proteins and carbohydrates which are essential for building up body tissues. In addition, the bitter taste of the seeds renders them favourable bitter stomachic (FAHMY, 1932) which aids digestion and absorption of food. It is worthy mentioning that administration of Fenugreek to rats by subcutaneous injection of the alcoholic extract was not effective on both body weight and the tested hematological criteria. Also the body weight and hemoglobin concentration in rats taking 4 gram/rat/day was noticed to be higher than the corresponding values of the other groups. This means that, 4 gram/rat/day is more nutritive than 0.04 gram/rat/day. On the other hand, 6 gram/rat/day was less beneficial for rats. It seems probable that there is a certain capacity of the intestines for absorption of the different concentrations of Fenugreek so the body can easily utilize the absorbed amounts. In this experiment the animal body seems to be able to absorb and metabolize beneficially the increased amounts of Fenugreek till 4 gram/rat/day but not more.

The estimation of blood sugar in the present experiment was intended to investigate the nutritive value of the large amount of mucilage contained in Fenugreek. FAHMY (1932) and WALLIS (1952) stated that mucilage of Fenugreek yields, by hydrolysis, the sugars mannose and galactose. However, DAOUD (1932), according to *in vitro* experiments, reported that Fenugreek mucilage is neither digested by salivary nor by pancreatic amylase. Accordingly Fenugreek is not digested anywhere in the alimentary tract, since he demonstrated no rise in blood sugar following ingestion of Fenugreek. On the other hand, the present study revealed a decrease in blood sugar of injected rats with the alcoholic extract of Fenugreek. However, administration of Fenugreek mixed with rat's food, in three increasing doses, led to a rise in their blood sugar reversible to the concentration of Fenugreek dose (Table 4). The increase of sugar level in blood of rats fed Fenugreek indicates that mucilage can be digested and hydrolysed as aimed by FAHMY (1932) and WALLIS (1952). At this condition of the body can get use of the Fenugreek meal which is rich in carbohydrates.

In conclusion, the above results proved that Fenugreek seeds are valuable food substances, since they increased the body weight gain and exhibited a hematonic effect probably due to their high nutritive and medicinal components. This may suggest utilization of Fenugreek seeds in animal and human diets, and in different therapeutic preparations.

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