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BIOLOGICAL EVALUATION OF FENUGREEK SEEDS BOILED DRINK

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ABSTRACT

In Egypt, fenugreek seeds are considered one of the most important crops belongs to family *Fabaceae* and it is major producing in most of the developing countries.

In this biological study using fenugreek seeds boiled drink "FSB", deodorized fenugreek seeds with water boiled drink "DFSWB" and deodorized fenugreek seeds with anise water boiled drink "DFSAB".

The results indicated that serum glucose in diabetic rats was reduced from 382.680 to 300.163 mg/dl, when the rats were fed on deodorized fenugreek seeds with water boiled drink. This means that the decrease of serum glucose was 82.517 mg/dl in diabetic rats after treatments for 5 weeks.

Treatments the rats with deodorized fenugreek seeds with water boiled drink "DFSWB" and deodorized fenugreek seeds with anise-water boiled drink "DFSAB" for 35 days decreased the serum glucose significantly but gradually.

The rate of increasing in serum Insulin reached from less than 0.02µUI/ml to 0.477, 0.653 and 0.537 µUI/ml when using fenugreek seeds boiled drink "FSB", deodorized fenugreek seeds with water boiled drink "DFSWB" and deodorized fenugreek seeds with anise-water boiled drink "DFSAB", respectively.

Keywords: Fenugreek, Anise, Insulin.

INTRODUCTION

The family *Fabaceae* includes many crops useful for food, forage, fiber, wood and ornamental purposes. In this family, a few legumes such as chickpea, soybean, faba bean, fenugreek, lentil, pea ……etc. *(Dangi et al., 2004)*.

Fenugreek is as wild plant and also cultivated in Northern India. The hypoglycemic effect of fenugreek seeds has been demonstrated in experimentally induced diabetic rats, dogs, mice and healthy volunteers. Ribes *et al.,* (1984).

Ribes *et al.,* (1986) studied the effect of isolated fibers, saponins and other proteins from fenugreek seeds on alloxan diabetic dogs meals for 21 day. The results showed significant anti-hyperglycemic and anti-glycosuric effect along with reduction in high plasma glucagon and somatostatin.

Salimath *et al.,* (2005) studied the beneficial effect of feeding fenugreek (*Trigonella foenum graecum*) seed mucilage and spent turmeric (*Curcuma Longa*) on streptozotocin-induced diabetic rats. Diabetic rats lost weight but body weights were improved by feeding spent turmeric than fenugreek seed mucilage. Fasting blood glucose showed a 26% and 18% improvement with fenugreek seed mucilage and spent turmeric feeding to diabetic rats,

respectively. Fenugreek seed mucilage compared with turmeric was more effective in ameliorating diabetic state.

Andersen, *et al.,* (1987) found that, the response of control subjects to a protein-poor and fat-rich as compared to a protein-rich and fat-poor diet was characterized by elevations of the concentration of HDL cholesterol. Although high-protein diets may be beneficial to diabetic blood- glucose control, the level of blood glucose, vLDL and triglycerides in serum remained unchanged. An increase in the HDL cholesterol level was observed earlier in healthy subjects given fat-rich food. The study changes were associated with a decrease in apparent rate of cholesterol synthesis.

Loubatieres–Mariani *et al.,* (1986) studies have clearly demonstrated the cholesterol. Lowering activity of fenugreek in animals in a typical study, fractions of fenugreek seeds were added to the diets of diabetic hyper cholesterolemic and normal dogs. The defatted fraction, which contains about 54% fiber and about 5% steroidal saponins, lowerd plasma cholesterol, blood glucose and plasma glucagon levels from pretreatment values in both groups of dogs. The hypocholesterolemic effect has been reproduced in rats.

According, this study was carried out to investigate the biological effect of fenugreek drink prepared with different methods.

MATERIALS AND METHODS

Materials:-

Fenugreek seeds were obtained from the local market of kafr El-Sheikh city, Egypt.

Methods:-

Preparation of fenugreek seeds boiled drink:-

Fenugreek seeds (230 gm) were cleaned and boiled in 1L. tap water for 30 min., cooled to room temperature and stored in glass bottles.

Preparation of deodorized fenugreek seeds with water boiled drink:-

Fenugreek seeds (230 gm) were cleaned and soaked in 1L. tap water for about 8hours. The solution was boiled about for 30 min., cooled to room temperature and stored in glass bottles *(El-Shirbeeny, 2011)*.

Preparation of deodorized fenugreek seeds with anise water boiled drink:-

Anise seeds (100 gm) were boiled in1L. tap water for 30 min. to enough solution followed by decantation. The deodorized fenugreek with water seeds were soaked in prepared of anise seeds solution for about 8hours and boiled about for 30 min. cooled to room temperature and stored in glass bottles *(El-Shirbeeny, 2011)*.

Biological assay:-

Thirty adult male albino rats (276-297gm) were kept under healthy conditions and fed on basal diets for adaptation for 35 days. Then the rats were divided randomly into five groups (n=6). Basal diet prepared as described by *Turnland and Margen, (1979),* salt mixture used was that proposed by *Fauzy, (1999)* and composition of vitamin mixture described by *Amer, (2002).*

All diets are given in Table (1). Rats were fed for 35 days according to the following scheme:-

- G1- Healthy rats fed on basal diet (negative control).
- G2- Diabetic rats fed on basal diet (positive control).
- G3- Diabetic rats fed on basal diet + 20% fenugreek seeds boiled drink + 80% water.
- G4- Diabetic rats fed on basal diet + deodorized fenugreek with water seeds boiled drink + 80% water.
- G5- Diabetic rats fed on basal diet + 20% deodorized fenugreek with anise-water seeds boiled drink + 80% water.

Table (1):- Composition of different tested diets of all groups rats from different treatments of fenugreek seeds boiled drink:-

Contents / Group NO.	Diets											
	Corn Starch	Casein	Corn Oil	Salt Mix.	Vitamin Mix.	Cellulose	Carbohydrates	Proteins	Fats	Crude Fibers	Water %	Fenugreek boiled drink %
Group (1) Control (-)	65	15	10	4	1	5	0	0	0	0	100	00
Group (2) Control (+)	65	15	10	4	1	5	0	0	0	0	100	00
Group (3) "FSB"	65	15	10	4	1	5	0	0	0	0	80	20
Group (4) "DFSWB"	65	15	10	4	1	5	0	0	0	0	80	20
Group (5) "DFSAB"	65	15	10	4	1	5	0	0	0	0	80	20

Biological analysis of serum:-

- Triglycerides level was determined enzymatically according to the method described by *Stein (1987).*
- Total Cholesterol (TC) was determined in blood serum of experimental rats using the kits of BIO-MED DIAGNOSTICS, MDSSGmbh Schiffgraben 41,30175 Hannover, Germany. The method of *Tietz (1976).*
- HDL-Cholesterol in blood serum was performed following colorimetric method of *Lopez, et al, (1977).*
- LDL-Cholesterol and vLDL-Cholesterol in blood serum was performed following colorimetric method of *Lopez, et al, (1977).*
- Glucose in blood serum was performed following colorimetric method of *Weissman, M. and Klien (1958).*
- The determination of GOT (AST) was performed following the method of *Henry (1964).*
- The determination of GPT (ALT) was performed following the method of *Henry (1964).*
- Insulin was determined following the method of *Turkinton, et al. (1982).*

Statistical analysis

Statistic analysis was done according to CoStat version 6.311. copyright © (1998-2005) CoHort Software 798 Lighthouse Ave.. PMB 320, Monterey, CA, 93940, USA.

RESULTS AND DISSCUSIONS

The biological evaluation of fenugreek seeds boiled drink "FSB", deodorized fenugreek seeds with water boiled drink "DFSWB" and deodorized fenugreek seeds with anise water boiled drink "DFSAB".

Effect of fenugreek seeds boiled drink and other treatments on body weight in rats:-

Results in Table (2) showed that the daily food intake for (1 rat and 6 rats) (g) and daily gain in body weight (g/rat) for different groups of rats fed with different boiled drink treatments from diets as well as the control group. The highest of daily gain in body weight was with the groups of rats fed with diet containing "DFSWB' and also group fed with diet containing "DFSAB".

In this concern, the highest daily food intake for (1 rat and 6 rats) was with the group of rats fed with basal diet and fenugreek seeds boiled drink by diet which was (19.08 g/rat/day and 114.52 g/6rats/day) and (18.52 g/rat/day and 111.15 g/6rats/day), respectively. Moreover, the daily food intake decreased in groups of rats fed with deodorized fenugreek seeds with water boiled drink "DFSWB" was (14.93 g/rat/day and 89.63) g/6rats/day and fed with deodorized fenugreek seeds with anise water boiled drink "DFSAB" was (17.87 g/rat/day and 107.22 g/6rats/day).

The effect of treatment on serum glucose in alloxan diabetic rats:-

The hypoglycemic effect of feeding other treatments of fenugreek seeds boiled drink:-

Data in Table (3) revealed that serum glucose was reduced every week with using different of fenugreek seeds boiled drink with diets on alloxan diabetic rats.

The best of treatment to use for feeding diabetic rats was deodorized fenugreek seeds with water boiled drink serum glucose decreased from 382.680 to 300.163 mg/dl and rate of decrement 82.51 mg/dl. Also, deodorized fenugreek seeds with anise-water boiled drink serum glucose were decreased from 380.270 to 318.550 mg/dl and rate of decrement 61.720 mg/dl. Another hands, control "A" basal diet in healthy rats, control "B" basal diet in diabetic rats and fenugreek seeds boiled drink were rate of decrement 5.904, 10.687 and 37.260 mg/dl, respectively after 35 days.

Table (2):- Feeding and growth parameters of rats fed on fenugreek seeds boiled drink treatments:-

Groups	Initial Body Weight (g/rat) "Adaptation Time*"	Final Body Weight (g/rat) after 5 weeks (35 days)	Gain in Body Weight (g/rat) after 5weeks (35 days)	Daily Gain in Body Weight (g/rat)	Daily Food Intake (g) For 1 Rat	Conversion of rate %
G1: Negative control "A"	276	360^{c}	84^{d}	2.41^{d}	19.08	12.56
G2: Positive control "B"	283	326^{c}	43^{c}	1.23^{d}	18.82	6.54
G3: Fenugreek seeds Boiled drink "FSB"	289	380^{d}	91^{i}	2.60^{e}	18.52	14.04
G4: Deodorized fenugreek seeds with water Boiled drink "DFSWB"	284	390^{h}	106^{a}	3.28^{i}	14.93	21.96
G5: Deodorized fenugreek seeds with anise-water Boiled drink "DFSAB"	297	394^{g}	97^{b}	2.77^{h}	17.87	15.50
L.S.D. Value		1.347	2.731	0.254		

(*) Rats were acclimated for 10 days in a purified reference diet without any added fenugreek seeds treatments.

- **Statistical analysis was carried out for each column separately.**
- **The same letters show that their statistical analysis was not significant, but different letters appear the significancy among the tasted samples**

Effect of different treatments on triglycerides and cholesterol in alloxan-induced diabetic rats:-

The results in Table (4) shows the effect of replace water to treatments of fenugreek seeds boiled drink on triglycerides in diabetic rats showed that effect deodorized fenugreek with water seeds boiled drink and deodorized fenugreek with anise-water seeds boiled drink decrement during less than fenugreek seeds boiled drink and basal diet control "B" in diabetic rats and basal diet control "A" in healthy rats.

In case of a healthy rats the rate of reduction on serum triglycerides was 34.093 mg/dl in deodorized fenugreek seeds with water boiled drink, while the rate of reduction in diabetic rats on serum triglycerides was 30.667 mg/dl in deodorized fenugreek seeds with anise-water boiled drink in Table (4).

Table (4) shows that, in healthy and diabetic rats feeding basal diet the rate of reduction for serum triglycerides were 1.356 and 4.693 mg/dl but the rate of reduction was 27.856 mg/dl in diabetic rats feeding fenugreek seeds boiled drink.

Table (3):- Effect of Feeding with treatments of Fenugreek Seeds boiled drink on serum glucose (mg/dl):-

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	107.206 ± 13.210 ^{Ac}	105.520 ± 12.681 ^{Ab}	103.750 ± 10.939 ^{Ab}	102.887 ± 10.853 ^{Ab}	103.160 ± 12.564 ^{Ab}	101.303 ± 12.532 ^{Ab}	18.284
G2 Positive Control (+)	320.420 ± 35.956 ^{Ab}	317.770 ± 35.161 ^{Aa}	315.327 ± 34.229 ^{Aa}	313.260 ± 34.371 ^{Aa}	310.877 ± 33.662 ^{Aa}	309.733 ± 32.515 ^{Aa}	61.078
G3 "FSB"	383.110 ± 36.488 ^{Aa}	378.683 ± 36.863 ^{Aa}	373.350 ± 36.738 ^{Aa}	363.743 ± 41.519 ^{Aa}	356.716 ± 43.251 ^{Aa}	345.850 ± 43.210 Aa	70.795
G4 "DFSWB"	382.680 ± 38.106 ^{Aa}	365.310 ± 38.456 ^{Aa}	345.106 ± 41.165 ^{Aa}	307.020 ± 72.382 ^{Aa}	307.626 ± 55.068 ^{Aa}	300.163 ± 40.320 Aa	87.524
G5 "DFSAB"	380.270 ± 34.955 ^{Aab}	368.373 ± 38.054 ^{Aa}	357.060 ± 31.135 ^{Aa}	339.260 ± 36.296 ^{Aa}	330.183 ± 33.231 ^{Aa}	318.550 ± 34.180 Aa	61.752
L.S.D. Value of Columns	60.188	61.334	59.259	79.632	69.507	62.364	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

Table (4):- Effect Feeding with treatments of Fenugreek Seeds boiled drink on serum Triglycerides (mg/dl):-

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	183.326 ± 13.453 ^{Ac}	181.730 ± 17.318 ^{Ab}	184.210 ± 7.995 ^{Ab}	184.470 ± 7.245 ^{Ab}	182.830 ± 10.599 ^{Ab}	181.970 ± 11.420 ^{Ab}	21.050
G2 Positive Control (+)	230.383 ± 9.750 ^{Ab}	230.593 ± 35.526 ^{Aa}	230.410 ± 32.072 ^{Aa}	230.140 ± 30.708 ^{Aa}	228.953 ± 22.145 ^{Aa}	225.690 ± 16.028 ^{Aa}	46.368
G3 "FSB"	249.696 ± 4.272 ^{Aa}	242.093 ± 2.883 ^{Ba}	236.946 ± 2.461 ^{BCa}	231.060 ± 2.264 ^{CDa}	225.920 ± 3.582 ^{DEa}	221.840 ± 6.610 ^{Ea}	7.051
G4 "DFSWB"	244.793 ± 5.108 ^{Aab}	236.466 ± 4.415 ^{Ba}	230.033 ± 4.067 ^{BCa}	223.963 ± 4.266 ^{CDa}	215.890 ± 4.952 ^{DEa}	210.700 ± 4.661 ^{Ea}	8.171
G5 "DFSAB"	252.160 ± 11.226 ^{Aa}	245.256 ± 11.694 ^{ABa}	239.563 ± 10.626 ^{ABCa}	234.303 ± 9.740 ^{BCDa}	227.993 ± 8.134 ^{CDa}	221.493 ± 4.720 ^{Da}	17.171
L.S.D. Value of Columns	17.190	33.807	28.511	27.151	21.621	17.732	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

Results in Tables (5, 6, 7, and 8) appear the levels of serum cholesterol such as total Cholesterol, HDL-Cholesterol, LDL-Cholesterol and vLDL-Cholesterol mg/dl of different treatments supplementation of fenugreek seeds boiled drink as well as the basal diet. The adaptation period for the animal groups was 10 days in which the animals received purified diets.

Total cholesterol in serum diabetic rats feeding treatments of fenugreek seeds boiled drink are presented in Table (5).

Table (5):- Effect of Feeding with treatments of fenugreek seeds boiled drink on serum Total Cholesterol (mg/dl):-

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	121.703 ± 3.445 ^{Ac}	122.210 ± 7.427 ^{Ad}	121.656 ± 2.543 ^{Ad}	122.496 ± 5.123 ^{Ad}	120.300 ± 2.214 ^{Ad}	119.810 ± 2.178 ^{Ad}	7.596
G2 Positive Control (+)	262.120 ± 3.295 ^{Aa}	258.963 ± 4.275 ^{ABa}	257.440 ± 4.298 ^{ABa}	255.703 ± 4.688 ^{ABa}	255.886 ± 5.609 ^{ABa}	253.113 ± 5.053 ^{Ba}	8.171
G3 "FSB"	252.450 ± 5.606 ^{Ab}	248.073 ± 4.716 ^{ABb}	244.836 ± 7.208 ^{ABb}	238.540 ± 7.640 ^{BCb}	231.233 ± 8.543 ^{CDb}	223.190 ± 3.499 ^{Db}	11.465
G4 "DFSWB"	244.513 ± 5.066 ^{Ab}	236.396 ± 4.924 ^{ABc}	228.850 ± 4.710 ^{BCc}	222.226 ± 5.243 ^{CDc}	214.306 ± 4.812 ^{Dc}	205.546 ± 3.693 ^{Ec}	8.481
G5 "DFSAB"	247.300 ± 6.299 ^{Ab}	240.620 ± 7.305 ^{ABbc}	232.383 ± 6.747 ^{Bc}	228.450 ± 8.086 ^{BCbc}	219.216 ± 6.717 ^{CDc}	213.320 ± 6.601 ^{Dc}	12.424
L.S.D. Value of Columns	8.893	10.709	9.783	11.490	10.843	8.126	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

The obtained results indicated that deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink on serum total cholesterol in diabetic rats are decreased at a rate of 38.967 and 33.980 mg/dl, respectively compared with group (3) fenugreek seeds boiled drink and Control "B" in diabetic rats and Control "A" in healthy rats were 29.260, 9,007 and 1.893, respectively.

It is clear that when using deodorized fenugreek seeds with water boiled drink in feeding diabetic rats gave the best results of decreased in serum total cholesterol compared with other boiled drink treatments.

In Table (6) observed that the reduction increased during the experiment in diabetic rats on serum HDL-Cholesterol in all levels of diets containing treatments of fenugreek seeds boiled drink.

In Table (6) explain that, the reduction for serum HDL-Cholesterol were results in rats fed diets containing deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink in diabetic rats higher than Control "A" in healthy rats and Control "B" in diabetic rats.

Table (6):- Effect of Feeding with treatments of fenugreek seeds boiled drink on serum HDL-Cholesterol (mg/dl)

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	49.253 ± 3.994 ^{Ab}	47.143 ± 4.028 ^{Ab}	47.033 ± 4.028 ^{Ab}	45.806 ± 3.479^{Ab}	41.496 ± 8.254 ^{Ab}	44.493 ± 4.339 ^{Ab}	8.675
G2 Positive Control (+)	73.323 ± 6.333 ^{Aa}	69.366 ± 9.071 ^{Aa}	69.466 ± 8.122 ^{Aa}	68.010 ± 1.975 ^{Aa}	68.853 ± 5.255 ^{Aa}	68.263 ± 3.068 ^{Aa}	10.997
G3 "FSB"	57.206 ± 8.435 ^{Ab}	55.863 ± 8.174 ^{Aab}	54.263 ± 7.898 ^{Ab}	51.463 ± 7.034 ^{Ab}	49.760 ± 7.494 Ab	48.580 ± 7.399 ^{Ab}	13.794
G4 "DFSWB"	54.836 ± 9.108 ^{Ab}	52.943 ± 9.184 ^{Ab}	50.653 ± 9.199 ^{Ab}	47.970 ± 9.685 ^{Ab}	45.970 ± 10.214 ^{Ab}	44.156 ± 10.131 ^{Ab}	17.074
G5 "DFSAB"	56.590 ± 7.455 ^{Ab}	54.730 ± 7.511 ^{Ab}	52.620 ± 7.308 ^{Ab}	50.333 ± 6.668 ^{Ab}	48.630 ± 7.328 ^{Ab}	47.270 ± 6.643 ^{Ab}	12.739
L.S.D. Value of Columns	13.263	14.122	13.677	11.612	14.323	12.333	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

In Table (7) observed that the reduction increased during the experiment in diabetic rats on serum LDL-Cholesterol in all levels of diets containing treatments of fenugreek seeds boiled drink.

Table (7) explain that, the reduction for serum LDL-Cholesterol were results in rats fed diets containing deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink in diabetic rats higher than Control "A" in healthy rats and Control "B" in diabetic rats.

Table (7):- Effect of Feeding with treatments of fenugreek seeds boiled drink on serum LDL-Cholesterol (mg/dl):-

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	38.754 ± 5.458 ^{Ab}	38.620 ± 9.175 ^{Ab}	37.781 ± 6.183 ^{Ab}	39.796 ± 8.858 ^{Ab}	42.236 ± 10.463 ^{Ab}	37.926 ± 5.297 ^{Ac}	13.936
G2 Positive Control (+)	142.720 ± 7.817 ^{Aa}	143.430 ± 5.148 ^{Aa}	141.891 ± 5.872 ^{Aa}	141.665 ± 1.820 ^{Aa}	141.242 ± 4.112 ^{Aa}	139.712 ± 4.730 ^{Aa}	9.320
G3 "F.S.B."	145.305 ± 6.613 ^{Aa}	143.791 ± 8.119 ^{Aa}	143.184 ± 10.134 ^{Aa}	140.864 ± 6.310 ^{ABa}	135.989 ± 5.642 ^{ABa}	130.242 ± 5.359 ^{Bab}	12.843
G4 "D.F.S.W.B."	140.718 ± 12.363 ^{Aa}	137.456 ± 10.038 ^{ABa}	132.190 ± 12. 404^{ABa}	129.440 ± 12.898 ^{ABa}	125.158 ± 12.457 ^{ABa}	119.250 ± 11.362 ^{Bb}	21.270
G5 "D.F.S.A.B."	140.278 ± 10.599 ^{Aa}	136.838 ± 11.802 ^{Aa}	131.850 ± 11.566 ^{Aa}	129.319 ± 10.444 ^{Aa}	124.988 ± 12.413^{Aa}	121.751 ± 12.302 ^{Ab}	20.540
L.S.D. Value of Columns	16.268	16.607	17.507	16.211	17.590	15.429	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

In Table (8) observed that the reduction increased during the experiment in diabetic rats on serum vLDL-Cholesterol in all levels of diets containing treatments of fenugreek seeds boiled drink.

Table (8):- Effect of Feeding with treatments of Fenugreek Seeds boiled drink on serum vLDL-Cholesterol (mg/dl)

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	36.568 ± 2.543 ^{Ac}	36.346 ± 3.464 ^{Ab}	36.842 ± 1.599 ^{Ab}	36.894 ± 1.449 ^{Ab}	36.566 ± 2.120 ^{Ab}	36.391 ± 2.279 ^{Ab}	42..160
G2 Positive Control (+)	46.076 ± 1.950 ^{Ab}	46.166 ± 7.085 ^{Aa}	46.082 ± 6.414 ^{Aa}	46.028 ± 6.142 ^{Aa}	45.791 ± 4.429 ^{Aa}	45.138 ± 3.205 ^{Aa}	9.265
G3 "FSB"	49.938 ± 0.857 ^{Aa}	48.418 ± 0.577 ^{Ba}	47.389 ± 0.492 ^{Bca}	46.212 ± 0.453 ^{CDa}	45.184 ± 0.716 ^{DEa}	44.368 ± 1.322 ^{Ea}	1.410
G4 "DFSWB"	48.958 ± 1.022 ^{Aab}	47.293 ± 0.883 ^{Ba}	46.006 ± 0.813 ^{BCa}	44.792 ± 0.853 ^{CDa}	43.178 ± 0.99 ^{DEa}	42.140 ± 0.932 ^{Ea}	1.634
G5 "DFSAB"	50.432 ± 2.245 ^{Aa}	49.051 ± 2.339 ^{ABa}	47.913 ± 2.125 ^{ABCa}	46.794 ± 1.928 ^{BCDa}	45.598 ± 1.627 ^{CDa}	44.298 ± 0.944 ^{Da}	3.428
L.S.D. Value of Columns	3.363	6.747	5.702	5.425	4.324	3.545	

values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

Data in Table (8) explain that, the reduction for serum vLDL-Cholesterol were results in rats fed diets containing deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink in diabetic rats higher than Control "A" in healthy rats and Control "B" in diabetic rats.

Effect of fenugreek seeds and different treatments boiled drink supplementation on the transaminases enzymes:-

Data in Tables (9 and 10) were showed that the significant was over high in diabetic rats when feeding on the all fenugreek boiled drink treatments compared with control "B" and groups "3, 4 and 5" in diabetic rats and control "A" in healthy rats on liver functions GOT (AST) and GPT (ALT).

These results showed that all treatments fenugreek seeds boiled drink were significantly after 5 wk. and improvement of liver enzymatic function in healthy rats control "A" and diabetic rats in other groups (2, 3, 4 and 5).

The results in Table (9) showed that all treatments were high significant in deodorized fenugreek with water seeds boiled drink on the liver function GOT (AST).

This is particularly due to the fact that the rat of decreasing in GOT (AST) arrived to 29.964, 35.196 mg/dl when using deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink and anther hands, the rate of decreasing was arrived

20.946, 5.602 and 2.941 when using fenugreek seeds boiled drink, control "B" basal diet (in diabetic rats) and control "A" basal diet (in healthy rats) this data in Table (9).

Table (9):- Effect of Feeding with treatments of Fenugreek Seeds boiled drink on serum GOT (mg/dl)

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	39.904 ± 3.850 ^{Ab}	39.959 ± 3.178 ^{Aa}	41.188 ± 1.657 ^{Aa}	38.748 ± 1.188 ^{Aa}	38.018 ± 2.117 ^{Aa}	36.963 ± 2.753 ^{Aa}	4.658
G2 Positive Control (+)	42.522 ± 21.989 ^{Aab}	40.322 ± 18.232 ^{Aa}	41.793 ± 16.159 ^{Aa}	41.308 ± 14.349 ^{Aa}	39.588 ± 13.865 ^{Aa}	36.920 ± 11.216 ^{Aa}	29.059
G3 "FSB"	59.559 ± 8.115 ^{Aab}	56.117 ± 5.512 ^{ABa}	53.691 ± 1.656 ^{ABa}	49.378 ± 0.785 ^{BCa}	43.676 ± 1.803 ^{CDa}	38.613 ± 1.256 ^{Da}	7.421
G4 "DFSWB"	59.842 ± 17.007 ^{Aab}	51.819 ± 11.479 ^{ABa}	48.522 ± 7.340 ^{ABa}	49.378 ± 6.078 ^{ABCa}	41.336 ± 4.135 ^{BCa}	29.878 ± 1.660 ^{Ca}	16.746
G5 "DFSAB"	66.486 ± 9.829 ^{Aa}	55.217 ± 4.026 ^{Ba}	50.768 ± 1.345 ^{Ba}	49.469 ± 1.549 ^{BCa}	42.200 ± 2.279 ^{Ca}	31.290 ± 2.114 ^{Da}	8.174
L.S.D. Value of Columns	25.077	18.567	14.606	12.793	12.129	9.702	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

Data in Table (10) were showed that the significant was over high in diabetic rats when feeding on the all fenugreek boiled drink treatments compared with control "B" and groups "3, 4 and 5" in diabetic rats and control "A" in healthy rats on liver function GPT (ALT).

These results showed that all treatments fenugreek seeds were significantly after 5 wk. and improvement of liver enzymatic function in healthy rats control "A" and diabetic rats in other groups (2, 3, 4 and 5).

Result in Table (10) showed that all treatments were high significant in deodorized fenugreek seeds with water boiled drink on the liver function GPT (ALT).

This is particularly due to the fact that the rat of decreasing in GPT (ALT) arrived to 28.045, 27.782 mg/dl when using deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink and anther hands, the rate of decreasing was arrived 21.371, 7.934 and 6.317 mg/dl when using fenugreek seeds boiled drink, control "B" basal diet (in diabetic rats) and control "A" basal diet (in healthy rats) this data in Table (10).

Table (10):- Effect of feeding with treatment of Fenugreek Seeds Boiled drink on serum GPT (mg/dl)

Contents / Groups No.	After 72 hr.	After 1 wk.	After 2 wk.	After 3 wk.	After 4 wk.	After 5 wk.	L.S.D. Value of Rows
G1 Negative Control (-)	36.070 ± 9.042 ABb	36.734 ± 0.944 Aa	36.351 ± 2.169 Ab	31.652 ± 1.289 ABCb	29.897 ± 0.932 BCa	29.753 ± 3.179 Cc	6.271
G2 Positive Control (+)	45.809 ± 8.534 Aab	42.172 ± 7.559 Aa	42.157 ± 5.758 Aab	40.540 ± 3.191 Aab	38.843± 3.121 Aa	37.875 ± 1.015 Aab	7.262
G3 "FSB"	59.881 ± 15.178 Aa	53.749 ± 15.123 Aa	50.772 ± 9.990 Aa	48.465 ± 9.007 Aa	44.541 ± 5.044 Aa	38.510 ± 1.189 Aa	9.853
G4 "DFSWB"	59.686 ± 16.381 Aa	50.155 10.701 Aa	44.268 ± 7.535 Aab	43.220 ± 7.341 Aa	35.873 ± 6.845 Ab	31.641 ± 3.059 Ac	18.755
G5 "DFSAB"	60.659 ± 9.862 Aa	52.926 ± 7.316 Aa	51.885 ± 5.067 Aa	48.666 ± 3.358 Aa	39.194 ± 6.716 Ab	32.877 ± 4.264 Abc	12.693
L.S.D. Value of Columns	22.290	17.350	12.071	10.231	7.664	5.152	

All values are means of three replicates ± SD. Value in the same column with different letters (a, b, c, d, e, .Etc) are significantly different (P ≤ 0.05).
Capital letters refer to time compared within each treatment (Row). Small letters refer to treatment comparison with each time (Column)

Effect of different treatments of fenugreek seeds on insulin:-

The results in Table (11) the rate of increasing in serum Insulin reached from less than 0.02µUl/ml to 0.477, 0.653 and 0.537µUl/ml when using fenugreek seeds boiled drink "FSB", deodorized fenugreek seeds with water boiled drink "DFSWB" and deodorized fenugreek seeds with anise-water boiled drink "DFSAB". And anther hands, the treatments wasn't happen any effect clearly in serum insulin on control "B" basal diet (in diabetic rats) and control "A" basal diet (in healthy rats) compared with all treatments of fenugreek.

Table (11):- Effect Feeding with treatment of fenugreek seeds boiled drink on serum Insulin (µlU/ml):-

Contents / Groups No.	After 72 hr.	After 5 wk.	Effect of treatments
G1: Control Negative (-)	0.819	0.845	No-Effect
G2: Control Positive (+)	Less than 0.02	Less than 0.02	No-Effect
G3: "FSB"	Less than 0.02	0.477	Low Effect
G4: "DFSWB"	Less than 0.02	0.653	High Effect
G5: "DFSAB"	Less than 0.02	0.537	Low Effect

CONCLUSION

Finally, it could be concluded that using deodorized fenugreek seeds with water boiled drink and deodorized fenugreek seeds with anise-water boiled drink was better than fenugreek seeds boiled drink in decreasing the rate of serum glucose in rats.

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التقييم البيولوجى للمشروب المغلى لبذور الحلبه

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تعتبر بذور الحلبه فى مصر أحد وأكثر المحاصيل أهميه والأكثر انتاجاً فى معظم المحافظات والتابعه للعائله البقوليه.

فى تلك الدراسه البيولوجيه تم استخدام المشروب المغلى لبذور الحلبه والمشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة الماء والمشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة ماء الينسون.

حيث أظهرت النتائج أنه عند التغذيه على المشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة الماء انخفضت نسبة السكر فى الدم من ٣٨٢.٦٨٠ إلى ٣٠٠.١٦٣ ملجم /لتر أى بمعدل انخفاض ٨٢.٥١٧ ملجم/لتر فى الفئران المصابه بمرض السكر بعد انتهاء مدة التجربه خمس أسابيع.

أعطى كل من المشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة الماء والمشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة ماء الينسون فروق معنويه واضحه فى انخفاض نسبه السكر فى الدم خلال ٣٥ يوم.

وصل معدل الزياده فى هرمون الانسولين من أقل من ٠.٠٢ ميكرون / مل إلى ٠.٥٩٤ ، ٠.٦٨١ ، ٠.٦٢٣ ميكرون / مل عند استخدام المشروب المغلى لبذور الحلبه والمشروب المغلى لبذور الحلبه منزعة الرائحه بواسطة الماء والمشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة ماء الينسون فى الفئران المصابه بمرض السكر.

توصى الدراسه باستخدام المشروب المغلى لبذور الحلبه منزوعة الرائحه بواسطة الماء والمشروب المغلى لبذور الحلبه منزوعة الرائحه بماء الينسون حيث اعطت افضل النتائج فى انخفاض سكر الدم فى الفئران مقارنة بالمشروب المغلى لبذور الحلبه.