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Anti Diabetic Effect Of Oats Flour On Streptozotocin-Induced Diabetic Rats

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Abstract

The effects of different concentrations (2.5 and 5%) of white and brown oat (*Avena sativa*) on diabetic rats were evaluated. Forty rats were used in this study and divided into 8 groups, each group contain 5 rats. Rats were treated by streptozotocin (STZ) at dose of 40 mg/kg body weight to induced diabetic. Results showed that rats fed on 5 % mixture powder recorded the lowest glucose level with significant differences being,109.5 mg/dl. The lower Aspartate Transaminase(GOT) and Alanine Transaminase (GPT)liver enzyme of treated group recorded for group fed on 5% mixture powder but, the highest value recorded for group fed on 2.5% white oat powder with significant difference. Lowest value of triglyceride and cholesterol recorded for group fed on 5% mixture powder. The highest High Density Lipoprotein cholesterol (HDL-c) of treated group recorded for group fed on5% oats mixture powder. While, the highest Low Density Lipoprotein cholesterol(LDL-c) of treated group recorded for rats fed on 5% white oat powder.The highest Very low Density Lipoprotein cholesterol (VLDL-c) of treated group recorded for rats fed on2.5% brown oat powder. The lowest urea, uric acid and creatinine levels of treated group recorded for group fed on 5%oats mixture powder.

In Conclusion , the main purpose of this study is the effect of the difference concentration of oats " Brown – White" on diabetic and there for benefits on general health.

Key words: Oat grains, Rats, Diabetic mellitusand Biochemical analysis.

Introduction

Diabetes mellitus is an endocrinological and/or metabolic disorder with anincreasing global prevalence and incidence, and **Diabetic Association, (2011)** defined diabetes as a chronic disease that requires continuous medical care and patient self-management education to prevent acute complications and reduce the risk of long-term complications. High blood glucose levels are symptomatic of diabetes mellitus as a consequence of inadequate pancreatic insulin secretion or poor insulin-directed mobilization of glucose by target cells. Diabetes mellitus is aggravated by and associated with metabolic complications thatcan subsequently lead to premature death. This review explores diabetes mellitus in terms of its historical perspective, biochemical basis, economic burden, management interventions along with the future perspectives **(Piero*et al* .,2015).**

Oats (*Avena sativa*) is a class of cereal grain essentially grown for human consumption as well as for livestock fodder**(Daou and Zhang,2012).**The common oat (*Avena sativa*) is species of cereal grain mainly grown for its utilization for human consumption as oatmeal as well as for livestock feed, oat has always been regarded as a health promoting food without clear knowledge of its specific health related effects ,these beneficial effects are chiefly due to the soluble fiber content of oats ,today oats is among the richest and most economical sources of soluble dietary fiber The present interest in soluble oat fiber originated from reports that showed that dietary oats can help in lowering cholesterol **(Tiwari and Cummins, 2011).**

These contribute to over 60% of the world food production providing about 50 percent of protein and energy necessary for the human diet,oats provide more protein, fiber, iron and zinc than other whole grains,oats are reported be unique among cereals as they are therapeutically active against diabetes, dyslipidemia, hypertension, inflammatory state and vascular injury than other grains which are predominantly insoluble, such as wheat or rice**(Sangwan*et al.*, 2014).**

Aro*et al.*, (2007)reported thatit is well known that dietary oat have been reported to reduce serum cholesterol and obesity, prevent coronary heart disease, and improve symptoms of diabetes, numerous studies indicate that oat have high contents of β-glucan which is beneficial to human health, as it isconsidered to be responsible for these health benefits,oat contains 2.0 - 7.5% β-glucan, 13 - 20% protein, 2 - 12% crude fat, and about 60% starch.

Hooda *et al.*,(2010) reports of research findings that oat dietary fiber could effectively lower cholesterol and blood glucose, and protect and prevent against various diseases. Moreover, there are many studies indicating the efficacy of oat bran in reducing total cholesterol (TC) and

LDL-C concentrations while either increasing or having no effect on plasma HDL-C concentrations in humans (**Charlton *et al.*, 2011)**.

Therefore, the main purpose of this study is:

In Conclusion , the main purpose of this study is the effect of the difference concentration of oats " Brown – White" on diabetic and there for benefits on general health.

Material & Methods

Materials

White oat *(Avena sativa*) and brown oat were obtained from local market, Menoufia Governorate, Egypt.

Cholesterol powder

Pure white crystalline cholesterol powder and saline solutions were purchased from SIGMA Chemical Co., (USA).

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 40 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, urea, creatinin, albumin) were obtained from Al-Gomhoria Company for , Cairo, Egypt.

Methods

Experimental design

Forty 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 **American Institute of Nutrition (AIN) (1993)** for 7 consecutive days. After this adaptation period, rats are divided into 8 groups, each group which consists of 5 rats as follows, group (1): Rats fed on basal diet as negative control. Group (2): Injected by streptozotocin a dose of 40 mg per kg of weight of the rat and used as a positive control group. Group (3): A group infected diabetic fed on the white oat as powder by 2.5% of the weight of the rat.Group (4): A group infected diabetic fed on the white oat as powder by 5% of the weight of the rat.Group (5): A group infected diabetic fed on the brown oat as powder by 2.5% of the weight of the rat.Group (6): A group infected diabetic fed on the brown oat as powder by 5% of the weight of the rat.Group (7): A group infected diabetic fed on the mixture white oat and brown oat as powder by 2.5% of the weight of the rat.Group (8): A group infected diabetic fed on the

mixture white oat and brown oat as powder by 5% of the weight of the rat.During the experimental period, the body weight and food intake were estimated weekly and the general behavior of rats was observed.The experiment will 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, then kept in deep freezer till using.

Blood sampling

After fasting for 12 hours, blood samples in initial times were obtained fromhepatic portal vein at the end of each experiment. Blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 28 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 at -20°C till analysis according to the method described by **Schermer (1967).**

Biochemical Analysis

Lipids profile

Determination of serum total cholesterol

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

Determination of serum triglycerides

Serum triglycerides were determined by enzymatic method using kits according to the **Young, (1975) and Fossati, (1982)**.

Determination of high density lipoprotein (HDL-c)

HDLc was determined according to the method described by**Fredewaid (1972) and Grodon and Amer (1977)**.

Calculation of very low density lipoproteincholesterol (VLDL-c)

VLDLc 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)

LDLc 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 aminotransferase (ALT), serum asparatateaminotransferase (AST), were carried out according to the method of **(ClinicaChimica Acta 1980**, **Hafkenscheid 1979 and Moss 1982**),respectively.

Kidney functions

Determination of serum urea, serum creatinin and serum uric acid

Serum urea and serum creatinin were determinated by enzymatic method according to **(Patton and Crouch 1977** and **Henry 1974)**.While, serum uric acid was determined calorimetrically according to the method of **Barham and Trinder (1972)**.

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

Data presented in Table (1) show the effect of white and brown oat on glucose levels of diabetic rats.The obtained results indicated that the highest glucose level recorded for positive control group, while the lowest level recorded for negative control group with significant differences ($P \leq 0.05$). The mean values were 250 and 101 mg/dl, respectively.

On the other hand, rats fed on 5 % oats mixture recorded the lowest glucose level with significant differences ($P \leq 0.05$). The mean value was 109.5 mg/dl. While, the higher glucose level in diabetic rats recorded for 2.5 % white oats with significant differences ($P \leq 0.05$). The value was 131.00 mg/dl. It could be concluded that 5 % oats mixture recorded the best treatment which showed highest reduction in glucose levels.These results are in agreement with **Nazanin *et al* ., (2016)** reported that oat β-glucan as a dietary agent for minimizing postprandial glucose and showed that modulating the activity of the key intestinal glucose transporters with oat β-glucan could be an effective way of lowering blood glucose levels in patients with diabetes.**Wood *et al.,(*2007)**suggested that there reductions in glucose and insulin responses after a meal are mainly due to the viscosity caused by oats.

Data given in Table (2) show the effect of oat (white and brown) and their mixtures on liver functions (GOT and GPT) of diabetic rats.The obtained results indicated that they GOT liver enzyme of positive control rats group recorded the highest value when compared with negative control group with significant difference ($P \leq 0.05$). The mean values were 58.82 and 13.20 U/L, respectively.While, the highest GOT liver enzyme of treated group recorded for group fed on 2.5 % white oat but, the lowest value recorded for group fed on 5% oats mixture with significant difference ($P \leq 0.05$). The mean values were

42.40 and 21.70 U/L, respectively. As conclusion, it could be indicated that the 5 % oats mixture has synergistic effect on reduction of liver enzymes levels.

In case of GPT liver enzyme of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 22.35 and 7.15 U/L, respectively.While, the highest GPT liver enzyme of treated group recorded for group fed on 2.5 % white oat but, the lowest value recorded for group fed on 5% oats mixture with significant difference (P≤0.05). The mean values were 13.00 and 8.75 U/L, respectively. As conclusion, it could be indicated that the 5 % oats mixture has synergistic effect on reduction of liver enzymes levels. These results are in agreement with **Hong *et al.*, (2013)**, data showed that consumption of oat reduced body weight, BMI, body fat and the waist-to-hip ratio, profiles of hepatic function, including AST, but especially ALT, were useful resources to help in the evaluation of the liver, oat could attenuate obesity, body fat deposition, waist circumstance, and improve serum parameters and liver function to prevent hepatic steatosis in obese subjects, consumption of oat reduced obesity, abdominal fat, and improved lipid profiles and liver functions, taken as a daily supplement, oat could act as an adjuvant therapy for metabolic disorders.

Data presented in Table (3) show the effect of oat (white and brown) and their mixtures on urea, uric acid and creatinine of diabetic rats.The obtained results indicated that the urea level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 69.05 and 38.0 mg/dl, respectively.While, the highest urea level of treated group recorded for group fed on 2.5 % brown oat but, the lowest value recorded for group fed on 5% oats mixture with significant difference (P≤0.05). The mean values were 55.81 and 39.80 mg/dl, respectively.

On the other hand, the uric acid level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 3.17 and 1.31mg/dl, respectively. While, the highest uric acid level of treated group recorded for group fed on 2.5 % white oat but, the lowest value recorded for group fed on 5% oats mixture with significant difference (P≤0.05). The mean values were 2.41 and 1.10 mg/dl, respectively.

In case of creatinine, the level of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 67.15 and 29.40 mg/dl, respectively. While, the highest creatinine level of treated group recorded for group fed on 2.5 % white oat but, the lowest value

recorded for group fed on 5% oats mixture with significant difference (P≤0.05). The mean values were 59.03 and 34.10 mg/dl, respectively. The best treatment was recorded for group 8 (5% oats mixture powder) as compared to negative control group.These results are in agreement with**Abdel-Rahman (2010),** reported that the rats fed oat bran and barley bran showed significant decrease in the level of uric acid, urea, and creatinine,in contrast, the rats fed oat bran and barley bran showed significant decrease in the level of uric acid, urea, and creatinine compared with the positive control, this result agrees with the assumption that dietary fiber improves the level of kidney function.

The effect of oat (white and brown) and their mixtures on the serum total cholesterol and triglycerides of diabetic rats are shown in Table (4). The obtained results indicated that the triglyceride of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 140.15 and 59.81 mg/dl, respectively. While, the lowest T.G recorded for group fed on 5% mixture powder group while the highest value recorded for 2.5% white oat powder group with significant differences. The mean values were 62.61 and 86.33 mg/dl, respectively. The best serum T.G level was showed for group 8 (5% oats mixture powder) when compared with negative control group.

On the other hand, the cholesterol levels of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 144.0 and 98.0 mg/dl, respectively.While, the lowest cholesterol levels recorded for group fed on 5 % oat mixture while the highest value recorded for 2.5% white oat with significant difference (P≤0.05). The mean values were 103.0 and 135.0 mg/dl, respectively. The best serum T.C level was showed for group 8 (5% oats mixture powder) when compared with negative control group.These results are in agreement with **Maki *et al.*, (2003),** said that according to scientific research results it has been known to scientists for over 2 decades that β-glucan (oat β-glucan) has strong cholesterol and triglyceride lowering properties leading to reduced cardiovascular diseases.Oats were first found to have a cholesterol-lowering effect and the active component was identified as beta-glucans **(Kerckhoffs*et al.*,2002).**

Data presented in Table (5) show the effect of oat (white and brown) and their mixtures on the serum lipid profiles of diabetic rats.The results indicated that the HDL-c of negative control rats group recorded the highest value when compared with positive control group with significant difference (P≤0.05). The mean values were 47.00 and 31.57 mg/dl, respectively.While, the highest HDL-c of treated group recorded for group fed on 5 % oats mixture but, the lowest value recorded for group fed on 2.5% brown oat with significant difference (P≤0.05). The

mean values were 46.01 and 41.74 mg/dl, respectively. The best serum HDL-c was observed for group 8 (5% oats mixture powder) when compared with negative control group.

On the other hand, the LDL-c of positive control rats group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 84.40 and 39.04 mg/dl, respectively.While, the highest LDL-c of treated group recorded for group fed on 5 % white oat but, the lowest value recorded for group fed on 5% oat mixture with significant difference (P≤0.05). The mean values were 73.31and 44.97 mg/dl, respectively. The best serum LDL-c was observed for group 8 (5% oats mixture powder) when compared with negative control group.

The mean value of VLDL-c of negative control group, while, was lower than positive control group with significant differences between them being 11.96 and 28.03 mg/dl, respectively.While, the highest VLDL-c of treated group recorded for group fed on 2.5 % brown oat but, the lowest value recorded for group fed on 5% oat mixture with significant difference (P≤0.05). The mean values were 17.03 and 12.52 mg/dl, respectively.The best serum VLDL-c was observed for group 8 (5% oats mixture powder) when compared with negative control group. These results are in agreement with **Aly,(2012)**, reported that the Supplementation of diet with either oat or wheat bran resulted in a significant decrease in the level of serum total lipid, total cholesterol, triglycerides, LDL-C, VLDL-C, and LDLC/HDL-C ratio with increase in the level of HDL-C compared with those fed high cholesterol.

Conclusion: Use of 5% oats mixture powder (white and brown) markedly reducing glucose levels and improvement of liver and kidney functions.Also, it's showed good effect on lipids profile.Finally, make programs of nutritive edification to explain the oats as dietary supplements for complementary and alternative medicine.

Table (1) Effect of oat (white and brown) and their mixtures on glucose of diabetic rats

Groups/ Treatments	Glucose (mg/dl)
G1 C (-)	$101.0^{i} \pm 0.30$
G2 C (+)	$250.0^{a} \pm 1.10$
G3(2.5% white oat)	$131.00^{b} \pm 0.50$
G4 (5% white oat)	$126.00^{c} \pm 0.30$
G5 (2.5% Brown oat)	$128.50^{b} \pm 0.60$
G6 (5%Brown oat)	$120.00^{d} \pm 0.10$
G7 (2.5%oats mixture)	$117.00^{d} \pm 0.40$
G8 (5%oats mixture)	$109.50^{e} \pm 0.60$
LSD	**3.110**

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

Table (2) Effect of oat (white and brown) and their mixtures on liver functionsof diabetic rats

Groups/ Treatment	(GOT) U/L	(GPT) U/L
G_1 C (-)	$13.20^{g} \pm 1.10$	$7.15^{d} \pm 0.80$
G_2 C (+)	$58.82^{a} \pm 1.35$	$22.35^{a} \pm 0.40$
G_3(2.5% white oat)	$42.40^{b} \pm 2.05$	$13.00^{b} \pm 1.20$
G_4 (5% white oat)	$33.00^{d} \pm 0.60$	$10.85^{c} \pm 0.90$
G_5 (2.5% Brown oat)	$36.65^{c} \pm 1.25$	$12.20^{b} \pm 0.50$
G_6 (5% Brown oat)	$28.71^{e} \pm 0.90$	$10.60^{c} \pm 0.60$
G_7 (2.5% oats mixture)	$28.00^{e} \pm 0.90$	$10.80^{c} \pm 0.60$
G_8 (5%oats mixture)	$21.70^{f} \pm 0.90$	$8.75^{d} \pm 0.60$
LSD	**2.260**	**1.350**

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$)**.**

Table (3): Effect of oat (white and brown) and their mixtures on urea, uric acid and creatinine of diabetic rats

Groups	Urea mg/dl	Uric acid mg/dl	Creatinine mg/dl
G_1 C (-)	$38.00^{e} \pm 1.10$	$1.31^{b} \pm 0.30$	29.40f+0.42
G_2 C (+)	$69.05^{a} \pm 0.20$	$3.17^{a} \pm 0.10$	67.15a+0.50
G_3(2.5% white oat)	$53.95^{b} \pm 0.50$	$2.14^{b} \pm 0.30$	59.03b+ 3.04
G_4 (5% white oat)	$46.35^{c} \pm 0.40$	$1.65^{b} \pm 0.40$	57.47b+ 1.20
G_5 (2.5% Brown oat)	$55.81^{b} \pm 0.20$	$2.11^{ab} \pm 0.40$	43.72c+ 1.30
G_6 (5% Brown oat)	$44.40^{c} \pm 0.30$	$1.20^{c} \pm 1.50$	41.21c+ 1.50
G_7 (2.5% oats	$42.10^{d} \pm 0.50$	$1.15^{c} \pm 1.40$	$40.21^{d} \pm 1.40$
G_8 (5%oats mixture)	$39.80^{d} \pm 0.40$	$1.10^{c} \pm 1.30$	$34.10^{e} \pm 1.30$
LSD	**3.00**	**1.21**	**3.13**

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

Table(4):Effect of oat (white and brown) and their mixtures on serum triglyceridesand serum total cholesterol of hyperglycemic rats

Groups	Triglycerides (TG)mg/dl	Total Cholesterol (TC)mg/dl
G_1 C (-)	$59.81^{e} \pm 0.20$	$98.00^{g} \pm 0.10$
G_2 C (+)	$140.15^{a} \pm 2.21$	$144.00^{a} \pm 1.40$
G_3(2.5% white oat)	$86.33^{b} \pm 1.30$	$135.00^{b} \pm 0.30$
G_4 (5% white oat)	$75.42^{c} \pm 0.50$	$132.00^{c} \pm 0.40$
G_5 (2.5% Brown oat)	$85.14^{b} \pm 0.15$	$127.00^{d} \pm 0.30$
G_6 (5% Brown oat)	$74.87^{c} \pm 0.60$	$115.00^{e} \pm 0.10$
G_7 (2.5% oats mixture)	$70.23^{d} \pm 0.10$	$116.00^{e} \pm 0.20$
G_8 (5%oats mixture)	$62.61^{e} \pm 0.30$	$103.50^{f} \pm 0.30$
LSD	**2.63**	**2.12**

TG= Triglyceride. TC= Total Cholesterol

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

Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).

Table (5): Effect of oat (white and brown) and their mixtures on lipid profile of diabetic rats

Groups	Parameters		
	(HDL-c) (mg/dl)	(LDL-c) (mg/dl)	(VLDL-c) (mg/dl)
G1 C (-)	$47.00^{ab} \pm 2.80$	$39.04^{f} \pm 0.13$	$11.96^{d} \pm 0.69$
G2 C (+)	$31.57^{d} \pm 1.71$	$84.40^{a} \pm 1.58$	$28.03^{a} \pm 1.20$
G3(2.5% white oat)	$45.46^{bc} \pm 1.38$	$72.27^{b} \pm 1.91$	$17.27^{b} \pm 1.72$
G4 (5% white oat)	$43.61^{c} \pm 0.50$	$73.31^{b} \pm 0.33$	$15.08^{c} \pm 0.10$
G5 (2.5% Brown oat)	$41.74^{bc} \pm 0.90$	$68.23^{c} \pm 1.40$	$17.03^{b} \pm 1.60$
G6 (5% Brown oat)	$44.41^{a} \pm 1.40$	$55.62^{d} \pm 1.15$	$14.97^{c} \pm 0.20$
G7 (2.5% oats mixture)	$45.40^{ab} \pm 1.10$	$56.55^{d} \pm 1.10$	$14.05^{c} \pm 2.20$
G8 (5%oats mixture)	$46.01^{ab} \pm 1.30$	$44.97^{e} \pm 1.10$	$12.52^{d} \pm 1.40$
LSD	**3.02**	**3.00**	**2.60**

LDL.c = Low density lipoprotein cholesterol. VLDL -c = Very low density lipoprotein cholesterol.

HDL-c = High density lipoprotein cholesterol

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

Mean under the same column bearing different superscript letters are different significantly($p \leq 0.05$).

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التاثير المضاد للسكر لدقيق الشوفان فى الفئران المصابة بالسكر بتأثير الإستربتوزوتوسين

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الملخص العربى

تم تقييم تأثيرات التراكيزالختلفة (5.2 و 5٪) من الشوفان الابيض والبني (أفيناساتيفا) على الفئران الصابة بداء السكري. تم استخدام أربعين فأر في هذه الدراسة وقسمت إلى 8 مجموعات،كل مجموعة تحتوي على 5 فئران. عولجت ا لجرذان بواسطة(STZ) الاستربتوزوتوسين بجرعة 40 ملجم / كجم من وزن الجسم لتحفيزالاصابة بمرض السكري. أظهرت النتائج أن الفئران التي تم تغذيتهاعلى مسحوق خليط 5 ٪سجلت أقل مستوى جلوكوزمع وجود فروق معنوية 5.109 مجم / ديسيلتر. تم تسجيل انخفاض انزيم امين الاسبارتات الناقل Alanine Transaminase(GPT) وGOT للمجموعه المعالجه التى تم تغذيتها على مسحوق خليط الشوفان بنسبة 5%ولكن اعلى قيمه مسجلة للمجموعةالتى تم تغذيتهاعلى مسحوق شوفان ابيض بنسبة 2.5%مع اختلاف معنوى وتحسين اعراض مرض السكرى ،وتشير العديد من الدراسات الى ان الشوفان يحتوى على نسبة عالية من البيتا جلوكان .وهو مفيد لصحة الانسان،حيث يعتبر مسؤلاعن هذة الفوائد الصحية ،يحتوى الشوفان على2.0-7.5% بروتين ،2-12% دهون خام ،وحوالى 60% نشا 13-20%بيتا جلوكان تشير Hooda واخرون (2010)الى نتائج الابحاث التى تفيد بان الالياف الغذائية من الشوفان يمكن ان تخفض بشكل فعال نسبة الكوليسترول والجلوكوز فى الدم،وتحمى وتقى من الامراض المختلفة يشير تشارلتون واخرون (2011) الى ان هناك العديد من الدراسات التى تشير الى فعالية نخالة الشوفان في تقليل HDL-C فى البلازما في البشر مع زيادة او عدم وجود تاثير على تركيزات LDL-C (TC)الكوليسترول الكلى اقترح وود (2007) ان هناك انخفاضات فى استجابات الجلوكوز والانسولين بعد الوجبة ترجع اساساالى اللزوجةالتى يسببها الشوفان فهى تعدل خصائص الكيموس فى الجزء العلوى من الجهاز الهضمى مما يؤثر افراغ المعدة وحركة الامعاء وامتصاص العناصر الغذائية والتى تنعكس فى انخفاض نسبة السكر فى الدم واستجابات الانسولين بعد الاكل(**Behall et al.,2006**)

المواد والطرق

تم الحصول على الشوفان الابيض(افينا ساتيفا) والشوفان البنى من السوق المحلى بمحافظة المنوفية ،مصر تم شراء مسحوق الكوليسترول البلورى الابيض النقى والمحاليل الملحية من شركة سيجما للكيماويات (الولايات المتحدة الامريكية) **DL الكازين،السليلوز،كلوريد الكولين،والميثونين**

تم الحصول على الكازين والسليلوزومسحوق كلوريد الكولين ومسحوق الميثونين بالقاهرة،مصر Morgan من شركة DL

حيوانات تجريبية
تم الحصول على 40من ذكور الجرذان البيضاء من سلالةSprague Dawley التى تزن140-10جم من منظمة اللقاح والمناعة،وزارة الصحه،مزرعة حلوان ،القاهرة،مصر
المجموعات الكيميائيه
تم الحصول على المجموعات الكيميائيه المستخدمة لتحديد (الالبومين ، اليوريا، الكرياتنين،TC،TG،HDL-C،ALT،AST)
طرق تصميم تجريبى
تم استخام اربعين من الجرذان البيضاء من الذكور البالغين ،سلالةSprague Dawley بعمر 10اسابيع ،وزنها(140-10جم)فى هذه التجربة.تم تغذية جميع الفئران على نظام غذائى اساسى (حمية الكازين)المحضر وفقا للمعهد الامريكى للتغذية (1993)(AIN)لمدة 7 ايام متتالية .بعد فترة التكيف هذة،يتم تقسيم الفئران الى 8 مجموعات، كل مجموعة تتكون من 5 فئران على النحو التالى،المجموعة(1):الفئران التى تتغذى على النظام الغذائى الاساسى كمجموعة تحكم سلبية.المجموعة(2):تحقن بالاستربتوزوتوسين بجرعة 40ملجم/كجم من وزن الجرذ وتستخدم كمجموعة تحكم موجبه.المجموعة(3):مجموعة مصابة بمرض السكر تتغذى على الشوفان الابيض كمسحوق بنسبة2.5%من وزن الجرذ. المجموعة(4):مجموعة مصابة بمرض السكر تتغذى على الشوفان الابيض كمسحوق 5%من وزن الجرذ. المجموعة(5):مجموعة مصابة بمرض السكر تتغذى على الشوفان البنى كمسحوق 2.5%من وزن الجرذ. المجموعة(6):مجموعة مصابة بمرض السكر تتغذى على الشوفان البنى كمسحوق5%من وزن الجرذ.المجموعة(7): مجموعة مصابة بمرض السكر تتغذى على خليط الشوفان الابيض والشوفان البنى على شكل مسحوق بنسبة 2.5% من وزن الجرذ. المجموعة(8): مجموعة مصابة بمرض السكر تتغذى على خليط الشوفان الابيض والشوفان البنى على شكل مسحوق بنسبة 5% من وزن الجرذ. خلال فترة التجربة، تم تقدير وزن الجسم وكمية الغذاء اسبوعيا ولوحظ السلوك العام للفئران .تستغرق التجربة 28يوما،وفى نهاية الفترة التجريبيه،يتم ذبح كل جرذ على حدة،ثم يتم جمع عينات الدم .تم طرد عينات الدم عند4000دورة فى الدقيقه لمدة عشر دقائق لفصل مصل الدم،ثم حفظت فى المجمد العميق لحين الاستخدام
اخذ عينات الدم
بعد الصيام لمدة 12 ساعة ،تم الحصول على عينات الدم فى الاوقات الاولية من الوريد البابى الكبدى فى نهاية كل تجربة .تم جمع عينات الدم فى انابيب زجاجيه للطرد المركزى وجافة ونظيفه وتركت لتتجلط فى حمام مائى 37 درجة مئويه لمدة 28 دقيقة ،ثم طردها لمدة 10 دقائق عند 4000دورة فى الدقيقة لفصل المصل ،والذى تم استنشاقه بعناية ونقله الى انبوب كفيت نظيف وتخزينها مجمدة عند -20 درجة مئويةحتى التحليل.
الكلمات الدالة:حبوب الشوفان ـــالفئران ـــ مرض السكر ـــالتحاليل الكيميائية الحيوية.