

Nutritional And Biochemical Effects Of Gum Arabic On The Pathological Changes Reduction Of Alloxan Induced Diabetic Rats

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Abstract

Natural substances have been used as a source of medicinal treatments for several decades and plants-based products play a critical role in the treatment of diabetes mellitus (DM) globally. This study was conducted to acquaintancethe effectiveness of gum Arabic (GA)on experimental rats suffered from diabetes mellitus.Thirty six mature male albino rats "*Sprague Dawley*" strain weighing (160 ± 10 g), were used and divided into two main groups, one was kept as a negative control group (n = 6) (**G1**), while the other was injected infraperitoneally with alloxan monohydrate by a single alose of alloxan (150mg/kg/B.W.) in 24 hrs fasting animal. This second main group divided into equal five groups (n = 6):. The five diabetic groups were as the following; **Group (2)**: was left as positive control and fed on basal diet only. **Group (3)**: was fed on basal diet supplemented with diamacron drug15mg /kg diet.**Group (4)**: was fed on basal diet supplemented with 50 g GA (5%) /kg diet. **Group (5)**: was fed on basal diet supplemented with 100 g GA (10%)/ kg diet. **Group (6)**: was fed

on basal diet supplemented with GA (10%) +diamacron drug15mg /kg diet. Biological evaluation; liver enzymes andlipid profile andlipoprotein fractions were evaluatedin addition to blood glucose and antioxidant enzyme (SOD) estimated. Moreover, histopathological investigation of liver carriedout.The obtained results concluded that supplemented diets withGA, especially at 10% of diet, improved the level of blood sugar,liver enzymes and lipid profile levels.

Introduction

Diabetes Mellitus (DM) is a heterogeneous metabolic disorder characterized byaltered carbohydrate, lipid and protein metabolism which causes hyperglycemiresulting from insufficient insulin secretion, insulin action or both (***Mutalik et al., 2003 and Joseph and Jini, 2011***).DM affects atleast 10% of the population,worldwide. Complications of DM include hypertension, atherosclerosis, microcirculatory disorders, retinopathy, nephropathy, neuropathy andangiopathy (***Edem, 2009***). Hyperglycemia can cause oxidative stress, which, in turn, may resultin cellular tissue damage. The harmful influence of diabetes on metabolism of tissuesand organs is well known likewise; uncontrolled hyperglycemia can lead todisturbances in the structure and function of organs (***Gupta et al., 2004***).

Many hypoglycemic agents, such as the iguanids and sulfonylureas, are usedalone or together with insulin to treat this disease, however these medications cancause serious side

effects, motivating a search for safer, more efficacious agents to control diabetes (*Huang, 2005*).

Studies showed that numerous extract obtained from plants are effective in reducing glycemia, causing fewer side effects and with lower cost than the usual antidiabetic agents (*Sohn et al., 2010*). The majority of the plants that are used in popular medicine for treatment of DM have been shown to possess biologically active chemical constituent such as alkaloids, flavonoids, phenolic substances, and other constituents, that can be used as new hypoglycemic agents (*Negri, 2005*).

Gum Arabic (GA) is a branched-chain, complex polysaccharide, either neutral or slightly acidic, found as mixed calcium, magnesium and potassium salt of a polysaccharidic acid (*Ahmed, 2007*). In Middle Eastern countries GA is widely used in the treatment of patients with chronic kidney disease and end-stage renal disease (*Al-Majed et al., 2002*).

Alloxan has been widely used to produce experimental diabetes mellitus syndrome. It causes necrosis of pancreatic-cells and induces free radicals which play a relevant role in the etiology and pathogenesis of both experimental and human diabetes mellitus (*Soto et al., 2004*). Moreover, widespread lipoid deposits throughout the exocrine tissue and loss of cells result from alloxan injection (*Soto et al., 2004*). Diabetics are predominantly vulnerable to oxidative stress resulting in the suppression of insulin gene transcription glucose stimulated insulin secretion and even producing apoptosis (*Kaneto et al., 2001*). Therefore, the present

study was carried out to assess the effects of gum Arabic on the pathological changes reduction of Alloxan induced diabetic rats .

Material and Method

Materials:

Thirty six male white albino rats of an average body weight 160 ± 10 g of (*Sprague Dawley Strain*) were used. They were obtained from the laboratory animal house of Faculty of Science, Tanta University.

Alloxan, Casein, vitamins, minerals and cellulose were purchased from EL-Gomhoryia Company, Cairo, Egypt. Gum Arabic "*Acacia Senegal*" was purchased from Elphraana Company for Chemicals and Drugs, Gharbia Governorate, Egypt.

Experimental design:

Rats were divided into two main groups as follow: Group (1) was fed on basal diet only and kept as a **negative control group (n =6)**. Group (2): Diabetes mellitus was induced in rats using diabetogenic substance alloxan monohydrate, by a single intraperitoneal injection of freshly prepared, in normal saline solution, alloxan (150mg/kg/B.W.) in 24 hrs fasting animal. This dose of alloxan was previously tested and proven to increase blood glucose level above 200 mg/dl in rats which were considered as diabetic. After that, the rats were divided into equal four groups (6 rats each) as following: **Group (2)**: was left as positive control and fed on basal diet only. **Group (3)**: was fed on basal diet supplemented with diamacrondrug 15mg /kg diet.

Group (4): was fed on basal diet supplemented with 50 g GA (5%) /kg diet. **Group (5):** was fed on basal diet supplemented with 100 g GA (10%) / kg diet. **Group (6):** was fed on basal diet supplemented with GA (10%) and diacylglycerol 15mg /kg diet. GA added on the expense of corn starch. Composition of mineral mixture was according to (*Campbell, 1963*), the vitamin mixture according to (*Hegsted et al., 1941*).

Biochemical analysis of serum:

At the end of the experiment, the rats were fasted overnight before sacrificed under ether anesthesia, and the blood samples were collected from each rat, and centrifuged to obtain the serum. Serum was carefully separated and transferred into dry clean eppendorf tubes and kept frozen at -20°C for analysis as described by (*Schermer, 1967*). Analysis was done at Medical College Laboratory, Zgazig University.

Biochemical analysis

Different tested parameters in serum were determined using specific methods as follows: Blood glucose according to the method of *Tietz (1976) and Yound (1975)*. Glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT) were determined in the serum according to the method described by *Reitman and Frankel (1957)*. Total cholesterol, triglycerides and HDL were determined according to the method described by *Allain et al., (1974), Trinder and Ann (1969), Lopes -Virella et al., (1977)*, respectively. Serum VLDL-C and LDL were calculated according to *Friedwald et al., (1972)*.

Statistical analysis

Data were expressed as mean \pm standard deviation. Values were statistically analyzed by one-way analysis of variance (ANOVA test) using SPSS 10.1 software package. Differences were considered significant at P values (0.05).

Results and Discussion

Biological evaluation:

The results (Table 1) show that feed intake (FI), body weight gain (BWG g) and feed efficiency ratio (FER) for positive control group (C+) were significant decreased, as compared to normal rats (negative control group C-). Meanwhile treatment with GA 10 % showed the highest levels of FI, BWG and FER, as compared to all treated groups. The changes in biology measurements might be attributed to the satiety stimulation effect by high fiber intake (*Ye et al., 2015*), which is associated with beneficial effects on fat metabolism or lowering caloric density of food (*Ali et al., 2009*). More detailed explanation was offered by *Marciani et al., (2000)* who showed that gum Arabic dissolves in water, forming a gel-like fluid with a viscous texture. This has the ability to slow the absorption and digestion of carbohydrates by the viscosity effect of dietary fibers. GA improves bowel movements (*Min et al., 2012*). GA modifies the body weight and decreased body mass index among healthy adult females (*Babiker et al., 2012*), reduced weight in rats (*Ushida et al., 2011*), and reduced visceral adipose tissues in female mice (*Ahmed et al., 2015*).

Biochemical parameters

Serum sugar (Glucose):

Results for glucose recorded significant increase of control (+ve) (190.34 ± 8.64 mg/dl), compared to control (-ve) group (119.33 ± 5.51 mg/dl) respectively. It denote that all treated groups were significant decrease for glucose, compared to control (+ve) group. The best result found in Arabic gum 10 % with value of 140.33 ± 13.05 mg/dlas shown in table (2). Dietary fiber plays an important role in controlling postprandial glycemc and insulin response in diabetic patients. There is an extensive literature on the influence of fiber on gastric emptying and its inverse relationship with the regulation of postprandial blood glucose responding in response to various fiber rich nutraceuticals(**Kang et al.,2014**).Gum Arabic is a non-digestible polysaccharide that has been shown to retard glucose absorption. It has a low glycaemic index and reduces plasma glucose concentrations in healthy individuals (**Phillips et al.,2008**). Additionally,**Omaima, Nasir et al., (2016)** showed that GA supplementation caused an overall improvement in biochemical factors related to T2DM and its complications. These observations have potential implications for the prevention and management of T2DM and its complications. Additionally, **Rasha, et al., (2017)** found that the GA group showed significant reduction in fasting plasma glucose (FPG) and HbA1c ($P<0.05$) within the GA group. Moreover, gum Arabic is a dietary supplement for improving nutrition of type 2 diabetic patients; it has demonstrated a good effect on improving their poor glycemc control. It has also shown improvement in the levels of the lipids and the BMI.

Mixtures of different types of gum (not including GA) have been shown to inhibit glucose movement in vitro, and lower postprandial blood glucose and plasma insulin in human subjects when incorporated in a drink containing 50 g glucose. Infusion of meals containing starch showed that a decrease in the digestion rate of starch in the upper small intestine accounted for part of the effect of viscosity on glycemic response, whereas the main effect of gum was apparently to slow gastric emptying (*Ahmed et al., 2015*).

Liver enzymes:

It is clear from table results (3) that there were significant increases for SGPT and SGOT enzymes in the serum of positive control group (56.00 ± 6.25 and 63.33 ± 2.08 U/L., respectively), as compared to negative control group (26.67 ± 8.14 and 33.00 ± 5.00 U/L., respectively). Results denote that all treated groups had significant decrease in serum levels of SGPT and SGOT activities when compared with positive control group. Treated group with gum Arabic 10 % and the group which treated with drug showed the highest decrease of SGPT and SGOT enzyme levels in serum, values were close to negative control group as shown in table (3). The activities of (ALT, AST and ALP) used as biochemical markers for evaluation of early hepatic injury (*AbdelAzim et al., 2017*). This was also observed in alloxan-induced diabetic animals in this study; blood levels of AST and ALT were elevated in the first 2 weeks after treatment, but only ALT remained significantly elevated at 6, 14 and 26 weeks after diabetes induction (*Lucchesi et al., 2015*).

A previous study (*Lucchesi, 2013*) showed that T1DM changed the oxidative balance in the liver of ALX-induced diabetic rats over the long-term, which was characterized by a significant increase in reactive oxygen species (ROS) in liver tissue and markedly reduced defense antioxidants. These results suggest that changes in blood liver enzymes (AST and ALT) and the morphological and ultrastructural lesions found in the livers of animals in this study are closely correlated to DM-induced chronic stress in liver cells. However, the molecular pathways by which chronic stress induces histopathological lesions in the liver in patients with T1DM are not clear because the mechanisms of hyperinsulinemia and hepatic and peripheral resistance to insulin are not usually the predominant mechanisms.

Regnell and Lernmark (2011) suggested a role of three mechanisms, separately or in combination, in the pathogenesis of nonalcoholic fatty livers disease (NAFLD) in patients with T1DM: (1) atypical rates or malfunction of lipoproteins would create alterations in triglyceride secretion by liver cells and lead to an accumulation of fat in the liver; (2) activation of transcription factors of hepatic metabolism by hyperglycemia, such as sterol regulatory element-binding proteins (SREBPs) and the carbohydrate response element-binding protein (ChREBP), would promote hepatic lipogenesis; and (3) excess liver glucose transported by the glucose transporter 2 factor (GLUT2) would lead to intrahepatic fat synthesis.

Lipid profile:

From tables (4&5): It could be observed that the mean value of total cholesterol, triglycerides, VLDL and LDL of (+ve)

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control group were higher than (-ve) control group. On the other hand, HDL level was significantly decreased in the serum of rats treated with alloxan (+ve), when compared with (-ve) control group. In all groups treated with GA and drug there were significant decreases in the serum levels of total cholesterol, triglycerides, VLDL and LDL but significant increase in serum level of HDL. The best results in level of total cholesterol and LDL was found in treated group with GA + Drug while the group treated with drug followed by GA (5%) showed the highest increase in the serum level of HDL. As for triglycerides and VLDL the best result recorded by the drug group followed by GA (10%).

Several quantitative and qualitative changes in lipoproteins are observed in T1DM patients, (*Verges, 2009*). On the other hand *Rasha, et al., (2017)* found that GA treatment significantly decreased the total cholesterol by 8.3%, triglycerides by 10.9%, LDL 19.2%, and significantly increased HDL level by 19.9% among GA treated group. The mechanism by which GA intake reduces the plasma cholesterol level may be related to the hypocholesterolemic effect of dietary fibers, which can be explained by many mechanisms, including viscosity effect of dietary fibers (*Marciani et al., 2000*), increase fecal bile acids, alteration of lipid metabolism (*Moundras et al., 1997*) and increase number of lipoprotein receptors in the liver (*Fernandez et al., 1995*). Although this study demonstrated that the consumption of 30g of GA improves nutrition of type 2 diabetic patients by improving FPG, HbA1c, and lipid profiles.

Antioxidant enzymes

Data in table (6) showed that serum levels of SOD had significant increase in all treated groups, as compared to positive control group except group of rats which were treated with 5&10% gum Arabic. Treated group with gum Arabic and drug (G5) recorded the best result for SOD level (0.308 ± 0.065 U/L) as compared to positive control group (0.087 ± 0.0185 U/), as shown in table (6).

Several studies have also shown a potentially protective effect of gum Arabic against gentamicin nephrotoxicity in rats (*Al-Majed et al., 2002 and Ali et al., 2003*), possibly in part through inhibition of the production of oxygen free radicals that cause lipid peroxidation.

There is however evidence that contradicts the theory that gum Arabic has significant antioxidant properties. *Ali et al., (2003)* demonstrated in a rat model that administration of varying concentrations of gum Arabic in the drinking water did not change significantly levels of free radical scavengers (*Ali et al., 2004*).

Histopathology examination results

Microscopically, liver of rat from negative control group revealed the normal histological structure of hepatic lobule (Photo 1). On the other hand, liver of rat from positive control group (G2, basal diet) showed cytoplasmic vacuolization of hepatocytes, Kupffer cells activation (Photo 2) and marked fibroplasia in the portal triad (Photo 3). However, liver of rat from drug group (G3, diamacron diet) revealed small vacuoles in the cytoplasm of hepatocytes (Photos 4&5). Meanwhile, liver of rat from GA

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(5%)G4, showed small vacuoles in the cytoplasm of some hepatocytes and slight activation of Kupffer cells (Photo 6). Liver of rat from GA (10%) revealed small vacuoles in the cytoplasm of some hepatocytes and slight activation of Kupffer cells with slight dilatation of hepatic sinusoids (Photos 7&8). Moreover, liver of rat from GA(10%) + drug 15mg /kg diet(G6) revealed cytoplasmic vacuolization of hepatocytes and slight activation of Kupffer cells (Photo 9).

Lucchesi et al., (2015) reported that rats with T1DM induced by intravenous alloxan (ALX) presented biochemical changes in blood and morphological and ultrastructural lesions in the liver that largely resembled chronic liver disease in humans. Liver changes ranged from the fatty degeneration of liver cells to steatohepatitis and periportal fibrosis. Typically, the observed lesions in the livers of diabetic animals in this study reached all structures of the organ, including both portal areas and sinusoids, and hepatocytes, nuclei, and intracytoplasmic organelles, including a progressive enlargement of sinusoids, micro- and macrovesicular fatty degeneration, steatohepatitis and periportal fibrosis. Further, ultrastructural changes in hepatocytes, particularly the mitochondria, the rough endoplasmic reticulum (rER) and cell nuclei, were also observed. However, whether the observed histopathological changes in the livers of ALX-induced diabetic rats were due to the toxic action of the drug. ALX and streptozotocin (SZ) exert a toxic effect on pancreatic beta cells, which causes T1DM, but this effect extends to the kidneys and livers of animals of several species (**Abd-Allah et al., 2002 and Al-Majed et al., 2003**).

Also it was emphasized that insulin plays an important role in the genesis of steatosis in rodent hepatocytes because it modulates the flow of free fatty acids (FFAs) that is transported by protein pathways mediated by 2 and 5 FATPs (fatty acid transport proteins). The actions of 2 and 5 FATP are dose-dependent and bimodal, and they are mediated by insulin receptor substrate-2 (IRS-2) under low concentrations of insulin and insulin receptor substrate-1 (IRS-1) during states of hyperinsulinemia. These observations indicate that an ideal balance in circulating insulin levels is required for the regulation of fat metabolism in the liver (*Regnell and Lernmark, 2011*). Therefore, deviations from this equilibrium, such as the lack of insulin production (T1DM) or an excess of insulin in the bloodstream because elevated peripheral resistance to insulin action (T2DM) or the inadequate administration of exogenous insulin, lead to fat accumulation in the liver (*Kirby et al., 2010*).

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Table (1): Effect of gum Arabic and drug on feedintake (F1), body weight gain(BWG)and feed efficiency ratio (FER) of diabetic rats (Mean \pm SD)

Parameters	FI g/day	BWG (g)	FER
	Mean \pm SD	Mean \pm SD	Mean \pm SD
G1 Control (-)	19.63 ^a \pm 0.56	11.17 ^a \pm 0.29	0.020 ^a \pm 0.004
G2 Control (+)	14.07 ^d \pm 0.13	-21.01 ^d \pm 0.28	-0.053 ^d \pm 0.003
G3 Drug	15.77 ^c \pm 0.40	-18.74 ^c \pm 0.64	-0.042 ^c \pm 0.002
G4 Arabic gum 5 %	13.31 ^d \pm 0.53	-24.15 ^e \pm 0.23	-0.065 ^e \pm 0.001
G5 Arabic gum 10 %	16.76 ^b \pm 0.47	-16.03 ^b \pm 0.17	-0.034 ^b \pm 0.009
G6 Arabic gum + Drug	12.39 ^e \pm 0.53	-26.07 ^f \pm 0.22	-0.075 ^f \pm 0.004

- Values denote arithmetic mean \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

Table(2): Effect of gum Arabic and drug on blood sugar of diabetic rats (Mean \pm SD)

Groups	Parameters	Glucose mg/dl
		Mean \pm SD
G1	Control (-)	119.33 ^d \pm 5.51
G2	Control (+)	190.34 ^a \pm 8.64
G3	Drug	166.67 ^b \pm 13.80
G4	Arabic gum 5 %	168.65 ^b \pm 2.31
G5	Arabic gum 10 %	140.33 ^c \pm 13.05
G6	Arabic gum + Drug	160.32 ^b \pm 10.21

- Values denote arithmetic means \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

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Table(3): Effect of gum Arabic and drug on liver enzymes of diabetic rats (Mean \pm SD)

Parameters	GOT U/L	GPT U/L
	Mean \pm SD	Mean \pm SD
G1 Control (-)	33.00 ^d \pm 5.00	26.67 ^d \pm 8.14
G2 Control (+)	63.33 ^a \pm 2.08	56.00 ^a \pm 6.25
G3 Drug	40.67 ^{cd} \pm 3.21	33.00 ^{cd} \pm 2.00
G4 Arabic gum 5 %	49.33 ^b \pm 7.09	43.00 ^{bc} \pm 4.36
G5 Arabic gum 10 %	35.00 ^{cd} \pm 4.58	25.00 ^d \pm 7.55
G6 Arabic gum + Drug	43.00 ^{bc} \pm 3.61	44.66 ^b \pm 4.04

- Values denote arithmetic means \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

Table(4): Effect of gum Arabic and drug on T.Ch and T.G of diabetic rats (Mean \pm SD)

Groups	Parameters	T.Ch mg/dl	T.G mg/dl
		Mean \pm SD	Mean \pm SD
G1 Control (-)		85.00 ^c \pm 4.36	71.00 ^c \pm 1.00
G2 Control (+)		146.33 ^a \pm 6.51	116.00 ^a \pm 6.25
G3 Drug		113.00 ^b \pm 7.58	75.00 ^{bc} \pm 6.08
G4 Arabic gum 5 %		127.33 ^b \pm 9.81	86.33 ^b \pm 6.66
G5 Arabic gum 10 %		117.33 ^b \pm 0.58	75.66 ^{bc} \pm 5.51
G6 Arabic gum + Drug		108.33 ^b \pm 14.15	85.67 ^b \pm 9.02

- Values denote arithmetic means \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

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Table(5): Effect of gum Arabic and drug on VLDL, LDL and HDL of diabetic rats (Mean \pm SD)

Groups	Parameters	VLDL mg/dl	LDL mg/dl	HDL-c mg/dl
		Mean \pm SD	Mean \pm SD	Mean \pm SD
G1 Control (-)		14.20 ^d \pm 1.50	22.80 ^d \pm 2.00	48.00 ^a \pm 5.00
G2 Control (+)		23.20 ^a \pm 0.90	83.46 ^a \pm 5.50	39.67 ^c \pm 2.08
G3 Drug		15.00 ^d \pm 1.00	47.67 ^c \pm 2.25	50.33 ^a \pm 3.06
G4 Arabic gum 5 %		17.27 ^b \pm 1.22	62.73 ^b \pm 3.20	47.33 ^{ab} \pm 2.31
G5 Arabic gum 10 %		15.13 ^{cd} \pm 0.75	60.20 ^b \pm 1.44	42.00 ^{bc} \pm 1.00
G6 Arabic gum + Drug		17.13 ^{bc} \pm 1.25	45.87 ^c \pm 1.90	45.33 ^{ab} \pm 3.21

- Values denote arithmetic means \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

Table (6): Effect of gum Arabic and drug on SOD of alloxan diabetic rats (Mean \pm SD)

Groups	Parameters	SOD U/L
		Mean \pm SD
G1 Control (-)		0.200 ^{abc} \pm 0.003
G2 Control (+)		0.087 ^c \pm 0.0185
G3 Drug		0.232 ^{ab} \pm 0.077
G4 Arabic gum 5 %		0.184 ^{abc} \pm 0.094
G5 Arabic gum 10 %		0.152 ^{bc} \pm 0.095
G6 Arabic gum + Drug		0.308 ^a \pm 0.065

- Values denote arithmetic means \pm Standard deviation of the mean.
- Means with different letters (a, b, c, d, etc.) in the same column differ significantly at $p \leq 0.05$ using Duncan test and vice versa.

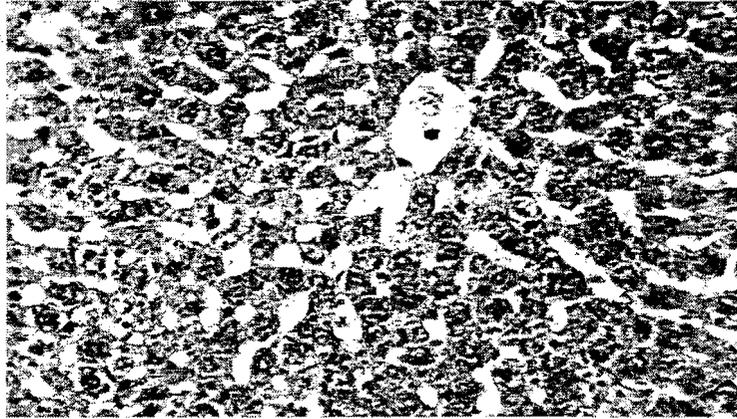
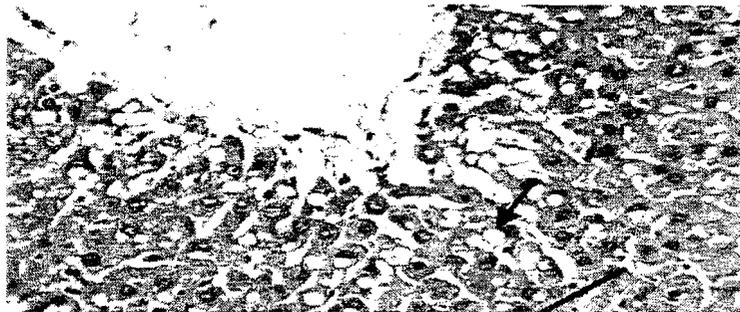


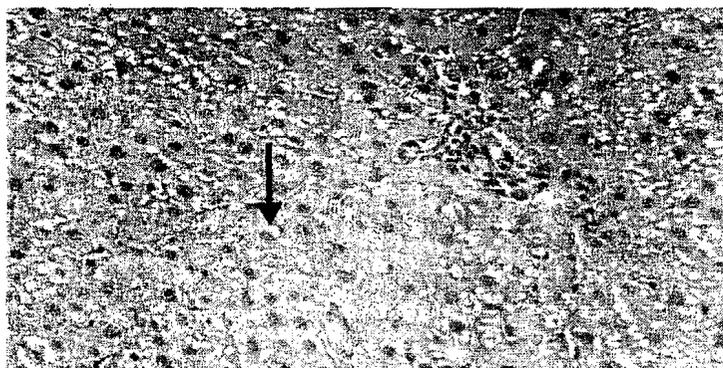
Photo (1): Liver of rat from negative control group (G1, basal diet) showing the normal histological structure of hepatic lobule (H & E X 400)



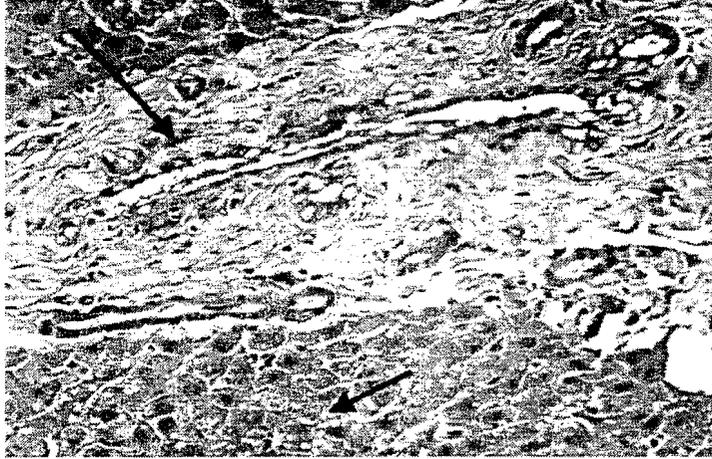
Photo(2): Liver of rat from positive control group (G2, basal diet) showing cytoplasmic vacuolization of hepatocytes and Kupffer cells activation (H & E X 400)



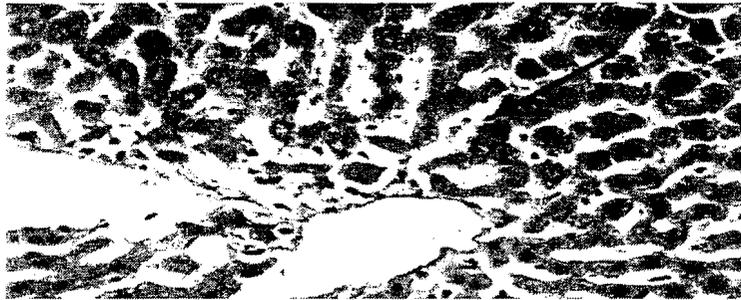
Photo(3): Liver of rat from positivecontrolgroup(G2, basal diet) showing marked fibroplasia in the portal triad (H & E X 400)



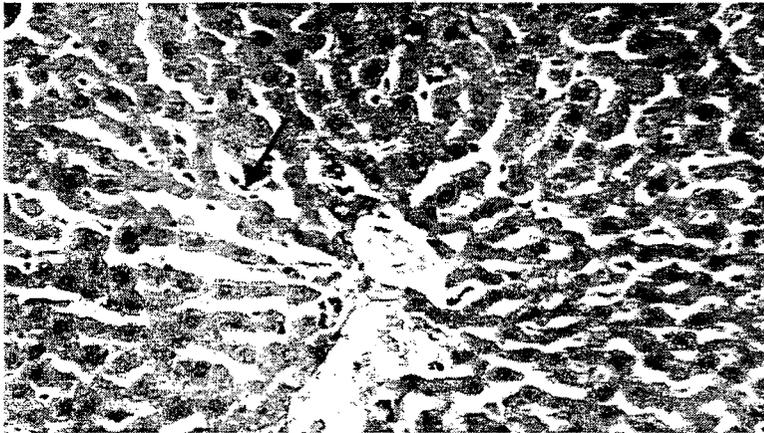
Photo(4): Liver of rat from drug group (G3, diamacron diet) showing small vacuoles in the cytoplasm of hepatocytes (H & E X 400)



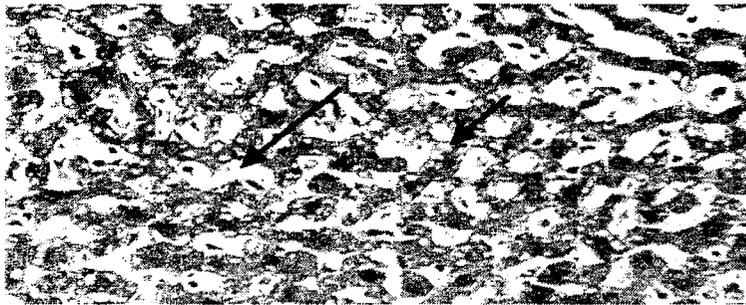
Photo(5): Liver of rat from drug group(G3, diamacron diet) showing small vacuoles in the cytoplasm of hepatocytes and fibrosis in the portal triad (H & E X 400)



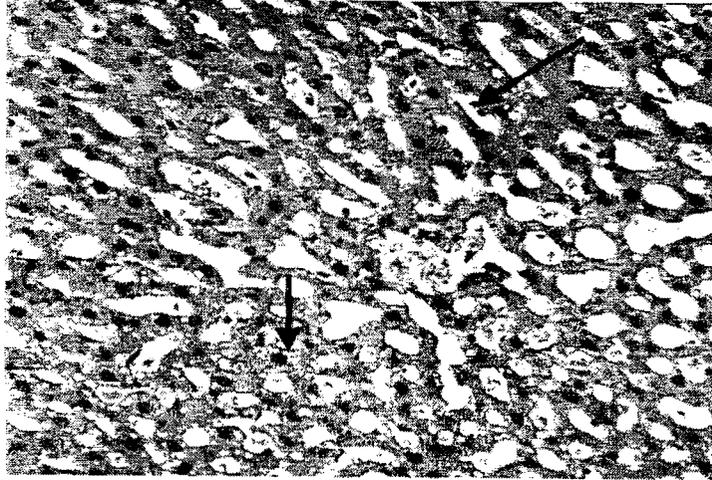
Photo(6): Liver of rat from GA (5%) (G4) showing small vacuoles in the cytoplasm of some hepatocytes and slight activation of Kupffer cells (H & E X 400)



Photo(7): Liver of rat from GA (10%) (G5) showing slight activation of Kupffer cells (H & E X 400)



Photo(8): Liver of rat from GA (10%) (G5) showing small vacuoles in the cytoplasm of some hepatocytes and slight dilatation of hepatic sinusoids (H & E X 400)



Photo(9): Liver of rat from GA(10%)+drug(15mg /kg diet) group(G6) showing cytoplasmic vacuolization of hepatocytes and slight activation of Kupffer cells (H & E X 400).

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التأثيرات الغذائية والبيوكيميائية للصبغ العربي علي التغيرات المرضية للحد من السكر المحدث بالالوكسان في الفئران

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الملخص العربي

تم إجراء الدراسة الحالية لمعرفة تأثير جرعات مختلفة من الصبغ العربي و أحدالعقاقيرعلي فئران التجارب المصابه بالبول السكري. تم استخدام ٣٦ فأراً أبيض بالغ يتراوح وزن كل منها 160 ± 10 جرام وتم تقسيمهم إلى مجموعتين رئيسيتان وتركت إحداها كمجموعة ضابطة سالبة و المجموعة الثانية الرئيسية تم حقنها تحت الغشاء البروتوني بمحلول الالوكسان بمقدار ١٥٠ ملجم /كجم من وزن الفأرثم قسمت الي خمس مجموعات متساوية (٦ فئران في كل المجموعة). المجموعة الفرعية الثانية: تركت كمجموعة ضابطة موجبة وتم تغذيتها علي الغذاء الاساسي فقط، المجموعة الثالثة: أعطيت الغذاء الاساسي مدعم بعقار الديامكرون(١٥ملجم /كجم من وزن الغذاء) لكل كجم من وزن الغذاء،المجموعة الرابعة: أعطيت الغذاء الاساسي مدعم ب ٥٠جم صبغ عربي لكل كجم من وزن الغذاء ، المجموعة الخامسة: أعطيت الغذاء الاساسي مدعم ب ١٠٠جم صبغ عربي لكل كجم من وزن الغذاء، المجموعة السادسة: أعطيت الغذاء الاساسي مدعم بالديامكرون (١٥ ملجم /كجم من وزن الغذاء) والصبغ العربي (١٠٠جم/كجم من وزن الغذاء).استمرت التجربة لمدة ٢٨ يوماً، وفي نهاية فترة التجربة تم ذبح الفئران ثم أخذت عينات الدم من الفئران لإجراء التقييم البيولوجي و لتقديرمستوي السكر بالدم و SOD وإنزيمات الكبد(SGPT&SGOT)والكوليسترول الكلي والجلسريدات الثلاثية والبروتينيات الدهنية في الدم (HDL-C, LDL-C, VLDL-C). وأظهرت النتائج أن الغذاء المدعم بالصبغ العربي خاصة علي مستوي ١٠% من الغذاء كان له تأثير في تصحيح مستوي السكر بالدم وتحسين وظائف الكبد ومستوي الانزيمات المضادة للأكسدة ودهون الدم.