Faculty of Home Economics

Journal of Home Economics
Menoufia University, Shibin El Kom, Egypt
https://mkas.journals.ekb.eg

Menoufia University

Nutrition and Food Sciences

Hyperglycemic Effect of Ropes Roots (*Rehium Ribes*) and Lemongrass Leaves (*Cymbopogon Cittates*) in Alloxan-Induced Diabetic Rats

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Abstract

Lemongrass and Rheum species are medicinal plants commonly consumed as a beverage for health and as a diabetes mellitus (DM) treatment in many countries. The primary purpose of this study was to study the effect of lemongrass leaves, ropes roots, and their mixture powder in lowering hyperglycemia in diabetic rats. Forty male albino rats weighing 140g±5g were divided into eight groups, each with five rats. Rats were given alloxan (150 mg/kg BWT) to make them diabetic. Glucose levels, total cholesterol, triglycerides, high-density lipoprotein (HDL-c), low-density lipoprotein (LDL-c), very low-density lipoprotein (VLDL-c), liver functions (ALT, AST, and ALP), and kidney functions (urea, uric acid, and creatinine) were also assessed. Results showed that the diabetic group had lower glucose levels and improved liver and kidney functions when fed a 5% combination, with significant differences (P≤0.05). Mixture plants had significantly lowest (P≤0.05) cholesterol and triglyceride levels and the lowest LDL-c and VLDL-c values. The group fed 5% mixed plants had the greatest amounts of HDL-c. The group fed 2.5 percent lemongrass had the lowest levels, with a significant difference (P≤0.05). In conclusion, diabetic rats given a 5% mixed powder showed significantly lower glucose levels and studied biochemical tests. Ropes, lemongrass powder, and their mixture could be utilized in our beverages, in addition to the other health benefits.

Key words: Plant roots, Rats, Diabetic, Biochemical analysis.

Introduction

Diabetes mellitus is a class of metabolic illnesses marked by high blood glucose levels (hyperglycemia) caused by insulin secretion, insulin action, or both [(1)]. Diabetes is one of the most common chronic diseases in the world, impacting over 100 million individuals.

Hyperglycemia, improper lipid and protein metabolism, and distinct long-term consequences affecting the retina, kidneys, and nervous system [(2)]. Diabetes mellitus is a clinical illness caused by a relative or absolute insulin deficit or insulin resistance at the cellular level, resulting in hyperglycemia and glucosuria [(3)]. Diabetes' persistent hyperglycemia is linked to long-term damage, dysfunction, and failure of various organs, particularly the eyes, kidneys, nerves, heart, and blood vessels. Diabetes is caused by a number of different pathogenic mechanisms. These range from autoimmune destruction of the panaceas' b-cells, resulting in insulin insufficiency, to anomalies that result in insulin resistance. The lack of insulin activity on target tissues is the cause of anomalies in carbohydrates, fat, and protein metabolism in diabetes [(4)].

Given their potential as bioactive compounds that can be employed as medications, medicinal plants are gradually gaining global acceptance. New hypoglycemic medicines derived from plants have proved to reduce some of the secondary consequences of diabetes, such as kidney damage, fatty liver, and oxidative stress, in addition to lowering blood sugar levels. Furthermore, as recently shown in experimental models, several tropical botanicals provide both benefits [(5)].

Rheum ribes, L., sometimes known as ropes or rhubarb, is a plant in the *Polygonaceae* family. Flavonoids, vitamins A, E, and C, oxalic acid, cinnamic acid, rhein, fatty compounds, a little quantity of essential oil, a big amount of starch, and a bitter chemical called -glucagon are all found in ropes [(6)]. Ropes is one of the most important species that contains perennial herbs and is found in temperate zones, primarily in the countries of West Asia (Turkey, Iraq, Iran, Lebanon, Syria). Rewas is the local name [(7)]. Ropes include various active chemicals such as emodin, aloeemodin, physcion, chrysophanol, rhein, and rutin, as well as vitamins A, B1, B2, and C, according to phytochemical studies [(8)]. Rope studies have revealed a variety of qualities of this plant, including anti-platelet accumulation, hypolipidemia, and kidney failure amelioration. Additionally, this herbal medication exhibited beneficial effects in diabetics and people with liver disease [(9)]. Desoxyrhaponticin (3,5-dihydroxy-49-methoxystilbene 3-O—D-glucoside), a main stilbene in rhubarb, decreases glucose uptake in the intestine and kidney in an in vitro and in vivo investigation, suggesting that other processes may be involved in the antidiabetic effect [(10)].

Lemongrass is a perennial grass species that can be found all over the world, but notably in tropical and subtropical areas. According to some reports, it originated in Asia (Indochina, Indonesia, and Malaysia), Africa, and the Americas [(11)]. Although there is enough data from clinical trials to evaluate the toxicological qualities of lemongrass, there is a scarcity of clinical trial data for therapeutic application to boost health. Lemongrass will aid to strengthen the body's antioxidant defense system by increasing serum antioxidant levels and reducing free radical related disorders, but a clinical trial study is

required to validate the laboratory analysis of having high antioxidant capacity [12]. Lemongrass is often used as an aromatic drink, and the full plant's lemon flavor is well blended into traditional meals. It was also widely used in traditional medicine. It has antibacterial, fever-reducing, anti-dyspeptic, carminative, and anti-inflammatory properties [13]. Lemongrass' anti-diabetic potential *in vivo* was explored using molecular docking. The levels of insulin, glucose, and triglycerides are all reduced significantly when lemongrass is consumed [14]. In rats with dexamethasone-induced hyperglycemia, the root and flower of lemongrass lowered fasting and postprandial blood sugar levels, bringing them back to normal. The reduction in fasting and postprandial blood sugar levels achieved with powdered root and flower of lemongrass was comparable to that achieved with glibenclamide 500 g/kg at 100 mg/kg/day, but the root had a better anti-diabetic effect than the flower [15]. *The action* of screening alkaloids, saponins, anthraquinone, phenol, and tannins in lemongrass may contribute to its effectiveness against insulin-dependent hyperglycemia. The active components in lemongrass should be isolated and tested in order to generate pharmaceutical anti-hyperglycemic medications from this herbal plant [16].
The purpose of this study was to see how varying concentrations of ropes, lemongrass roots, and their powder mixture affected hyperglycemic rats.

Material & Methods

Materials

Ropes roots (*Rehium ribes*) and lemongrass leaves (*Cymbopogon cittates*) were purchased from herbalist in Shebin El-Kom City, Menoufia Governorate, Egypt.

Casein, cellulose, choline chloride, and DL Methionine

Morgan Co. Cairo, Egypt provided casein, cellulose, choline chloride powder, and DL methionine powder.

Experimental animals

The Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt, provided a total of 40 adult normal male albino rats of the Sprague Dawley strain weighing 140±5 g.

The chemical kits

Al-Gomhoria Company for Trading Chemicals, Drugs, and Medical Instruments, Cairo, Egypt, provided the chemical kits used to determine the (TC, TG, HDL-c, ALT, AST, ALP, urea, creatinine, albumin).

Methods

Experimental design

In this experiment, forty adult male white albino rats, Sprague Dawley Strain, 10 weeks old, weighing (140±5g) were tested. For 7 days, all rats were fed a basal diet (casein diet) prepared according to [17]. After this period of adaption, rats were separated into eight groups, each of which has five rats as follows: Group (1): Rats fed on basal diet and used as negative control. Group (2): The remaining 35 rats were injected by alloxan a dose of 150 mg per kg of weight to induce diabetes, then they were divided into 7 groups each of which has five rats as follows a positive control group. Group (3): Diabetic rats fed on the ropes as powder by 2.5% of the weight of basal diet. Group (4): Diabetic rats fed on the ropes as powder by 5% of the weight of the rat. Group (5): Diabetic rats fed on the lemongrass roots as powder by 2.5% of the weight of basal diet. Group (6): Diabetic rats fed on the lemongrass roots as powder by 5% of the weight of basal diet. Group (7): Diabetic rats fed on the mixture (1:1) ropes and lemongrass as powder by 2.5% of the weight of basal diet. Group (8): Diabetic rats fed on the mixture (1:1) ropes and lemongrass as powder by 5% of the weight of basal diet. Rats must be fasting for 12 hours before slaughter, and at the end of that time, each rat was weighed individually, and the rats were slaughtered and blood samples were taken.

Blood sampling

At the end of each trial, blood samples were taken from the hepatic portal vein after a 12-hour fast. Blood samples were collected into dry, clean centrifuge glass tubes and allowed to clot for 28 minutes in a water bath (37°C), after which they were centrifuged for 10 minutes at 4000 rpm to separate the serum, which was carefully aspirated and transferred into clean cuvette tubes and stored frozen at -20°C until analysis according to the method described by [18].

Biochemical analysis

Lipid profiles

Serum total cholesterol was determined according to the colorimetric method described by [19]. Serum triglycerides was determined by enzymatic method using kits according to the [20 and 21]. HDL-c was determined according to the method described by [22 and 23]. VLDL-c was calculated in mg/dl according to [24] using the following formula: **VLDL-c (mg/dl) = Triglycerides / 5**. LDL-c was calculated in mg/dl according to [24] as follows:

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

Liver functions

The serum alanine aminotransferase (ALT), serum aspartate aminotransferase (AST), and serum alkaline phosphatase (ALP) were measured using the methods described by [25, 26), and (27].

Kidney functions

According to the method, serum urea and serum creatinine were determined using an enzymatic technique [28 and 29]. While serum uric acid was measured using a calorimeter using the method of [30].

Determination of blood glucose

The method of enzymatic determination of serum glucose was carried out calorimetrically [31].

Statistical analysis

When a significant main effect was found, the data were analyzed using a completely randomized factorial design [32] and the means were separated using the student-Newman-Keuls Test. Using the Costate Program, differences between treatments of ($P \leq 0.05$) were considered significant. One Way ANOVA was used to assess the biological results.

Results And Discussion

Data tabulated in table (1) showed the effect of lemongrass, ropes roots and their mixture as powder on glucose level of diabetic rats. The obtained results indicated that the higher glucose level recorded for positive control group, while the lower level recorded for negative control group with significant difference ($P \leq 0.05$). The mean values were 260 and 95.0 mg/dl, respectively.

On the other hand, diabetic rats fed on 5% mixture powder recorded the lowest glucose level with significant differences ($P \leq 0.05$) being, 106.10 mg/dl. While the highest glucose level in diabetic rats recorded for 2.5% ropes roots powder with significant difference ($P \leq 0.05$). The value was 140.10 mg/dl. It could be concluded that 5% mixture powder of ropes roots and lemon grass showed highest reduction in glucose level. These observations support the findings of Hamzeh *et al.,* [9] who found that Rhubarb can lower plasma glucose and cholesterol levels (particularly at a dose of 150 mg/kg bw). It was discovered that Rhubarb extract therapy resulted in a strong anti-diabetic effect.

In a type 2 diabetes, rat model, drinking lemongrass at both dosages for four weeks lowered blood glucose levels, enhanced postprandial glucose utilization, reduced insulin resistance, and altered several biochemical markers [33].

The effect of ropes roots, lemongrass leaves and their mixture powder on liver functions (GOT, GPT and ALP) of diabetic rats are shown in table (2). The obtained results indicated that GPT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with significant difference ($P \leq 0.05$), which were 21.50 and 7.10 U/L, respectively. While the highest GPT liver enzyme of diabetic group recorded for group fed on 2.5 % ropes roots powder but, the lowest value recorded for group fed on 5% mixture powder mixture with significant difference ($P \leq 0.05$), which were 16.00 and 7.60 U/L, respectively.

As for GOT liver enzyme, the positive control rats group recorded the higher value when compared with negative control group with significant difference ($P \leq 0.05$). The mean values were 55.00 and 19.50 U/L, respectively. While the highest GOT liver enzyme of diabetic group recorded for group fed on 2.5% ropes roots powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 26.85 and 10.80 U/L, respectively.

Table (1) Effect of ropes roots, lemongrass leaves and their mixtures on glucose of diabetic rat

Groups \ Parameters	Glucose (mg/dl) Mean±SD
G_1 C (-)	95.00 ± 0.40^g
G_2 C (+)	260.00^a± 0.50
G_3 (2.5 ropes roots powder)	140.10^b± 0.40
G_4 (5% ropes roots powder)	129.00^c± 0.10
G_5 (2.5% lemongrass powder)	121.50^d± 0.10
G_6 (5% lemongrass powder)	119.70^d± 0.11
G_7 (2.5% mixture powder)	116.50^e± 0.30
G_8 (5% mixture powder)	106.10^f± 0.20
LSD (P ≤ 0.05)	4.370

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same line bearing different superscript letters are different significantly (P ≤ 0.05).

In case of ALP liver enzyme of positive control rats group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 195.00 and 93.00 U/L, respectively. While, the highest ALP liver enzyme of diabetic group recorded for group fed on 2.5% lemongrass powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 133.0 and 97.0 U/L, respectively. The best treatment observed the highest reduction in liver enzymes recorded for 5% mixture powder. These findings correspond with those of **Joven *et al.*,** **[34]** who found that treatment with lemongrass tea (LGT) alleviated the change, demonstrating the LGT's capacity to reverse diabetes-related changes. The main constituents in LGT, phenolics and terpenes, have been proven to improve hepatic glucokinase activity, which boosts glucose utilization and promotes glycogen storage.

Moreover, the increased glycogen content seen in the treated groups might be attributable to the principal active components' suppression of glucokinase activity. This is most likely the mechanism of LGT's anti-diabetic impact **[33]**.

The effect of ropes, lemongrass and their mixture on the serum total cholesterol and triglycerides of diabetic rats are shown in table (3). The obtained results indicated that the total cholesterol levels of positive control group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 125.0 and 75.0 mg/dl, respectively. While the highest cholesterol levels recorded for group fed on 2.5% ropes roots powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 112.0 and 88.0 mg/dl, respectively.

Table (2): Effect different levels of ropes roots, lemongrass leaves and their mixture powder on liver functions of diabetic rats

Parameters / Groups	ALT (U/L)	AST (U/L)	ALP (U/L)
G_1 C (-)	7.10^e± 0.40	19.50^f ±1.10	93.0^e ±1.20
G_2 C (+)	21.50^a± 0.10	55.00^a ±1.35	195.0^a ± 0.20
G_3 (2.5% ropes roots powder)	16.00^b ± 0.20	26.85^d ±1.25	121.0^c ± 0.10
G_4 (5% ropes roots powder)	14.73^c± 0.10	16.91^e ± 0.90	111.0^d ±0.40
G_5 (2.5% lemongrass powder	14.60^c ± 1.00	39.10^b ± 2.05	133.0^b ± 1.10
G_6 (5% lemongrass powder)	11.75^d ± 0.30	30.70^c ± 0.60	123.0^c ± 1.30
G_7 (2.5% mixture powder)	7.90^e ± 0.20	14.91^e ± 0.90	107.0^d ± 0.30
G_8 (5% mixture powder)	7.60^e ± 0.10	10.80^f ± 0.90	97.0^e ± 0.10
LSD (P ≤ 0.05)	1.390	2.290	4.320

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same line bearing different superscript letters are different significantly (P≤ 0.05).

In terms of triglycerides of positive control group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 135.0 and 65.0 mg/dl, respectively. The highest triglycerides recorded for group fed on 2.5% ropes roots powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 101.0 and 71.0 mg/dl, respectively. These findings are consistent with those of Goel *et al.,* [35] who found that Rhubarb has the ability to decrease cholesterol in men. *Rheum rhaponticum* stalk fiber significantly lowered plasma cholesterol, hepatic cholesterol concentration, and cholesteryl esters content in cholesterol-supplemented rats, according to this study. Rhubarb fiber supplementation decreased the activity of acylco A and cholesterol acyl transferees while increasing fecal bile acid excretion and cholesterol 70.-hydroxylase activity.

The significant inhibitory impact of squalene poxidase, a rate-limiting enzyme in cholesterol production, may be responsible for the cholesterol-lowering effect of Rhubarb (*R. palmatum*) [36].

The effect of ropes roots, lemongrass and their mixture on the serum lipid profile (HDL-c, LDL-c and VLDL-c) level of diabetic rats are shown in table (4). The obtained results indicated that the high-density lipoprotein (HDL-c) levels of negative control group recorded the higher value when compared with positive control group with significant difference (P≤0.05). The mean values were 48.0 and 30.25 mg/dl, respectively. While the highest HDL-c levels recorded for group fed on 5% mixture powder but, the lowest value recorded for group fed on 2.5 % ropes roots powder with significant difference (P≤0.05), which were 43.37 1and 33.65 mg/dl, respectively.

Table (3): Effect of ropes roots, lemongrass leaves and their mixtures on serum triglycerides, and total cholesterol of diabetic rats

Groups \ Parameters	Total cholesterol (mg/dl) Mean ±SD	Triglycerides (mg/dl) Mean ±SD
G_1 C (-)	$75.00^g \pm 0.30$	$65.00^f \pm 0.22$
G_2 C (+)	$125.00^a \pm 1.10$	$135.00^a \pm 1.31$
G_3 (2.5% ropes roots powder)	$112.00^c \pm 0.20$	$101.50^b \pm 2.10$
G_4 (5% ropes roots powder	$103.00^d \pm 0.10$	$87.00^c \pm 1.25$
G_5 (2.5% lemongrass powder)	$117.00^b \pm 0.30$	$89.83^c \pm 1.10$
G_6 (5% lemongrass powder)	$108.00^c \pm 0.40$	$76.50^d \pm 0.30$
G_7 (2.5% mixture powder)	$95.00^e \pm 0.40$	$75.00^d \pm 0.20$
G_8 (5% mixture powder)	$88.00^f \pm 0.40$	$71.00^e \pm 0.10$
LSD (P≤0.05)	4.270	3.681

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same line bearing different superscript letters are different significantly (P≤ 0.05).

Data also showed that the low-density lipoprotein (LDL-c) levels of positive control group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 67.75 and 12.0 mg/dl, respectively. While the highest LDL-c levels recorded for group fed on 5 % ropes roots powder but, the lowest value recorded for group fed on 5 % mixture powder with significant difference (P≤0.05), which were 63.10 and 30.43 mg/dl, respectively.

In terms of very low-density lipoprotein (VLDL-c) levels, the positive control group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 27.0 and 15.0 mg/dl, respectively. While the highest VLDL-c levels recorded for group fed on 2.5 % ropes roots powder but, the lowest value recorded for group fed on 5 % mixture powder with significant difference (P≤0.05). The mean values were 20.30 and 14.20 mg/dl, respectively. These findings are consistent with those of Goel *et al.,* [35], who discovered that giving Rhubarb stalk fiber to hypercholesterolemia men for four weeks reduced serum total cholesterol and LDL cholesterol while leaving HDL cholesterol intact. They also suggested that Rhubarb fiber's hypocholesterolemic impact could be attributed to enhanced bile acid excretion and induction hydroxylase activity in rats.

Data tabulated in table (5) showed the effect of ropes roots, lemongrass and their mixture powder on the kidney functions (uric acid, urea and creatinine) level of diabetic rats. It is clear to notice that the urea levels of positive control group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 70.00 and 40.00 mg/dl, respectively. While the highest urea levels recorded for group fed on 2.5 % lemon grass powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 58.13 and 42.20 mg/dl, respectively.

Table (4): Effect different levels of ropes roots, lemongrass and their mixture powder on lipid profile level of diabetic rats

Parameters / Groups	HDL-c (mg/dl) Mean ±SD	LDL-c (mg/dl) Mean ±SD	VLDL-c (mg/dl) Mean ±SD
G_1 C (-)	48.00^{a} ± 2.14	12.00^{g}± 0.21	15.00^{c}±0.69
G_2 C (+)	30.25^{f}± 1.22	67.75^{a}±1.20	27.00^{a}±1.20
G_3 (2.5% ropes roots powder)	33.65^{e}± 0.40	58.05^{c} ±1.72	20.30^{b} ±1.41
G_4 (5% ropes roots powder)	36.50^{d} ±1.10	63.10^{b} ±0.90	17.40^{c} ±0.30
G_5 (2.5% lemongrass powder)	$38.17^{d\pm}$1.23	51.86^{d}±1.60	17.97^{c}±1.10
G_6 (5% lemongrass powder)	40.30^{c}±0.30	39.40^{e}±2.20	15.30^{d}±1.20
G_7 (2.5% mixture powder)	41.44^{c}±0.10	31.56^{f}±2.20	15.00^{d}±2.10
G_8 (5% mixture powder)	43.37^{b}±0.21	30.43^{f}±2.20	14.20^{d}±1.30
LSD (P≤0.05)	2.021	2.671	1.614

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same line bearing different superscript letters are different significantly (p ≤ 0.05).

Data also indicated that the uric acid levels of positive control group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 3.90 and 2.0 mg/dl, respectively. While the highest uric acid levels recorded for group fed on 2.5 % lemon grass powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 3.21 and 2.85 mg/dl, respectively.

As for creatinine levels, data showed that the positive control group recorded the higher value when compared with negative control group with significant difference (P≤0.05). The mean values were 1.15 and 0.75 mg/dl, respectively. While the highest creatinine levels recorded for group fed on 2.5 % lemon grass powder but, the lowest value recorded for group fed on 5% mixture powder with significant difference (P≤0.05). The mean values were 1.11 and 0.78 mg/dl, respectively. These findings are in accordance with those of Hamzeh *et al.,* [9], who found that a hydroalcoholic extract of ropes root improves renal dysfunction in alloxan-induced diabetic rats by regulating blood glucose and providing renal protection.

Purified low molecular weight tannins from rhubarb enhanced glomerular filtration rate, lowered uremic toxins, and boosted blood flow to the kidneys [37].

Table (5): Effect different levels of ropes roots, lemongrass and their mixtures on kidney functions level of diabetic rats

Parameters / Groups	Urea (mg/dl) Mean ±SD	Uric acid (mg/dl) Mean ±SD	Creatinine (mg/dl) Mean ±SD
G_1 C (-)	40.20^{f} ± 2.10	2.00^{b} ± 0.20	0.75^{c} ± 0.21
G_2 C (+)	70.00^{a} ±3.20	3.90^{a} ± 0.90	1.15^{a} ± 0.13
G_3 (2.5% ropes roots powder)	51.96^{c} ± 1.60	2.57^{b} ± 0.60	1.08^{a} ± 0.01
G_4 (5% ropes roots powder)	48.27^{d} ± 0.90	2.20^{b} ± 0.30	1.00^{b} ± 0.14
G_5 (2.5% lemongrass powder)	58.13^{b} ± 1.30	3.21^{a} ± 0.70	1.11^{a} ± 0.01
G_6 (5% lemongrass powder)	53.40^{c} ± 0.50	2.85^{a} ± 1.20	1.04^{a} ± 0.03
G_7 (2.5% mixture powder)	44.25^{e} ± 0.50	2.10^{b} ± 1.10	0.91^{b} ± 0.02
G_8 (5% mixture powder)	42.20^{e} ± 0.50	1.85^{b} ± 1.30	0.78^{c} ± 0.03
LSD (P≤0.05)	3.242	1.261	0.120

Each value is represented as mean ± standard deviation (n = 3)
Mean under the same line bearing different superscript letters are different significantly (p≤0.05).

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التأثير المضاد للسكر لجذور الروبرب وأوراق حشيشة الليمون فى الفئران المصابة بالسكر بتأثير الألوكسان

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الملخص العربي

تعتبر أنواع عشبة الليمون والروبرب من النباتات ذات الأهمية الطبية وتستهلك على نطاق واسع كمشروبات للصحة وعلاج لمرض السكر في العديد من البلدان. الهدف الأساسي من هذه الدراسة هو تقدير فعالية حشيشة الليمون وجذور الروبرب ومزيجها كمسحوق في تقليل اعراض مرض السكر في الفئران المصابة بالسكر. في هذه الدراسة ، تم تقسيم أربعين من ذكور الفئران البيضاء وزنها ١٤٠ جم ± ٥ جم إلى ثمانية مجموعات ، كل مجموعة بها خمسة فئران. للحث على الإصابة بمرض السكر في الفئران ، تم حقن الفئران بواسطة الألوكسان (١٥٠ مجم / كجم من وزن الجسم). أيضًا تم تقدير مستويات الجلوكوز ووظائف الكبد (AST ، ALP ، ALT) والكوليسترول الكلي والدهون الثلاثية والبروتين الدهني عالي الكثافة ومنخفض الكثافة ومنخفض الكثافة جدا ووظائف الكلى (اليوريا وحمض البوليك والكرياتينين). أظهرت النتائج المتحصل عليها أن المجموعات المصابة بالسكر انخفضت فيها مستويات الجلوكوز وتحسنت وظائف الكبد والكلى عند تغذيتهم بخليط بنسبة ٥٪ مع وجود فروق معنوية (P≤0.05). كان للنباتات المختلطة أقل مستويات الكوليسترول والدهون الثلاثية ، بالإضافة إلى أقل قيم البروتين الدهني منخفض الكثافة منخفض الكثافة جدا ، مع وجود فرق معنوي (P≤0.05). كانت المجموعة التي تغذت على ٥٪ من مخوط النباتات سجلت أعلى قيم لمستويات البروتين الدهني عالي الكثافة. تم الحصول على أقل مستوي في المجموعة التي غذيت ٢,٥٪ من حشيشة الليمون ، مع وجود فرق معنوي (P≤0.05). الخلاصة, أظهرت الفئران المصابة بمرض السكر انخفاض كبير فى مستوي الجلوكوز وكذلك مع جميع التحليلات الكيميائية الحيوية عند تغذيتها على المخلوط بنسبة ٥٪. لذلك ، يمكن استخدام الروباص وحشيشة الليمون ومخلوطمها في مشروباتنا ، إلى جانب حقيقة فوائدها الصحية العديدة.

الكلمات المفتاحية: جذور النباتات ، الفئران المصابة بالسكر ، التحاليل الحيوية.