Anti-diabetic Effect of Purslane (Leaves, Seeds and Mixture) in Alloxan-Induced Diabetic Rats

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Abstract :

The effect of different concentrations (2.5 and 5%) of purslane (*Portulaca oleraceae,* L.) leaves, seeds and mixture on diabetic rats were evaluated. Eighty four rats were used in this study and divided into 8 groups, each group contain 6 rats. Rats were treated by alloxan (150mg/kg B.W) to induced diabetic. Results showed that the lowest glucose level of treated groups recorded for 2.5% purslane seeds with significant differences. While, the highest glucose level of treated groups recorded for 5 % purslane seeds with significant differences. The mean values were 163.75 and 131.75, respectively. The lowest GPT and GOT liver enzyme recorded for 2.5% purslane mixture and 2.5% purslane leaves with significant differences. The lowest total cholesterol and triglycerides recorded for 5% purslane mixture and 5% purslane leaves with significant differences. The highest high density lipoprotein of treated groups recorded for 5 % purslane mixture. While the lowest low density lipoprotein and very low density lipoprotein recorded for 5% purslane mixture and 2.5% purslane seeds with significant differences. The lowest uric acid, urea and creatinine recorded for 5% purslane leaves, 2.5% purslane leaves and 2.5% purslane leaves with significant differences. As conclusion, purslane seeds and leaves showed highly effect for reduce glucose level, liver functions, kidney functions and improve lipid profile in rats.

Key words:

Purslane, Rats, Anti-diabetic and Biochemical analysis.

INTRODUCTION:

Diabetes mellitus (DM) is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves **(Nagappa *et al.*, 2003).**

Since, ancient times, plants have played an important role in the treatment of many diseases. Different parts of medicinal plants such as leaf, root, flower and seed are used as extracts and chemical compounds to produce drugs **(Ozgen *et al.*, 2009)**.

According to world Health Organization (WHO), 80% of the World's population is dependent on the traditional medicine **(Maiyo *et al.*, 2010)**.

Diabetes is the world's largest endocrine disease associated with increased morbidity and mortality rate. Diabetes mellitus is also associated with long term complications including retinopathy, nephropathy, neuropathy and angiopathy and several others **(Sharma *et al.*, 2010)**.

A variety of ingredients present in medicinal plants are thought to act on a variety of targets by various modes and mechanisms. They have potential to impart therapeutic effect in complicated disorders like diabetes and its complications **(Tiwari and Rao, 2002)**.

Medicinal plants are gradually gaining global acceptability given their potential as bioactive agents to be used as pharmaceuticals. New hypoglycemic agents derived from plants have shown both hypoglycemic action and the ability to improve some of the secondary complications of diabetes such as kidney damage, fatty liver, and oxidative stress. In addition, some tropical herbs offer both benefits as it has been recently informed in experimental models **(Fonseca *et al.*, 2012).**

The plant purslane, in Arabic '*Rejlah*', (*Portulaca oleraceae,* L.) occurs in the Arabian Peninsula and adjacent areas including, United Arab Emirates and Oman. Purslane is also consumed as a vegetable in some provinces of China. It is also used as an antibacterial and anti-viral agent, as well as for the treatment of viral hepatitis and diabetes management in China **(Meng and Wu, 2008)**.

Portulaca oleracea, (*P. oleracea*, Family *Portulacaceae*), also known as purslane, is a herbaceous plant distributed throughout the

world. It is eaten extensively around the Mediterranean and tropical Asian countries and has been used as a folk medicine in many countries. It contains many biologically active compounds and is a source of many nutrients including oxalic acid, alkaloids, ω-3 fatty acids, coumarins, flavonoids, cardiac glycosides, anthraquinones, linolenic acid, mono-terpene glycosides, N-transferuloyl tyramine, vitamins C and A, oleoresins-I and -II, saponins, tannins, saccharides, triterpenoids, and glutathione **(Zhou *et al.*, 2015)**.

Purslane has been described as a 'power food' of the future because of its high nutritive and anti-oxidant properties **(Al- Howiriny, 2008)**.

Abdalla (2010) reported that purslane treated rats at doses of 150 and 300 mg/kg body weight improved the insulin resistance index when compared to high fat diet control. In conclusion, purslane ethanolic extract showed effects indicative of potential anti-obesity and anti-diabetic actions in rats fed a high fat obesity-induced diet.

The use of medicinal plants in the management of diabetes has a long history. One of the most important medicinal plants is *Portulaca oleracea*, or purslane, which is a good source of biologically active compounds including omega-3 fatty acids and β-carotene amino acids, α-tocopherols, ascorbic acid, glutathione, and flavonoids compounds **(Zhang et al., 2007)**.

Consumption of purslane seeds by hypercholesterolemic rats resulted in a significant decrease in lipid parameters as compared with hypercholesterolemic group. Our results suggest that purslane seeds have anti-atherogenic hypolipidemic effects which are probably mediated by unsaturated fatty acids (omega-3) present in the seeds and also the possible influence of the relatively higher fiber content of the seed **(Soltan, 2012)**.

Ahmad *et al.*, (2015) reported that consumption of purslane seeds for 5 weeks in persons with type 2 diabetes might improve their anthropometric measures, serum triglyceride levels, and blood pressure. Purslane consumption decreased serum triglyceride levels (−25.5 vs. −1.8 mg/dl, $P = 0.04$) but could not affect serum high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and total cholesterol levels.

Ramadan *et al.*, (2017) mentioned that the *Portulaca oleracea* is a general tissue protective and regenerative agent, as evidenced by increasing ß cell mass and therefore improved the glucose metabolism.

Thus, stimulation of *P. oleracea* signaling in ß- cells may be a novel therapeutic strategy for diabetes prevention.

This work was conducted to study the effect of gooseberry fruit powder and its extracts on biochemical analysis of obese rats.

Material and Methods Materials :

Purslane (*Portulaca oleracea*) leaves and seeds were obtained from local market, Shibin El-Kom City, Menoufia Governorate, Egypt.

Cholesterol powder

Alloxan, it was pure chemical fine product (DBH) were purchased from SIGMA Chemical Co., (USA), and was used for induction of diabetes among rats.

Casein, cellulose, choline chloride, and DL- Methionine

Casein, cellulose, choline chloride powder, and DL- methionine powder, were obtained from Morgan Co. Cairo, Egypt.

Experimental animals

A total of 48 adult normal male albino rats Sprague Dawley strain weighing 140±10 g were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

The chemical kits

Chemical kits used for determination the (TC, TG, HDL-c, ALT, AST, ALP, urea, uric acid and creatinine) were obtained from Al-Gomhoria Company for Chemical, Medical and Instruments, Cairo, Egypt.

Methods Preparations of purslane leaves and seeds

To prepare the dried purslane leaves and seeds were obtained from local market. Plant was washed thoroughly under running tap water, shade dried, and ground to a fine powder using an air mill.

Experimental design

Eighty four adult male white albino rats, Sprague Dawley Strain, 10 weeks age, weighing (140±10g) were used in this experiment. All rats were fed on basal diet (casein diet) prepared according to AIN, (1993) for 7 consecutive days. After this adaptation period, rats are divided into 8 groups, each group which consists of six rats as follows: group (I): rats fed on basal diet as negative control. Group (2): Injected by alloxan a dose of 150 mg /kg of rat's body weight and used as a positive control group. Group (3): A group infected diabetic fed on purslane leaves as powder by 2.5% of the weight of basal diet. Group

(4): A group infected diabetic fed on purslane leaves as powder by 5% of basal diet. Group (5): A group infected diabetic fed on purslane seeds as powder by 2.5 % of basal diet. Group (6): A group infected diabetic fed on purslane seeds as powder by 5 % of basal diet. Group (7): A group infected diabetic fed on purslane mixture leaves and seeds as powder by 2.5 % of basal diet. Group (8): A group infected diabetic fed on purslane mixture leaves and seeds as powder by 5 % of basal diet. During the experimental period, the body weight and feed intake were estimated weekly and the general behavior of rats was observed. The experiment period was take 28 days, at the end of the experimental period each rat weight separately then, rats are slaughtered and collect blood samples. Blood samples were centrifuged at 4000 rpm for ten minute to separate blood serum, and then kept in deep freezer till using.

Blood sampling

After fasting for 12 hours, blood samples in initial times were obtained from retro orbital vein, while it obtained from hepatic portal vein at the end of each experiments. blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 30 minutes, then centrifuged for 10 minutes at 4000 rpm to separate the serum, which were carefully aspirated and transferred into clean cuvette tube and stored frozen in deep freezer till analysis according to method described by Schermer (1967).

Biochemical analysis Lipids profile

Determination of total cholesterol

Serum total cholesterol was determined according to the colorimetric method described by Thomas (1992).

Determination of serum triglycerides

Serum triglyceride was determined by enzymatic method using kits according to the Young, (1975) and Fossati, (1982).

Determination of high density lipoprotein (HDL-c)

HDL-c was determined according to the method described by Friedewaid (1972) and Grodon and Amer (1977).

Calculation of very low density lipoprotein cholesterol (VLDL-c)

VLDL-c was calculated in mg/dl according to Lee and Nieman (1996)

Using the following formula:

VLDL-c (mg/dl) = Triglycerides / 5

Calculation of low density lipoprotein cholesterol (LDL-c)

LDL-c was calculated in mg/dl according to Lee and Nieman (1996) as follows:

LDL-c (mg/dl) = Total cholesterol – HDL-c – VLDL-c

Liver functions

Determination of serum alanine amino transferase (ALT), serum asparatate amino transferase (AST), were carried out according to the method of Hafkenscheid (1979) .

Kidney functions

Determination of serum urea

Serum urea, uric acid and serum creatinine were determined by enzymatic method according to (Henry (1974) and Patton & Crouch 1977).

Determination of blood glucose:

Enzymatic determination of plasma glucose was carried out calorimetrically according to the method of Tinder (1969).

Statistical analysis:

The data were analyzed using a completely randomized factorial design (SAS, 1988) when a significant main effect was detected; the means were separated with the Student-Newman-Keuls Test. Differences between treatments of ($P \leq 0.05$) were considered significant using Costat Program. Biological results were analyzed by One Way ANOVA.

RESULTS AND DISCUSSION

Changes of glucose level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Data presented in Table (1) show the changes of glucose level (mg/dl) of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture. The obtained data indicated that the glucose level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 234.50 and 125.00 g, respectively. On the other hand, the highest glucose level of treated groups recorded for 5 % purslane seeds; while the lowest glucose level recorded for 2.5% purslane seeds with significant differences. The mean values were 163.75 and 131.75 g, respectively. These results are in agreement with **Li *et al.*, (2009),** they indicated that hydro-ethanolic extract of *P. oleracea* seeds has anti-

diabetic effect in diabetic animals. Purslane treatment could increase concentration of serum insulin in alloxan induced diabetic mice.

Changes of GPT and GOT liver enzymes level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture:

Data given in Table (2) show the changes of GPT liver enzyme level (mg/dl) of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture. The obtained data indicated that the GPT level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 99.50 and 58.50 g, respectively. On the other hand, the highest GPT liver enzyme of treated groups recorded for 2.5 % purslane seeds; while the lowest GPT liver enzyme recorded for 2.5% purslane mixture with significant differences. The mean values were 84.25 and 62.25 g, respectively. These results are in agreement with El-Sayed, (2011), they reported that purslane improves liver functions of diabetic subjects by decreasing ALT, AST, gamma-glutamyl transferase, total and direct bilirubin close to normal levels and increasing albumin synthesis by the liver.

In case of GOT, data indicated that the level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 168.50 and 122.75 g, respectively. On the other hand, the highest GOT liver enzyme of treated groups recorded for 2.5 % purslane mixture; while the lowest GOT liver enzyme recorded for 2.5% purslane leaves with significant differences. The mean values were 137.75 and 113.75 g, respectively. These results are in agreement with Simopoulo et al., (2005), they reported that purslane ethanolic extract administration significantly suppressed increases in GOT and GPT. Plasma GOT activity in purslane 150 and 300 mg/kg body weight treated groups was markedly decreased by 48.6% and 56.6%, respectively when compared to the high fat diet control group.

Changes of total cholesterol level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture:

Data given in Table (3) show the changes of total cholesterol level (mg/dl) of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture. The obtained data indicated that the total cholesterol level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 149.75 and 102.75 mg/dl, respectively. On the other

hand, the highest total cholesterol of treated groups recorded for 5 % purslane leaves; while the lowest total cholesterol recorded for 5% purslane mixture leaves with significant differences. The mean values were 118.75 and 110.75 mg/dl, respectively. These results are in agreement with El-Sayed, (2011), they reported that in the only available report on persons with type 2 diabetes, consumption of purslane seeds was associated with decreased levels of serum triglycerides, LDL-C, and total cholesterol levels.

The obtained data indicated that the total triglycerides level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 124.50 and 70.50 mg/dl, respectively. On the other hand, the highest total triglycerides of treated groups recorded for 5 % purslane mixture; while the lowest triglycerides recorded for 5% purslane leaves with significant differences. The mean values were 98.25 and 77.50 mg/dl, respectively. These results are in agreement with Besong et al., (2011) they reported that purslane seeds consumption decreased serum triglyceride levels but could not affect serum total cholesterol levels. Consumption of 6 g/day freeze-dried purslane leaves in hypercholesterolemic subjects for 4 weeks led to improved total cholesterol levels.

Changes of lipid profile level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture:

Data given in Table (4) show the changes of high density lipoprotein level (HDL-c) of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture. The obtained data indicated that the high density lipoprotein level of control negative group recorded the highest value compared with control positive group with significant differences. The mean values were 52.25 and 34.50 g/dl, respectively. On the other hand, the highest high density lipoprotein of treated groups recorded for 5 % purslane mixture; while the lowest high density lipoprotein recorded for 5% purslane mixture with significant differences. The mean values were 49.75 and 36.00 g/dl, respectively. These results are in agreement with Dkhil et al., (2011), they reported that the purslane supplementation also results in the significant attenuation in the level of HDL in serum toward the control level which again strengthens the hypolipidemic effect of the purslane.

In case of low density lipoprotein, data indicated that the LDL-c level of control positive group recorded the highest value compared

with control negative group with significant differences. The mean values were 85.35 and 36.40 g/dl, respectively. On the other hand, the highest low density lipoprotein of treated groups recorded for 5 % purslane mixture; while the lowest low density lipoprotein recorded for 5% purslane mixture with significant differences. The mean values were 60.65 and 40.85 g/dl, respectively. These results are in agreement with Sharma et al., (2003), they reported that the serum cholesterol, triglycerides and LDL levels decreased significantly in diabetic rats after purslane treatment. These effects may be due to low activity of cholesterol biosynthesis enzymes or low level of lipolysis which are under the control of insulin.

The obtained data indicated that the very low density lipoprotein level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 20.15 and 14.10 g/dl, respectively. On the other hand, the highest very low density lipoprotein of treated groups recorded for 2.5 % purslane leaves; while the lowest very low density lipoprotein recorded for 2.5% purslane seeds with significant differences. The mean values were 24.90 and 15.00 g/dl, respectively. These results are in agreement with Xiang et al., (2014), they reported that purslane may inhibit lipid peroxidation by scavenging free radicals and increasing intracellular concentration of glutathione, and thereby decrease oxidized LDL, VLDL and improve insulin receptor activity.

Changes of kidney functions level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture:

Data given in Table (5) show the changes of uric acid level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture. It is clear to mention that the uric acid level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 4.55 and 2.50 mg/dl, respectively. On the other hand, the highest uric acid of treated groups recorded for 5 % purslane mixture; while the lowest uric acid recorded for 5% purslane leaves with significant differences. The mean values were 3.95and 2.93 mg/dl, respectively. These results are in agreement with Hozayen et al., (2011), they reported that Co-administration of PO extract improve the adverse changes in the kidney functions by an increase in antioxidants activities and reduction of peroxidation.

It is obvious to notice that the urea level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were 52.50 and 29.00 mg/dl, respectively. On the other hand, the highest urea of treated groups recorded for 2.5 % purslane mixture; while the lowest urea recorded for 2.5% purslane leaves with significant differences. The mean values were 37.75and 2.93 mg/dl, respectively. These results are in agreement with Lee et al., (2012), they reported that the aqueous extract of purslane (PO) ameliorate d diabetic nephropathy through suppression of fibrosis and inflammation in the kidney.

It is clear to notice that the creatinine level of control positive group recorded the highest value compared with control negative group with significant differences. The mean values were ٠.٩٧٢ and 0.٧٦٧ mg/dl, respectively. On the other hand, the highest creatinine of treated groups recorded for 5 % purslane mixture; while the lowest creatinine recorded for 2.5% purslane leaves with significant differences. The mean values were 0.897and 0.847 mg/dl, respectively. These results are in agreement with Karimi et al., (2010), they reported that the aqueous extract of purslane possesses marked nephroprotective activity, and have a promising role in the treatment of acute renal injury induced by nephrotoxins.

Table (1): Changes of glucose level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Parameters	(G 1) negative control	(G 2) positive control	Purlane leaves		Purlane seeds		Mixture		L.S.D ($p \leq 0.05$)
			(G 3) 2.5%	(G 4) 5%	(G 5) 2.5%	(G 6) 5%	(G 7) 2.5%	(G 8) 5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean SD±	Mean SD±	Mean SD±	
Glucose level (mg/dl)	125 ^{d} ± 7.703	234.5^{a} ± 18.157	148 ^{bc} ± 9.202	134.5 ^{cd} ± 11.958	131.75 ^{cd} ± 8.694	163.75^{b} ± 7.456	154 ^{bc} ± 17.185	153.75^{bc} ± 13.475	15.8595

Each value is represented as mean ± standard deviation (n = 3).

Mean with the same letters in the same horizontal column are not significantly different at P≤0.05.

Table (2): Changes of GPT liver enzyme level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Parameters	(G 1) Negative control	(G 2) positive control	Purlane leaves		Purlane seeds		Mixture		L.S.D (p ≤ 0.05)
			(G 3) 2.5%	(G 4) 5%	(G 5) 2.5%	(G 6) 5%	(G 7) 2.5%	(G 8) 5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean SD±	Mean SD±	Mean SD±	
GPT level (mg/dl)	58.5 ^{d} ± 8.021	99.5 ^{a} ± 11.269	64.75 ^{cd} ± 5.3151	80.5 ^{bc} ± 10.1489	84.25 ^{b} ± 6.0208	77.5 ^{bc} ± 10.1489	79.5 ^{bc} ± 11.475	62.25 ^{d} ± 2.9861	12.0213
GOT level (mg/dl)	122.75 ^{b} ± 23.517	168.5 ^{a} ± 49.95	113.75 ^{b} ± 5.909	134.75 ^{ab} ± 18.572	116 ^{b} ± 24.386	122.5 ^{b} ± 22.517	137.75 ^{ab} ± 14.431	127.5 ^{b} ± 14.059	30.5064

Each value is represented as mean ± standard deviation (n = 3).

Mean with the same letters in the same horizontal column are not significantly different at P≤0.05.

Table (3): Changes of total cholesterol level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Parameters	(G 1) negative control	(G 2) positive control	Purlane leaves		Purlane seeds		Mixture		L.S.D (p ≤ 0.05)
			(G 3) 2.5%	(G 4) 5%	(G 5) 2.5%	(G 6) 5%	(G 7) 2.5%	(G 8) 5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean SD±	Mean SD±	Mean SD±	
TC level (mg/dl)	102.75 ^{b} ± 3.594	149.75 ^{a} ± 6.292	116.25 ^{b} ± 13.376	118.75 ^{b} ± 10.2103	117.5 ^{b} ± 13.229	118.75 ^{b} ± 8.0984	112.75 ^{b} ± 2.8723	110.75 ^{b} ± 7.9320	12.9232
TG level (mg/dl)	98.25 ^{b} ± 14.222	70.50 ^{b} ± 5.1562	124.50 ^{a} ± 17.0978	89.75 ^{b} ± 15.064	77.50 ^{b} ± 11.210	88.0 ^{b} ± 5.4772	85.0 ^{b} ± 14.0475	89.25 ^{b} ± 11.9548	18.9995

TC= Total cholesterol TG=Triglycerides

Each value is represented as mean ± standard deviation (n = 3).

Mean with the same letters in the same horizontal column are not significantly different at P≤0.05.

Table (4): Changes of lipid profile level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Parameters	(G 1) negative control	(G 2) positive control	Purlane leaves		Purlane seeds		Mixture		L.S.D ($p \leq 0.05$)
			(G 3) 2.5%	(G 4) 5%	(G 5) 2.5%	(G 6) 5%	(G 7) 2.5%	(G 8) 5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean SD±	Mean SD±	Mean SD±	
HDL-C level (g/dl)	52.25^{a} ± 7.4554	34.50^{b} ± 3.416	42.50^{ab} ± 2.0817	46.50^{ab} ± 5.508	48.50^{a} ± 6.455	49.25^{a} ± 6.131	36.00^{ab} ± 7.394	49.75^{a} ± 9.569	9.51597
LDL-C level (g/dl)	36.40^{c} ± 9.052	85.35^{a} ± 6.871	60.65^{b} ± 16.221	57.25^{bc} ± 3.796	51.40^{bc} ± 10.418	51.70^{bc} ± 12.119	48.90^{bc} ± 6.4031	40.85^{bc} ± 14.903	15.0423
VLDL-C level (g/dl)	20.15^{b} ± 3.458	14.10^{b} ± 1.0392	24.9^{a} ± 3.4196	18.1^{b} ± 3.057	15.0^{b} ± 3.01552	17.6^{b} ± 1.0955	17.8^{b} ± 2.8095	17.85^{b} ± 2.391	4.05791

HDL-C= High density lipoprotein LDL-C= Low density lipoprotein

VLDL-C= Very low density lipoprotein

Each value is represented as mean ± standard deviation (n = 3).

Mean with the same letters in the same horizontal column are not significantly different at $P \leq 0.05$.

Table (5): Changes of uric acid level of diabetic rats fed diet supplemented with purslane leaves, seeds and their mixture

Parameters	(G 1) negative control	(G 2) positive control	Purlane leaves		Purlane seeds		Mixture		L.S.D (p ≤ 0.05)
			(G 3) 2.5%	(G 4) 5%	(G 5) 2.5%	(G 6) 5%	(G 7) 2.5%	(G 8) 5%	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ± SD	Mean SD±	Mean SD±	Mean SD±	
UA level (mg/dl)	2.50^{C} ± 0.3367	4.55^{a} ± 0.4042	2.934^{C} ± 0.3837	2.975^{b} ± 0.562	3.425^{bC} ± 0. 383	3.425^{bC} ± 0.2363	3.0^{C} ± 0.3162	3.95$^{a\,b}$ ± 0.635	0.61569
UR level (mg/dl)	29.25^{b} ± 2.629	52.50^{a} ± 5.9161	29.0^{b} ± 5.354	32.0^{b} ± 2.944	32.25^{b} ± 5.378	34.25^{b} ± 10.210	37.75^{b} ± 6.9941	36.75^{b} ± 6.9941	9.0699
CR level (mg/dl)	0.7675^{a} ± 0.06397	0.9725^{a} ± 0.1561	0.8475^{a} ± 0.0585	0.885^{a} ± 0.037	0.8525^{a} ± 0.0957	0.865^{a} ± 0.0819	0.865^{a} ± 0.0742	0.8972^{a} ± 0.0768	0.1338

UA= Uric acid UR= Urea CR= Creatinine

Each value is represented as mean ± standard deviation (n = 3).

Mean with the same letters in the same horizontal column are not significantly different at P≤0.05.

REFERENCES

1. Ahmad, E.; Elahe, Z.; Faghihimani, E.; Mahmoodreza, G. and Jazayeri, S. (2015): **The effect of purslane seeds on glycemic status and lipid profiles of persons with type 2 diabetes: A randomized controlled cross-over clinical trial. J. Resh. Med. Sci., 20 (1): 47-53.**
2. **Abdalla, H. M. (2010): Purslane Extract Effects on Obesity-Induced Diabetic Rats Fed a High-Fat Diet. Mal. J. Nutr., 16 (3): 419 -429.**
3. AIN (1993): **American institute of nutrition purified diet for laboratory Rodent, Final Report. J. Nutrition, 123: 1939-1951 and O. Compactum Benth. J. Essential Oil Res. 8 (6): 657-664.**
4. Al-Howiriny, T. (2008): **Protective effect of purslane on rat liver injury induced by carbon tetrachloride. Saudi Pharmaceut. J. 16: 239-244.**
5. Besong, S.; Ezekwe, M. and Ezekwe, E. (2011): **Evaluating the effects of freeze dried supplements of purslane (*Portulaca oleracea*) on Blood lipids in hypercholesterolemic adults. Int. J. Nutr. Metab. 3:43-9.**
6. Dkhil, M.A.; Moniem, A.E.A.; Al-Quraishy, S. and Saleh, R.A. (2011): **Antioxidant effect of purslane (*Portulaca oleracea*) and its mechanism of action. J. Med. Plants Res., 5 (9): 1563-589.**
7. **El-Sayed, M. (2011):** Effects of *Portulaca oleracea* L. seeds in treatment of type-2 diabetes mellitus patients as adjunctive and alternative therapy. J. Ethnopharmacol., 137 (1): 643-651.
8. **Fonseca, V.A.; Kirkman, M.S.; Darsow, T. and Ratner, R.E. (2012):** The american diabetes association diabetes research perspective. Diabetes, 6:1338–1345.
9. **Fossati, P. (1982):** Pricipe l. Clin. Chem., 28: 2077 (Chemical Kits).
10. **Friedwaid, W.T. (1972):** Determination of HDL. Clin. Chem., 18: 499. (Chemical Kits).
11. **Grodon, T. and Amer, M. (1977):** Determination of HDL. Clin. Chem., 18: 707. (Chemical Kits).
12. **Hafkenscheid, J.C. (1979):** Determination of GOT. Clin. Chem., 25:155.
13. **Henry, R.J. (1974):** Clinical Chemist: Principles and Techniques, 2nd Edition, Hagerstoun (MD), Harcer, ROW, 882.
14. **Hozayen, W.; Bastawy, M. and Elshafeey, H. (2011):** Effects of aqueous purslane (*Portulaca peracea*) pxtract and fish oil on gentamicin nephrotoxicity in albino rats. Nat. Sci., 9: 47-62.
15. **Karimi, G.; Khoei, A.; Omidi, A.; Kalantari, M.; Babaei, J. and Taghiabadi, E. (2010):** Protective effect of aqueous and ethanolic extracts of Portulaca oleracea against cisplatin induced nephrotoxicity. Iranian Journal of Basic Medical Sciences, 13 (2): 31-35.
16. **Lee, R. and Nieman, D. (1996):** Nutrition Assessment. 2nd Ed. Mosby, Missouri, U.S.A.
17. **Lee, A.S.; Lee, Y.J.; Lee, SM.; Yoon, J.J.; Kim, J.S. and Kang, D.G. (2012):** *Portulaca oleracea* ameliorates diabetic vascular inflammation and endothelial dysfunction in db/db mice. Evid. Based Complement Alternat Med.
18. **Li, F.; Li, Q.; Gao, D.; Peng, Y. and Feng, C. (2009):** Preparation and antidiabetic activity of polysaccharide from *Portulaca oleracea* L. Afr. J. Biotechnol., 8 (4): 569-73.
19. **Maiyo, Z.C.; Ngure, R.M.; Matasyoh, J.C. and Chepkorir, R. (2010):** Phytochemical constituents and antimicrobial activity of leaf extracts of three *Amaranthus* plant species. African Journal of Biotechnology, 9 (21): 3178-3182.
20. **Meng, F. B. and Wu, R. G. (2008):** Appraisal on medicinal values of *Portulaca oleracea,* L. Forest Investig. Des., (1): 77-78.
21. **Nagappa, A.N.; Thakurdesai, P.A.; VenkatRao, N. and Jiwan, S. (2003):** Antidiabeticactivity of *Terminalia catappa*, Linn fruits. J. Ethnopharmacol., 88 (1): 45-50.

22. **Ozgen, M. ; Serce, S. and Kaya, C. (2009):** Phytochemical and antioxidant properties of anthocyanin-rich *Morus nigra* and *Morus rubra* fruits. Sci, Horticult. Amsterdam, 119: 275-279.
23. **Patton, C.J. and Crouch, S.R. (1977):** Enzymatic determination of urea. J. of Anal. Chem., 49: 464-469.
24. **Ramadan, B. K.; Schaalan, M. F. and Tolba, A. M. (2017):** Hypoglycemic and pancreatic protective effects of *Portulaca oleracea* extract in alloxan induced diabetic rats. Complementary and Alternative Medicine, 17 (37): 2-10.
25. **SAS (1988):** SAS Users Guide: Statistics version 5th Ed. SAS. Institute Inc., Cary N.C.
26. **Schermer (1967):** The Blood Morphology of Laboratory Animal. Longmans, Printed in Great Britain, Green and Co. Ltd., pp.350.
27. **Sharma, S.B.; Nasir, A.; Prabhu, K.M.; Murthy, P.S. and Dev, G. (2003):** Hypoglycaemic and hypolipidemic effect of ethanolic extract of seeds of *Eugenia jambolana* in alloxan-induced diabetic rabbits. J. Ethnopharmacol, 85 (2-3): 201-206.
28. **Sharma, U.; Sahu, R.; Roy, A. and Golwala, D. (2010):** *In vivo* anti-diabetic and antioxidant potential of *Stephania hernandifolia* in streptozotocin induced-diabetic rats. J. Young Pharm., (2): 255-260.
29. **Simopoulo,s A.; Tan, D.; Manchester, L and Reiter, R. (2005):** A plant source of omega -3 fatty acids and melatonin. J. Pineal Res., 39: 331332.
30. **Soltan, S.SA.M. (2012):** The Effects of varieties sources of omega-3 fatty acids on diabetes in rats. Food and Nutrition Sciences, 3: 1404-1412.
31. **Thomas, L. (1992):** Labor and Diagnose, 4 th Ed. Marburg: Die Medizinischi Verlagsgesellschaft. (Chemical Kits).
32. **Tinder, P. (1969):** Determination of triglycerides, Ann. Clin. Biochem., 6: 24 – 27.
33. **Tiwari, A. and Rao, J. (2002):** Diabetes mellitus and multiple therapeutic approaches of phytochemicals: present status and future prospects. Current science, 83: 30-38.
34. **Xiang C, Zhang L, Xiaowei Z, Xiaojuan L. (2014):** Polysaccharides from *Portulaca oleracea* L. improve exercise endurance and decrease oxidative stress in forced swimming mice. Tropic J. Pharmaceutic Res, 13 (2): 229 - 234.
35. **Young, D. (1975):** Effects of drugs on clinical laboratory tests. Pestaner, L. Clin. Chem., 21: 5, 1D- 432D. (Chemical Kits).
36. **Zhang, Y.; Chen, J.; Ma, X.M. and Shi, Y.P. (2007):** Simultaneous determination of flavonoids in Ixeridium gracile by micellar electrokinetic chromatography. J. Pharm. Biomed. Anal., 45: 742-746.
37. **Zhou, Y.X.; Xin, H.L.; Rahman, K.; Wang, S.J.; Peng, C. and Zhang, H. (2015):** *Portulaca oleracea*, L.: a review of phytochemistry and pharmacological effects. Biomed Res Int., 9 2: 56-61.

التأثير المضاد للسكر لأوراق وبذور الرجلة فى الفئران المصابة بالسكر بتأثير الألوكسان

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الملخص العربى

تم تقييم تأثير تركيزات مختلفة (٢.٥، ٥%) من أوراق وبذور الرجلة في الفئران المصابة بمرض السكر. واستخدم ٤٨ فأر في هذه الدراسة وتم تقسيمها إلى ٨ مجموعات، كل مجموعة تحتوي على ٦ الفئران. وتم اصابة الفئران بمرض السكر بواسطة الألوكسان (١٥٠ مجم/ كجم من وزن الجسم) . وأظهرت النتائج أن أقل مستويات للجلوكوز في المجموعة المعالجة سجلت مع تركيز ٢.٥٪ من بذور الرجلة مع وجود فروق معنوية .في حين سجل أعلى مستوى من الجلوكوز في المجموعات المعالجة مع تركيز ٥٪ من بذور الرجلة مع وجود فروق معنويةحيث كان متوسط القيم ١٦٣.٧٥ ، ١٣١.٧٥ مجم / ديسيلتر على التوالي . سجلت أقل قيم من أنزيمات الكبد GPT ، GOT مع تركيز ٢.٥٪ من مخلوط أوراق وبذور الرجلة ، ٢.٥٪ من أوراق الرجلة مع اختلافات كبيرة. سجلت أقل قيم من الكوليسترول والدهون الثلاثية مع تركيز ٥٪ من مخلوط الرجلة ، ٥٪ من أوراق الرجلة مع وجود فروق معنوية على التوالي. سجلت أعلى قيم من البروتين الدهني عالي الكثافة للمجموعات المعالجة مع تركيز ٥٪ من مخلوط الرجلة. في حين سجلت أقل قيم من البروتينات الدهنية منخفضة الكثافة والبروتين الدهني منخفض الكثافة جدا مع تركيز ٥٪ من مخلوط الرجلة ، ٢.٥٪ من بذور الرجلة مع وجود فروق معنوي. سجلت أقل قيم من حمض اليوريك واليوريا والكرياتينين لأوراق الرجلة مع تركيز ٥ ٪ ، وأوراق الرجلة ٢.٥ ٪ وأوراق الرجلة ٢.٥ ٪ مع وجود فروق معنوي. خلاصة القول ، أظهرت بذور وأوراق الرجلة تأثيرًا كبيرًا فى خفض مستوى الجلوكوز ، وظائف الكبد ، وظائف الكلى وتحسين صورة دهون الدم في الفئران.

الكلمات الكاشفة: الرجلة ـ الفئران . التأثير المضاد للسكر . التحاليل الكيميائية الحيوية.