

Effect of Fenugreek on Total Body and Organ Weights: A Study on Mice

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Summary

OBJECTIVE

The present study was undertaken with an objective to examine the effects of fenugreek on

- a) Weight gain induced by high fat diet and its reduction by adding different doses (0.3% and 1%) of fenugreek seed extract and
- b) Organ weights

METHODS

24 female ddY mice of 5 weeks old were selected for the study and were randomly assigned to 4 groups A, B, C and D and were fed with the following diet ad libitum for 22 days: A- High fat diet, B- Low fat diet, C- High fat diet with fenugreek 0.3% and D- High fat diet with fenugreek 1%. Total body weights of each animal from all groups were measured on every 4th day. Animals were sacrificed on the 22nd day and organ weights were measured.

RESULTS

During the study stepwise gain in body weight was seen with both control groups (A and B) which is statistically significant, and a gradual decrease in body weight was seen in both the fenugreek-administered groups (C and D). Greater decrease in body weight was seen with higher concentration fenugreek (1%), which was statistically significant. Except for adipose tissue weight in female mice under study, weights of other organs were not significantly different. Significant increase in adipose tissue weight was seen in both the control groups A and B and significant decrease in adipose tissue weight was seen in test groups C and D.

DISCUSSION

In the present study dose dependent decrease in total body weight is seen with fenugreek administered group of animals in comparison with control groups. Fenugreek does not have any effect on the solid organs like liver, spleen and kidney weights. It only decreased the total amount of adipose tissue.

CONCLUSION

Fenugreek seed extract is effective in reducing the total body and adipose tissue weight in a dose dependent manner.

KEYWORDS: Fenugreek, Obesity, high fat diet, low fat diet

Introduction

Obesity is one of the major risk factor for morbidity and mortality¹. Obesity may be defined as abnormal growth of adipose tissue. Sevringhaus defined obesity as an excess of fat over the normal expected for the height, age and sex of the person². Obesity is caused by various genetic and environmental factors³. One of the main environmental factors causing obesity is the high fat diet which has come into wide use today. The gain in weight with advancing age is greater in females than in males and a greater proportion of females are overweight than men². Statistical studies have demonstrated the adverse influence of obesity on hypertension, diabetes, cirrhosis, heart disease, venous thrombosis and embolism, atherosclerosis, acute and chronic nephritis and toxemias of pregnancy. Also there is a greater severity of degenerative arthritis in the knees, hips and lumbar spine, increased incidence of gall bladder disease, earlier appearance of varicose veins, more frequent fractures, increased fetal mortality and greater difficulty in obstetrical delivery in obese females. In addition to the physical disorders mentioned, there are serious mental disorders like neurosis stemming from obesity. These are the reasons that force us for the correction of obesity.

Fenugreek (*Trigonella foenum-graecum*) also known as Greek hay is a well-known leguminous annual herbaceous plant extensively cultivated in Asia, Africa and Europe. The Latin name of fenugreek, *Trigonella* means triangle shaped pale yellow flower and *Foenum graecum* means Greek hay. Fenugreek grows to an average height of 2 feet. In most of the countries fenugreek is still used as a supplement in wheat and maize flour for bread making⁴. In traditional Chinese medicine, fenugreek seeds are used as a general tonic to improve metabolism and health as well as a treatment for weakness and edema of legs⁴. In India fenugreek is commonly consumed as a condiment and used medicinally as a lactation stimulant⁴. The possible hypoglycemic and anti-hyperlipidaemic properties of oral fenugreek seed powder have been reported by the results of preliminary and human trials⁴. The present study was therefore undertaken with an objective to examine the effects of Fenugreek on a) weight gain, induced by high fat diet and its reduction by adding different levels (0.3% and 1%) of fenugreek seed extract b) organ weights.

Material and Methods

Fenugreek seed was purchased from the local market and authenticated by Pharmacognosy department. After cleaning they were powdered and were extracted with 70% ethanol and the extracted solution was evaporated, a dark brown extract was obtained. 24 female ddY mice of 5 weeks old were obtained from the Animal House, Department of Pharmacology, JJM Medical College, Davangere. All experiments were performed in accordance with the Institutional Animal Ethical Committee, JJM Medical College, Davangere. The selected mice were randomly allocated into 4 groups (A, B, C and D) of 6 mice each. Initial weight of the mice (on day 0) was measured in terms of grams. The animals were fed with the following diet *ad libitum* for 22 days. Group A was given high fat diet, Group B low fat diet. Group C and D were fed a high fat diet incorporated with 0.3% and 1% fenugreek extract respectively. The fenugreek extracts were incorporated by replacing equal amounts of casein in the diet because it is known that a small change in casein content does not affect body weight gain³. Group A and B

were considered as control. Body weight was measured every 4th day during the study. On 22nd day of the study, animals of all the 4 groups were sacrificed and organ weights (liver, kidney, spleen and adipose tissue) were measured.

Table 1: Composition of experimental diets

Component in	HFD	LFD
Casein	30%	30%
Beef tallow	40%	5%
Corn starch	11%	11%
Cellulose	5%	40%
Sucrose	9%	9%
Multivitamins	1%	1%
Minerals (iron, calcium)	4%	4%

HFD: HIGH FAT DIET, LFD: LOW FAT DIET

Results

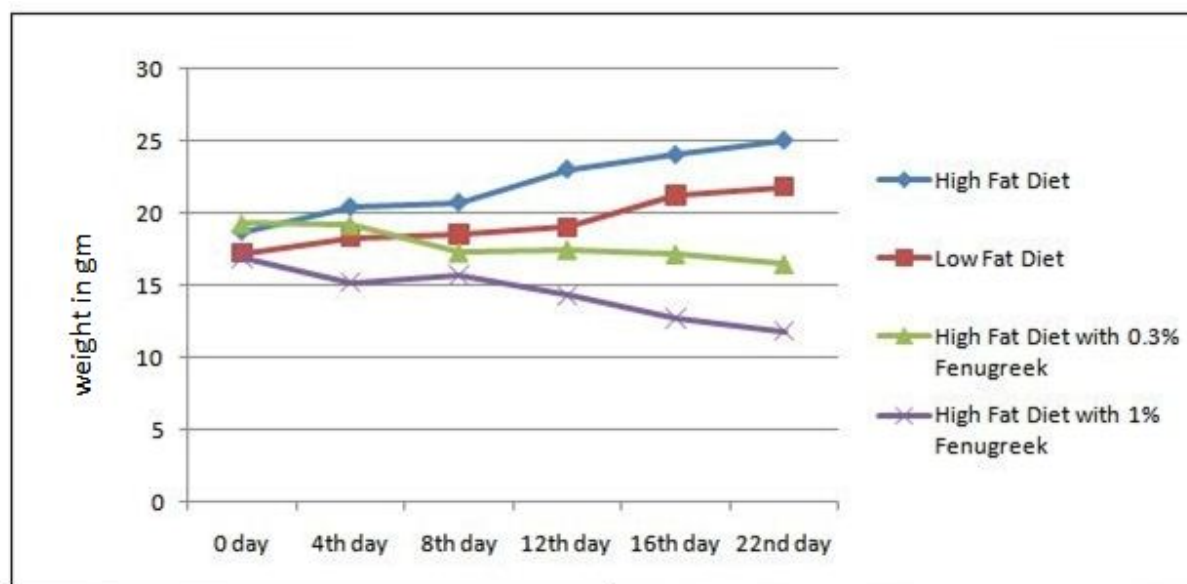
Animals fed with diets containing various levels of fenugreek seed extract showed reduced food intake during the first few days (0 – 8 days) but later regained their appetite, otherwise supplementation with fenugreek at 0.3% and 1% levels did not alter the food intake of animals.

Table 2: Effect of Fenugreek seed extract on body weight on obese model mice at different intervals.

Group	0 day	4 th day	8 th day	12 th day	16 th day	22 nd day	0- 22 DAYS		
							Mean change	% change	P value
A	18.7 [±] 1.4	20.4 [±] 1.4	20.7 [±] 1.2	23 [±] 1.2	24 [±] 1.9	25 [±] 3.5	6.3 [±] 1.8	34% [↑]	<0.01
B	17.2 [±] 1.1	18.3 [±] 1.5	18.5 [±] 3.5	19.3 [±] 1.6	21.2 [±] 1.3	21.8 [±] 1.6	4.6 [±] 0.7	27% [↑]	<0.01
C	19.3 [±] 0.6	19.2 [±] 0.6	17.3 [±] 0.4	17.5 [±] 1.5	17.2 [±] 1.3	16.5 [±] 0.8	2.8 [±] 0.5	15% [↓]	<0.01
D	16.9 [±] 1.1	15.2 [±] 1.6	15.7 [±] 1.6	14.3 [±] 1.2	12.7 [±] 0.9	11.8 [±] 0.8	5.1 [±] 0.7	30% [↓]	<0.01
ANOVA									
F	1.14	2.58	2.83	8.82	15.77	25.98	65.5		
p	0.36,NS	0.08,NS	0.06,NS	<0.01,S	<0.01,S	<0.01,S	<0.01,S		

Data are expressed as the mean[±] S.E. and were analyzed by one-way ANOVA and Scheffe's test. *p < 0.01

Figure 1: Effect of fenugreek seed extract on body weight on obese model mice at different intervals



During the study stepwise gain in body weight was seen with both control groups (A and B) which is statistically significant, and a gradual decrease in body weight was seen in both the fenugreek administered groups(C and D). Greater decrease in body weight was seen with higher concentration of fenugreek (1%), which was statistically significant.

As shown in Table 3 except for adipose tissue weight in female mice under study, weights of other organs were not significantly different. Significant increase in adipose tissue weight was seen in both the control groups A and B and significant decrease in adipose tissue weight was seen in both the test group C and D.

Table 3: Effect of fenugreek seed extract on organ weight in obese model mice

	A	B	C	D	ANOVA
Liver	1.32 ±0.05	1.26±0.16	1.17±0.06	1.03±0.11*	F=1.55 P=0.23,NS
Spleen	0.058±0.009	0.045±0.009	0.050±0.007	0.028±0.007*	F=2.42 P=0.10,NS
Kidney	0.33±0.02	0.39±0.04	0.33±0.03	0.30±0.02*	F =1.85 P=0.17,NS
Adipose tissue	2.63±0.31	4.36±0.19	3.26±0.16	2.64±0.27**	F=11.37 P<0.01,S

Data are expressed as mean ±S.E. and analyzed by one-way ANOVA and Scheffe's test.

* t test – NS , ** p<0.01

Discussion

In the present study fenugreek seed extract incorporated into diet at levels of 0.3% and 1% showed significant decrease in body weight and adipose tissue weight. The present study observations on the fenugreek seed extract supplementation in reducing the body and adipose tissue weight is in line with the findings of earlier study by Toshiaki Handa et al³. The probable mechanism of fenugreek decreasing the total body and adipose tissue weight may be that 1) fenugreek flushes out the carbohydrates from the body before they enter the blood stream resulting in weight loss 2) Fenugreek seeds contain a high proportion (40%) of soluble fiber. This fiber forms a gelatinous structure (similar to gaurgum) which may have effects on slowing the digestion and absorption of food from the intestine and create a sense of fullness in the abdomen, thus suppresses appetite and promotes weight loss. However in the present study fenugreek seed extract did not alter the food intake of animals. A dose dependent decrease in total body weight was seen with fenugreek administered group of animals in comparison with control groups. Fenugreek does not have any effect on the weight of solid organs like liver, spleen and kidney; it only decreases the total amount of adipose tissue. These results establish that fenugreek seed extract has useful anti-obesity property. Further studies in humans are required to correlate the studies done on animals.

Conclusion

As in the present study beneficial decrease in total body as well as adipose tissue weight is seen, fenugreek can be accepted as one of the herbal preparation for treating obesity. Further study is needed for exploring the other mechanism of anti-obesity by fenugreek.

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