JHE
JOURNAL OF HOME ECONOMICS, MENOUFIA UNIVERSITY
Website: https://mkas.journals.ekb.eg
Print ISSN 2735-5934 Online ISSN 2735-590X

Nutrition and Food Sciences
Article Type: Original article

Received: 9 Jul 2024
Accepted: 13 Aug 2024
Published: 1 Jan 2025

Comparative Study Using Dill Plant Parts Considering Amelioration of Diabetes Side Effects

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ABSTRACT:

Dill (*Anethum graveolens*) is used as a culinary and medicinal herb. The major objective of this study was to assess the impact of powdered dill plant components, leaves, seeds, and roots in proportions (2.5 and 5%) on diabetic rats (injected with alloxan at dose 0.150 mg/kg of body weight). Forty adult male rats were used and the rats were divided into 8 groups (n=5) as following: G1: Control negative, G2: Fed on basal diet (BD) after injected with alloxan, G3:4: Fed on BD and dill leaves powder 2.5 & 5%) and G5: 6: Fed on BD and dill seeds powder 2.5 & 5%) and G7:8: Fed on BD and dill roots powder 2.5% & 5%). After 28 days of the experiment, blood samples were taken to assess liver and kidney function, lipid profile, and serum glucose levels. Histopathological alterations in the kidney and liver were examined. This study revealed that feeding on dill leaves as powder is more effective in lowering glucose levels because it contains many antioxidants. The collected data results confirm that, in evaluating the control positive group, the examined group fed on dill roots 5% ($p \leq 0.05$) dropped serum glucose, LDL-c, kidney, and liver functions whilst raised HDL-c.

Keywords: Rats ,Anethum Graveolens, Glucose, Antioxidants, Blood Lipids

Cite as: Mashal et al., 2025, Comparative Study Using Dill Plant Parts Considering Amelioration of Diabetes Side Effects. JHE, 35 (1), 55-67.
DOI:10.21608/mkas.2024.302935.1329

1- INTRODUCTION

Dill (*Anethum graveolens*) , commonly known as dill primarily used as a flavoring agent in salads , Its pharmacological properties, such as anti-hyperlipidemic and antihyperglycemic [1].*Adm*inistration of different of dill in diabetic models reduced triglyceride, total cholesterol , low-density lipoprotein cholesterol (LDL-c), very low-density lipoprotein cholesterol (VLDL-c) on the other hand many studies reported that dill has hypoglycemic and antioxidant activity.[2]. An abundance of nutrients, including vitamin A, C, D, riboflavin, manganese, folate, iron, copper, magnesium, zinc, and dietary fibers, are inherently present in fresh springs [3]. The antioxidant, antimicrobial, antidiuretic, antifungal, anticancer and anti -inflammatory are some benefits of *Anethum graveolens* [4].

Dill seeds essential oil, its non-polar and polar fractions, compound isolated and derivatized were evaluated for their antioxidant potential using different in vitro assays [5]. An excellent supply of mineral elements, vital amino acids, and fatty acids are in the root portion of *Anethum graveolens*. Due to its antibacterial, cytotoxic, and antioxidant properties, the essential oil has a great deal of potential as bioactive oil for use in pharmaceuticals and medicinal applications [6].

This study was designed to investigate the effect of dill parts as powder on diabetic rats .

2-Materials and Methods:

2.1. Materials:

2.1.1. The plant that was utilized:

Dill *(Anethum graveolens L)* plant components (leaves and roots) were obtained from one of the markets in Quesna city, Menoufia, Egypt, and seeds obtained from one of the herbarium in Quesna, and each part of the plant was separately beaten in the pneumatic mill, and the sieved well to obtain the powder and it was stored in a tightly closed container before the start of the study [7].

2.1.2. Alloxan:

Alloxan was purchased from the SIGMA corporation in Cairo, Egypt.

Rats: The study used forty male albino rats of the Sprague Dawley breed, weighted at 150 ± 10. The animals were obtained from the Egyptian corporation in Helwan, Egypt that produces vaccines, medications, and serums.

2.2. Methods:

2.2.1. Plants preparation:

Dill (Anethum graveolens L) plant components (leaves and roots) were obtained from one of the markets in Quesna city, Menoufia, Egypt, and seeds obtained from one of the herbarium in Quesna, and each part of the plant was separately beaten in the pneumatic mill, and the sieved well to obtain the powder and it was stored in a tightly closed container before the start of the study according to [7]. The powder add by 25.0 gram for 1 kilogram of basal diet for the concentration 2.5%, while 50.0 grams were added for 1 kilogram of basal diet for the concentration 5%.

2.2.2. Induction of diabetes mellitus:

Alloxan injected intraperitoneally for seven days to healthy male albino rats and was utilized at a dosage of 150 mg/kg body weight. This procedure was done to raise glucose levels which considered one of the side effects of alloxan to obtain diabetics according to [8].

2.2.3. Experimental design and animal groups:

The Research Ethics Committee of the Faculty of Home Economics, Menoufia University accepted research No. MUFHE / S / NFS / 6/24.

All biological experiments were done at the research biological lab in the Faculty of Home Economics, Menoufia university. Rats were housed in separate stainless-steel cages within a controlled environment in the animal house. For seven days, they were given a basal diet before switching to an experimental diet to help them get used to it. Rats were weighted once week and their feed and water were monitored daily. Non-scattering feeding cups were used to supply the rats' feed, in order to minimize feed loss, and contamination. Glass tubes that extended through the wire cage and were supported on one side of the cage by an upside-down bottle provided water for the rats.

After one week, the rats were split up to eight groups,

The initial group: n=5 negative controls fed a basal diet for 28 days.

The second group: Positive control (n=5) treated with alloxan solution then fed a basal diet only.

group 3: Rats (n=5) injected with alloxan then fed a basal diet consisting of 2.5% dill leaves as powder.

group 4: Rats (n=5) injected with alloxan then fed a basal diet consisting of 5% dill leaves as powder.
group 5: Rats (n=5) injected with alloxan then fed a basal diet consisting of 2.5% dill seeds as powder.
group 6: Rats (n=5) injected with alloxan then fed a basal diet consisting of 5% dill seeds as powder.
group 7: Rats (n=5) injected with alloxan then fed a basal diet consisting of 2.5% dill roots as powder.
group 8: Rats (n=5) injected with alloxan then fed a basal diet consisting of 5% dill roots as powder.
The rats were initially sacrificed under ether anesthesia at the conclusion of the experiment, and blood samples were taken via the abdominal aorta following a 12-hour fast. Samples of blood were positioned in sterile tubes for a dry centrifuge, allowed at room temperature to clot, and then centrifuged at 3000 rpm for 10 minutes to extract the serum. For biochemical analysis, after carefully aspirating the serum, it was moved into sterile cuvette tubes, and kept frozen at -20℃, following the procedure outlined by [9]. All samples were analyzed for determination the following parameters:

2.2.4. Biological evaluation:

Biological assessment of several diets using:
Daily feed intake measurements, body weight gain in grams (BWG), and feed efficiency ratio (FER) calculations based on [10] making use of the following formulas:

$$\text{BWG \%} = \frac{Final\ weight - Initial\ weight}{Initial\ weight} \times 100$$

$$\text{Feed Efficiency Ratio} = \frac{Gain\ in body\ weight\ (\frac{g}{day})}{Food\ intake\ (\frac{g}{day})}$$

Biochemical examination of serum:

Determination of blood glucose: Based on the procedure of [11].
Determination of serum lipid profile:
Determination of total cholesterol: It was determined based on the procedure of [12].
Determination of triglycerides: These were determined based on the procedure of [13-14].
Determination of HDL: It was determined based on the procedure of [15].
Calculation of VLDL and LDL: Carried out based on the procedures of [16-17]. As following:
VLDL (mg/dl) = Triglycerides/5
LDL (mg/dl) = Total cholesterol- (HDL-VLDL).
Determination of kidney function:
Determination of serum urea: Based on the procedure of [18].
Determination of serum uric acid: Based on the procedure of [19].
Determination of creatinine: Based on the procedure of [20].
Determination of liver function:
Determination of serum alkaline phosphatase: Based on the procedure of [21].
Determination of Aspartate transferase and Alanine amino transferase: Based on the procedures of [22-23].

2.2.5. Analytical Statistics:

A one-way ANOVA was used to statistically assess the data an automated costate analysis program application. The outcomes are displayed as mean ± standard deviation. Significant variations in treatment at ($p \leq 0.05$) were observed [24].

3. Results and Discussion:

Information displayed in a table (1), illustrate the result of dill plant parts powders at concentrations (2.5& 5%) on BWG & FI and FER presented for 28 days.
The mean value of BWG (g/day/rat)for the control (+) group was lower than that of the control (-) group, with respective mean values of 0.60±0.003and 2.38±0.001. This indicates a significant difference in the percent increases of +296.66 for the control (-) group compared to the control (+) group. On the other side , rats fed on dill roots 5% (group 8) recorded the best BWG value (2.10± 0.008).

The control group (+) exhibited a lower mean value of FI/g/day/rat than the control (-) group, with values of 15.97 ±0.007 and 18.23±0.111, respectively. This difference was statistically significant, with the control (-) group displaying a +14.15 percent increases in comparison to the control (+) group. On the other side , rats fed on dill roots 5% (group 8) recorded the best FI value (18.13± 0.003).

The control group (+) had a mean value of (FER/g/day/rat) of 0.04 ± 0.005 and 0.13 ± 0.008, which was lower than the control (-) group. This difference was statistically significant, with the control (-) group displaying a +225 percent increases in comparison to the control (+) group. On the other side , rats fed on dill roots.5% (group 8) recorded the best FER value (0.12± 0.006).

These outcomes concur with [25], who suggested that dill seeds powder intake reduced weight gain on diabetic rats due to *Anethum graveolens L* is a source of fiber and phenolic compounds which can decrease oxidative stress. Also, [26] reported that dill powder improved feed intake and body weight gain in brolier chicken; also use of dill powder in diet could decrease abdominal fat and cholesterol level of plasma.

Table (1): Effect of dill (Anethum graveolens) plant parts as powder (2.5% & 5%) of diet on feed intake (FI), body weight gain (BWG), and feed efficiency ratio (FER) of diabetic rats

Parameters / Groups	BWG (g/d/rat) (Mean ± SD)	FI (g/d/rat) (Mean ± SD)	FER (Mean ± SD)
G1: Control -ve	2.38± 0.001 a	18.23± 0.111 a	0.13± 0.008 a
G2: Control +ve	0.60± 0.003 g	15.97± 0.007 g	0.04± 0.005 d
G3: Dill leaves powder 2.5%	1.96± 0.002 c	17.88± 0.008 c	0.11± 0.025 b
G4: Dill leaves powder 5%	1.34± 0.006 d	17.66± 0.006 d	0.08± 0.003 c
G5: Dill seeds powder 2.5%	1.24± 0.005 f	17.32± 0.002 f	0.07± 0.001 c
G6: Dill seeds powder 5%	1.27± 0.009 e	17.48± 0.009 e	0.07± 0.002 c
G7: Dill roots powder 2.5%	1.35± 0.007 d	18.07± 0.015 b	0.07± 0.008 c
G8: Dill roots powder 5%	2.10± 0.008 b	18.13± 0.003 b	0.12± 0.006 b
LSD	0.01	0.069	0.018

The means of the same column with distinct litters differ significantly at ($p < 0.05$).

Table (2) data display the mean value of serum glucose (mg/dl) of rats .It was observed that the control (+) group's mean blood glucose value (mg/dl) was higher than the control (-) group's, being 251 ± 1.3 & 113 ± 1.1 respectively, demonstrating a substantial difference between the control (-) group's percent decreases of -54.98 and the control (+) group's. all hyperglycemia rats fed on dill leaves 5% and dill roots 2.5% showed significantly variances when contrast to control (+) group. Values were 120± 1.6 & 123± 1.3 (mg/di) . on the other side , rats fed on dill roots 5% (group 8) recorded the best value (117± 0.8).

These outcomes concur with [27], who noticed that diabetic rats' blood glucose levels had decreased as rats treated with powder of

Table (2): Effect of dill (Anethum graveolens) plant parts as powder (2.5% & 5%) of diet on the serum glucose (mg/dl) of rats with diabetes

Parameters / Groups	Glucose (mg/dl) Mean ± SD
G1: Control –ve	113 ± 1.1 f
G2: Control +ve	251 ± 1.3 a
G3: Dill leaves powder 2.5%	127 ± 1.4 b
G4: Dill leaves powder 5%	120 ± 1.6 d
G5: Dill seeds powder 2.5%	126 ± 0.6 e
G6: Dill seeds powder 5%	124.80 ± 0.3 bc
G7: Dill roots powder 2.5%	123 ± 1.3c
G8: Dill roots powder 5%	117± 0.8 g
LSD	2.19

The means of the same column with distinct litters differ significantly at ($p < 0.05$).

Anethum graveolens L. Also [28], who reported that dill powder reduced serum glucose levels due to possessed antioxidant, minerals as well as polyphenols, flavonoids

and alkaloids .As well as, [29] suggested that diet containing 1.5 g /day of dill powder for 6 weeks decreased serum levels of insulin.

Table(3) data display the mean value of serum triglyceride (TG) of alloxan injected rats on fed dill *(Anethum graveolens L.)* plant parts as powder. It was observed that the control (+) group's mean (TG) was higher than the control (-) group's, at 141± 1.2 & 117 ± 1.9. This indicated a significant difference in the precent decreases (-17.02) between control (-) group and control (+) group. One other side , rats fed dill roots powder 5%(group 8) recorded the best TG value (120± 0.9).

The average amount of serum total cholesterol (TC) alloxan injected rats fed on dill (*Anethum graveolens L.)* plant parts as powder is given in table (3). It was observed that the control (+) group's mean temperature (TC) was higher than the control (-) group's, at 171 ± 0.8 & 133 ± 0.1. This indicated a significant difference in the percent decreases (-22.22) between the control (-) group and the control (+) group. . One other side , rats fed dill roots powder 5%(group 8) recorded the best TC value (134± 0.3).

These outcomes concur with [30], who found that *Anethum graveolens L* supplementation significantly decreased total cholesterol (TC) however; there was no significant affection triglyceride (TG).

Also [31], who concluded that TC and TG levels significantly decrease after 4 weeks of 1g/day Anethum graveolens L powder treatment for hyperlipidemic patients.

The average amount of serum high density lipoprotein cholesterol in (HDL-c) alloxan injected rats on dill *(Anethum graveolens L.)* plant parts as powder was studied. It was observed that the control (+) group's mean (HDL) was lower than the control (-) group's, at 26± 0.1 & 36 ± 0.9, respectively. This indicated a significant difference in the percent increase (+38.46) between the control (-) group and the control (+) group. . One other side , rats fed dill seeds powder 5%(group 6) recorded the best HDL value (27± 0.4).

The average amount of serum low density lipoprotein cholesterol (LDL-c) of alloxan injected rats on dill *(Anethum graveolens L.)* plant parts as powder is shown in table (3). It was observed that the control (+) group's mean temperature (LDL-c) was higher than the control (-) group's, at 116.8 ± 0.06 & 73.6 ± 0.01, respectively. This indicated a significant difference in the percent decreases (-36.98) between the control (-) group and the control (+) group. . One other side , rats fed dill roots powder 5%(group 8) recorded the best LDL value (76± 0.4).

VLDL-c followed exactly the trend changes recorded. The best sample was that of dill group 8 fed on 5% dill roots when compared to control (+) group.

lipid profile of dill roots group is agreement with rarely finding [32], *Anethum graveolens L* supplementation significantly decreased low-density lipoprotein cholesterol (LDL-c). However, there was no significant effect on high-density lipoprotein cholesterol (HDL-c).

Also [33], who mentioned that trials with *Anethum graveolens L* extract supplementation had a lower heterogeneity in 6 weeks of duration.

These results are consistent with [34], They discovered that, when compared to patients treated with 20 mg/day, treating hyperlipidemic patients with 1 g/day of Anethum graveolens L powder for four weeks significantly reduced their levels of TC, TG, LDL-c, and very-low density lipoprotein. Nevertheless, there was no discernible shift in the serum HDL-c levels.

The mean value of serum (AST, U/L) alloxan injected rats on dill *(Anethum graveolens L.)* plant parts as powder is shown in table (4). It was observed that the control (+) group's mean temperature (AST) was higher than the control (-) group's, at 33.68 ± 0.3 & 16.50 ± 0.1, respectively. This indicated a significant difference in the percent decreases (-51) between the control (-) group and the control

(+) group. In group8 (dill roots powder, 5%) to the control (+) group, the finest AST was found.

Table (3): Effect of dill (Anethum graveolens) plant parts as powder (2.5% & 5%) of diet on Rats with diabetes and their lipid profiles (T.G, T.C, HDLc, LDLc, and VLDLc)

Parameters	Lipid profile (mg/dl)				
Groups	T.G	T.C	HDLc	LDLc	VLDLc
G1: Control –ve	117± 1.9 f	133± 0.1 h	36± 0.9 a	73.6 ± 0.01 f	23.4± 0.01 f
G2: Control +ve	141± 1.2 a	171± 0.8 a	26± 0.1 g	116.8 ± 0.06 a	28.2± 0.03 a
G3: Dill leaves powder 2.5%	130± 1.4 bc	142± 0.6 b	32± 0.7 c	82 ± 0.9 c	26± 0.9 bc
G4: Dill leaves powder 5%	122± 1.5 e	138± 0.7 d	32± 0.2 c	81.6 ± 0.03 c	24.4 ± 0.12 e
G5: Dill seeds powder 2.5%	128± 1.2 cd	139± 0.9 c	28± 0.3 e	85.4± 0.06 b	25.6 ± 0.23 cd
G6: Dill seeds powder 5%	126± 1.3 d	137± 0.4 e	27 ± 0.4 f	84.8 ± 0.001 b	25.2± 0.06 d
G7: Dill roots powder 2.5%	132± 0.3 b	136± 0.2 f	30 ± 0.8 d	79.6± 0.05 d	26.4± 0.33 b
G8: Dill roots powder 5%	120 ± 0.9 e	134± 0.3 g	34± 0.6 b	76 ± 0.4 e	24± 0.2e
LSD	2.23	0.99	0.99	0.60	0.56

The means of the same column with distinct litters differ significantly at (p < 0.05).
** T.C: Total cholesterol, TG: Triglycerides, HDL-c: High density lipoprotein, LDL-c: Low density lipoprotein and VLDL-c: Very low density lipoprotein.*

The average amount of serum (ALT, U/L) of alloxan injected rats on dill *(Anethum graveolens L.)* plant parts as powder is shown in table (4). It was observed that the control (+) group's mean temperature (ALT) was higher than the control (-) group's, at 38 ± 0.4& 24 ± 0.2, respectively. This indicated a significant difference in the percent decreases (-36.84) between the control (-) group and the control (+) group. Comparing group 8 (dill roots powder, 5%) to the control (+) group, the finest ALT was found.

The average amount of serum (ALP) of alloxan injected rats on dill *(Anethum graveolens L.)* plant parts as powder is shown in table (4). It was observed that the control (+) group's mean temperature (ALP) was higher than the control (-) group's, at 101.70 ± 0.25 & 65 ± 0.22, respectively. This indicated a significant difference in the percent decreases (-36.08) between the control (-) group and the control (+) group. Comparing group 8 (dill roots powder, 5%) to the control (+) group, the finest ALP was found.

The obtained results of liver enzymes activities is agreement with previous feeding by [35] , who noted that there was a notable decline in ALT, AST and ALP activities in diabetic rats after dill root consumption.

Table (4): Effect of dill (Anethum graveolens) plant parts as powder (2.5% & 5%) of diet on regarding hepatic function of diabetic rats

Parameters	Liver functions (U/L)		
Groups	AST	ALT	ALP
G1: Control –ve	16.50± 0.1 f	24 ± 0.2 h	65 ± 0.22 h
G2: Control +ve	33.68± 0.3 a	38 ± 0.4 a	101.70 ± 0.25 a
G3: Dill leaves powder 2.5%	20.60 ± 0.8 d	30 ± 0.9 e	81.20 ± 0.33 b
G4: Dill leaves powder 5%	22.50 ± 0.7 c	32 ± 0.1 d	79.80 ± 0.45 c
G5: Dill seeds powder 2.5%	24 ± 0.6 b	36 ± 0.5 b	74 ± 0.89 d
G6: Dill seeds powder 5%	20 ± 0.5 d	33 ± 0.3 c	73 ± 0.41 e
G7: Dill roots powder 2.5%	19 ± 0.6 e	27 ± 0.6 f	72 ± 0.16 f
G8: Dill roots powder 5%	17 ± 0.2 f	26 ± 0.8 g	70 ± 0.28 g
LSD	0.91	0.94	0.75

The means of the same column with distinct litters differ significantly at (p < 0.05).
AST: Aspartate Aminotransferase, ALT: Alanine Aminotransferase and ALP: Alkaline Phosphates.

Also [36], who showed that dill roots reduced the liver enzymes activities since its high in fiber and polysaccharides, Hence, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) are elevated in diabetic mice.

The average amount of serum urea of alloxan injected rats fed on dill *(Anethum graveolens L.)* plant parts as powder is presented in table (5). It was observed that the control (+) group's mean urea was higher than the control (-) group's, at 43 ± 0.2 & 26.50 ± 0.001, respectively. This indicated a significant difference in the percent decreases (-38.37) between the control (-) group and the control (+) group. In group 8 (dill roots powder, 5%) to the control (+) group, the finest serum urea was found.

The average amount of serum uric acid of alloxan injected rats fed on dill *(Anethum graveolens L.)* plant parts as powder is illustrated in table (5). It was observed that the control (+) group's mean uric acid was higher than the control (-) group's, at 6.44 ± 0.001 & 4.48 ± 0.002, respectively. This indicated a significant difference in the percent decreases (-30.43) between the control (-) group and the control (+) group. In group 8 (dill roots powder, 5%) to the control (+) group, the better serum uric acid was found.

The average amount of serum creatinine of alloxan injected rats raised on dill *(Anethum graveolens L.)* plant parts as powder is shown in table (5). It was observed that the control (+) group's mean creatinine was higher than the control (-) group's, at 0.84 ± 0.002 & 0.51 ± 0.001, respectively. This indicated a significant difference in the percent decrease (-39.28) between the control (-) group and the control (+) group. In group 8 (dill roots powder, 5%) to the control (+) group, the better creatinine was found.

These outcomes concur with [37], who suggested revealed, when compared to diabetic rabbits without receiving treatment, dill seed extract given to them for 45 days lowed their serum creatinine level. This suggested that an extract from dill seeds could aid with diabetes mellitus's secondary problems, such as kidney damage. Also [38], who showed that After 45 days, alloxan-induced diabetes results in a significant ($p < 0.05$) increase in the diabetic group's (T2) urea concentration when compared to other groups. These results are consisted with [39], who found that in mice with alloxan diabetes, the presence of antioxidants such flavonoids, polyphenols, and vitamins in dill may be the cause of the restoration of urea, creatinine, albumin, and uric acid.

Table (5): Effect of dill (Anethum graveolens) plant parts as powder (2.5% & 5%) of diet on kidney function of diabetic rats

Parameters	Kidney functions (mg/dl)		
Groups	Urea	Creatinine	Uric acid
G1: Control –ve	26.50± 0.001 f	0.51 ± 0.001 h	4.48 ± 0.002 f
G2: Control +ve	43 ± 0.2 a	0.84 ± 0.002 a	6.44± 0.001 a
G3: Dill leaves powder 2.5%	38± 0.3 b	0.65± 0.003 e	5.42± 0.009 c
G4: Dill leaves powder 5%	36 ± 0.5 c	0.64± 0.002 g	4.6± 0.003 e
G5: Dill seeds powder 2.5%	36 ± 0.9 c	0.70± 0.007 c	5.54± 0.005 b
G6: Dill seeds powder 5%	30 ± 0.8 e	0.67± 0.008 d	4.54± 0.004 ef
G7: Dill roots powder 2.5%	32 ± 0.6 d	0.71± 0.009 b	5± 0.1 d
G8: Dill roots powder 5%	26.80 ± 0.009 f	0.61 ± 0.005 f	4.50± 0.088 f
LSD	0.92	0.009	0.082

The means of the same column with distinct litters differ significantly at ($p < 0.05$).

The results of the histopathology:

From histopathological results, liver of rats from group 1 (negative group) revealed the

normal histological appearance of portal areas, central veins and hepatocytes (picture 1). Meanwhile, livers of diabetic rats in-group 2 (positive group) revealed marked degeneration of hepatocytes, involving large areas of the lobules, characterized by discrete clear cytoplasmic vacuoles with peripheral flattened nuclei (fatty degeneration). Multifocally, vacuoles of adjacent hepatocytes coalesce. There was occasional focal necrosis of hepatocytes, close apposition of portal area, characterized by loss of hepatic tissue and cellular architecture, replaced by fibrin, and eosinophilic cellular debris and infiltrated by neutrophils, lymphocytes and fewer macrophages (picture 2) .

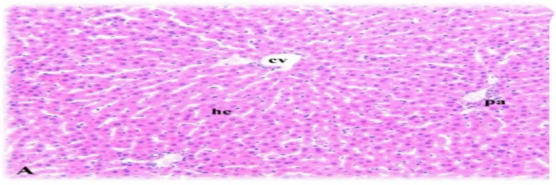

Photo (1) : liver of rat from group 1 showing the normal histological architecture of hepatic lobule (H & E X 400) .

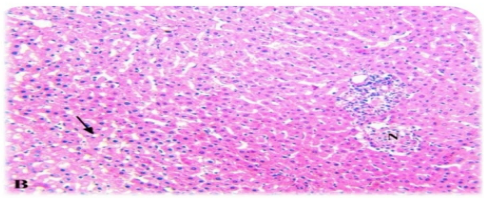

Photo (2) : liver of rat from group 2 showing the degeneration of hepatocytes , involving large areas of the lobules (H & E X 400) .

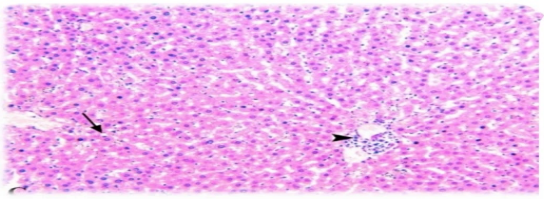

Photo (3) : liver of rat from group 3 showing the hepatocytes with occasional multifocal small interstitial lymphocytic infiltrates (H & E X 400) .

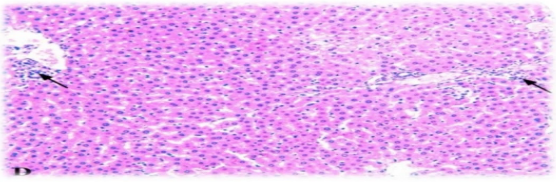

Photo (4) : liver of rat from group 4 showing the occasional mild portal inflammatory infiltrates of mononuclear cells (H & E X 400) .

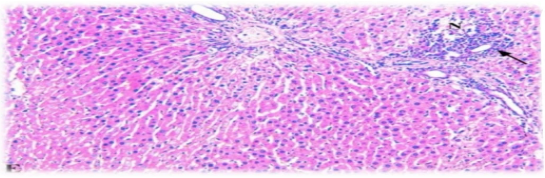

Photo (5) : liver of rat from group 5 showing the periportal focal hepatocytes necrosis (H & E X 400) .

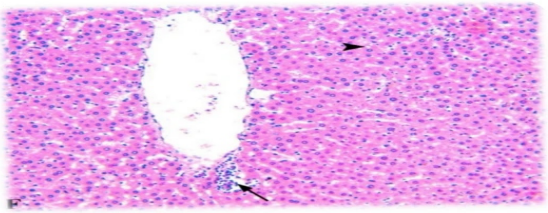

Photo (6) : liver of rat from group 6 showing the exhibited mild fatty degeneration of hepatocytes (H & E X 400) .

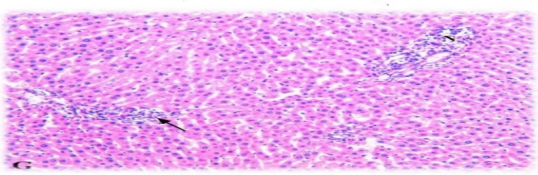

Photo (7) : liver of rat from group 7 showing the periportal hepatocellular necrosis and inflammatory cellular infiltrate (arrow) (H & E X 400) .

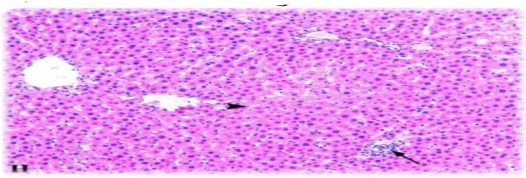

Photo (8) : liver of rat from group 8 showing the mild fatty degeneration (arrowhead) of hepatocytes(H & E X 400) .

The livers of rats in-group 3 (Dill leaves powder 2.5%) revealed normal histological appearance of central veins and hepatocytes with occasional multifocal small interstitial lymphocytic infiltrates and mild fatty degeneration of hepatocytes, characterized by swollen pale vacuolated cytoplasm (picture 3). The livers of treated rat's in-group 4 (Dill leaves powder 5%) revealed maintained normal hepatic architecture with occasional

mild portal inflammatory infiltrates of mononuclear cells (picture 4). The livers of treated rats in-group 5 (Dill seeds powder 2.5%) showed mild fatty degeneration of hepatocytes, periportal focal hepatocellular necrosis and inflammatory cellular infiltrate in portal areas (picture 5). Rats' in-group 6 (Dill seeds powder 5%) exhibited mild fatty degeneration of hepatocytes and interstitial inflammatory cellular infiltrates in the examined livers (picture 6) . The livers of group 7 and 8 (Dill roots powder 2.5&5%) revealed some parts of pancreases in group rats appeared to have normal pancreatic parenchyma (picture 7,8).

4.Conclusion

Based on its historical applications in disease treatment of the abundance of active chemical constituents it contains it that Dill roots as powder significantly decrease serum glucose level (p≤0.05) and levels of liver and kidney functions , thus, we might use a dill root in our daily drinks and meals.

Conflict of Interest

The authors declare that there is no conflict of interest.

Funding

No fund has been received.

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نوع المقالة: بحوث اصلية
التغذية وعلوم الاطعمة

تاريخ الاستلام: ٩ يوليو ٢٠٢٤
تاريخ القبول: ٣ أغسطس ٢٠٢٤
تاريخ النشر: ١ ابريل ٢٠٢٥

دراسة مقارنة لأجزاء نبات الشبت لتقليل التأثيرات الجانبية للسكري

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الملخص العربى:
يستخدم الشبت كعشب للطهي والطبية. هدفت هذه الدراسة إلى تقييم تأثير مسحوق مكونات نبات الشبت من أوراق وبذور وجذور بنسب (2.5 و5%) على الجرذان المصابة بداء السكري (المحقنة بمادة الألوكسان) (150 مجم/كجم من وزن الجسم). تم استخدام أربعين فأرًا ذكرًا بالغًا وتم تقسيم الفئران إلى 8 مجموعات (ن = 5) على النحو التالى: المجموعة الاولى: المجموعة الضابطة السالبة، المجموعة الثانية: المجموعة الضابطة الموجبة وتم تغذيتها على نظام غذائى أساسى بعد حقنها بالألوكسان، المجموعة الثالثة والرابعة: تم تغذيتها على نظام غذائى يحتوي على مسحوق أوراق الشبت 2.5 و5%) والمجموعة الخامسة والسادسة: تم تغذيتها على نظام غذائى يحتوي على مسحوق بذور الشبت 2.5و5%) والمجموعة السابعة والثامنة: تم تغذيتها على نظام غذائى يحتوي على مسحوق جذور الشبت (2.5 و 5%). بعد 28 يومًا من التجربة، تم أخذ عينات الدم لتقييم وظائف الكبد والكلى ومستوى الدهون ومستويات الجلوكوز فى الدم. تم فحص التغيرات النسيجية المرضية فى الكلى والكبد. وكشفت هذه الدراسة أن التغذية على جذور الشبت كمسحوق أكثر فعالية على مستويات الجلوكوز لاحتوائها على الكثير من مضادات الأكسدة. تؤكد نتائج البيانات المجمعة أنه فى التقييم لمجموعة السيطرة الموجبة فإن المجموعة المفحوصة 8 التى تغذت على جذور الشبت 5% (p<0.05) انخفضت نسبة الجلوكوز فى الدم والبروتين الدهنى منخفض الكثافة ووظائف الكلى والكبد بالإضافة إلى ارتفاع مستوى الكوليسترول الجيد .

الكلمات الكاشفة: الفئران، الشبت، مستوي سكر الدم، مضادات الاكسدة، دهون الدم.

الاستشهاد الي:
Mashal et al., 2025, Comparative Study Using Dill Plant Parts Considering Amelioration of Diabetes Side Effects. JHE, 35 (1), 55-67.
DOI:10.21608/mkas.2024.302935.1329