

Anti-diabetic Effect of Black Rice and their Extracts on Alloxan-Induced Diabetic Rats

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Abstract

This study was conducted to investigate the effect of black rice (*Oryza sativa*, *L. indica*) and their extracts on diabetic rats. Rats infected of diabetic by injected with alloxan (150 mg/kg body weight). Forty eight white male albino rats, weighing 140 ± 10 g were used in this study. The rats were divided into 8 groups, each group contains 6 rats. Group 1 and group 2 used as negative and positive control groups. Group 3 and group 4 received black rice powder orally, in dose of by 2.5% and 5% of the weight of the diet, respectively. Group 5 and group 6 received on ethanol extract of black rice orally, in dose of by 500 and 1000 mg/kg body weight, respectively. Group 7 and group 8 received on aqueous black rice extract orally, in dose of by 500 and 1000 mg/kg body weight, respectively. Glucose, serum liver functions (GOT GPT and ALP), T.G, T.C, LDL-c, HDL-c, VIDL-c, kidney functions (uric acid, urea and creatinine) was determined. The obtained results of diabetic rats revealed that black rice as powder, aqueous and ethanolic extracts could improved serum glucose level and liver functions in rats especially ethanolic black rice extract at the dose of 1000 mg/kg B.W.

Key words: Black rice powder, Aqueous and ethanolic extract, Anti-diabetic effect and Biochemical analysis.

INTRODUCTION

Diabetes mellitus (DM) is common endocrine disorder affecting more than 200 million people worldwide. According to the International Diabetes Federation, Plant materials which are being used as traditional medicine for the treatment of diabetes are considered one of the good sources for a new drug or a lead to make a new drug (**Nadkarnim, and Nadkarni, 1995**).

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**).

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the pancreatic β -cells with consequent insulin deficiency to abnormalities that result in resistance to insulin action (**American Diabetes Association, 2014**).

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**).

Black rice is a type of the rice species *Oryza sativa*, *L. indica* which is glutinous, packed with high level of nutrients and mainly cultivated in Asia the pericarp (outer part) of kernel of this rice color is black due to a pigment known as anthocyanin an anti-oxidant black rice is also known as purple rice, forbidden rice, heaven rice, imperial rice, king's rice and prized rice (**Kong et al., 2008**).

The health benefits of black glutinous rice have recently been reported by several investigators. A recent report showed that anthocyanin supplementation in humans improves LDL and HDL levels

(Qin *et al.*, 2009) and can delay cancer development in rodents models of carcinogenesis (Thomasset *et al.*, 2009).

Black rice bran (BRB) is rich in fiber contains bioactive compounds including tocopherols, tocotrienols, oryzanols, vitamin B complex, and phenolic compounds (Zhang *et al.*, 2010).

Ichikawa *et al.*, (2001) reported that black rice is efficient, and two fold stronger with respect to antioxidant activities of blueberries.

Among the phenolic compounds, cyanidin-3-glucoside (C3G) is the major anthocyanins in black rice. This compound is 93% of total anthocyanins in black rice (Ichikawa *et al.*, 2001).

Black rice contains many vitamins and minerals, including iron, vitamin A and vitamin B, which are beneficial for overall health and the prevention of heart disease (Chen *et al.*, 2003).

Black rice may have anti-atherogenic activity and may improve certain metabolic pathways associated with diets high in fructose (Guo *et al.*, 2007).

Nutritive value of black rice is superior to any other rice this rice is free of gluten, free of cholesterol, low in sugar, salt and fat it is a whole grain, super nutritious type of rice that is high in fiber, anthocyanin, antioxidants, vitamins B complex and E, iron, thiamine, magnesium, niacin and phosphorous it is estimated that 50 gm. of black rice provides 35% of RDA of selenium, copper, zinc and magnesium per day quality and quantity of protein is higher than any other rice varieties (Ujjawak, 2016).

This study was conducted to investigate the effect of black rice (*Oryza sativa*, *L. indica*) and their extracts on diabetic rats.

Material and Methods

Materials

Casein, all vitamins, all minerals, cellulose, cholinchloride, methionine, ethanol 70%, and alloxan were obtained from El-Gomhoria company for chemical, Drugs and Medical Instruments, Cairo, Egypt. Oil and corn starch were obtained from local market in Menoufia, Egypt. The kits were supplied by Bio diagnostics company Cairo, Egypt. Black rice was obtained from agriculture research center, Kefir El-sheikh.

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.

Methods

Preparation of black rice

Black rice obtained from the Agricultural Research Center in Kafr El-Sheikh then removed the impurities from it and then black the black rice grains in the blender to get the powder.

Preparation of black rice extract

Ethanolic black rice extract: The black rice grains were milled and 10g of powder were immersed in 90ml. Of ethanol alcohol (80%), vibrates for 10 minutes, then allows it to stay at room temperature for 72 hours. The mixture was then filtered using filtered paper and the filter evaporated until drying on a water bath at 60°C. The ethanolic extract was kept in a narrow bottle in the air in the refrigerator at 4°C until it was used and served raw ore extract.

Aqueous black rice extract: The black rice grains were milled and 10g of powder were immersed in 90ml. Of water, vibrates for 10 minutes, then allows it to stay at room temperature for 72 hours. The mixture was then filtered using filtered paper and the filter evaporated until drying on a water bath at 60°C. The ethanolic extract was kept in a narrow bottle in the air in the refrigerator at 4°C until it was used and served raw ore extract according to **Jun *et al.*, (2012)**.

Experimental design and animal group

The experimental was done in the faculty of Home Economics, Menoufia University, Shebin El-Kom. Forty eight male albino rats, weighing 140±10g were used in the study. The animal were obtained from research, center, Giza, Egypt. Rats were housed in individual stales steel cages under controlled environmental conditions, in the animal house of the faculty of Home Economics, Menoufia University and fed 7 days on basal diet (casein diet) prepared according to **AIN, (1993)**, period to start feeding on experimental diet for acclimatization. Rats are divided into 8 groups, each group which consists of six rats as follows: Group 1 (-ve): feed on basal diet only, as negative control. Group 2 (+ve): feed on basal diet and treated with alloxan (150 mg/kg body weight), as positive control. Group 3: diabetic group received is fed on the black rice powder by 2.5% of the weight of the diet. Group 4: diabetic group received is fed on the black rice powder by 5% of the weight of the diet. Group 5: diabetic group received is fed on ethanol extract of black rice by 500 mg/kg B.W. and fed on basal diet. Group 6: diabetic group received is fed on ethanol extract of black rice by 1000 mg/kg B.W. and fed on basal diet. Group 7: diabetic group received is

fed on aqueous extract of black rice by 500 mg/kg B.W. and fed on basal diet. Group 8: diabetic group received is fed on aqueous extract of black rice by 1000 mg/kg B.W. and fed on basal diet. 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.

Biochemical analysis

Determination of blood glucose

Serum glucose was measured using the modified kinetic method according to **Kaplan, (1984)** by using kit supplied by spin react. Spain.

Liver functions

Determination of alanine amino transferase (ALT) (GPT)

ALT activities were measured in serum using the modified kinetic method of **Tiez, (1976)** by using kit supplied by Human, Germany.

Determination of aspartate amino transferase (AST) (GOT)

AST activities were measured in serum using the modified kinetic method of **Henry, (1974)** by using kit supplied by human, Germany.

Determination of alkaline phosphatase (ALP)

ALP activities were measured in serum using the modified kinetic method or liquicolor of **Moss, (1982)** by using kit supplied by human, Germany.

Kidney functions

Determination of urea nitrogen

Urea was determination in serum using the modified kinetic method or liquicolor of **Patton and crouch, (1977)** by using kit supplied by Human, Germany.

Determination of creatinine

Serum creatinine was measured using the modified kinetic method according to **Schirmeister, (1964)** by using kit supplied by Human, Germany.

Determination of uric acid:

Serum uric acid was measured using the modified kinetic method according to **While et al., (1970)** by using kit supplied by Human, German.

Lipids profile

Determination of total cholesterol (T.C)

Serum cholesterol was measured using the modified kinetic according to **Richmond, (1973)** by using kit supplied by Hu Germany.

Determination of triglycerides (T.G)

Serum triglycerides (T.G) were measured using the modified kinetic method according to the method described by **Fossati, (1982)** by using kit supplied by Spinreact, Spain.

Determination of high density lipoprotein cholesterol (HDL-c)

Serum high density lipoprotein cholesterol (HDL-c) was measured using the modified kinetic method according to **Allain, (1974)** by using kit supplied by Human, Germany.

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

Serum very low density lipoprotein cholesterol (VLDL-c) was calculated as mg/dl according to **Lee and Nieman, (1996)** equation:

VLDL-c Concentration mg/dl =

Determination of low density lipoprotein cholesterol (LDL-c)

Serum low density lipoprotein cholesterol (LDL-c) was calculated as mg/dl according to **Castelli et al., (1977)** equation:

LDL Concentration mg/dl = Total Cholesterol – HDL-c – VLDL-c

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 black rice and their extracts on serum glucose level in diabetic rats. As shown in the table, the mean value of serum glucose level of positive control group was significantly higher than negative control group, which were 210 and 95.66 mg/dl, respectively. Also, the mean value of G3, G4, G5, G6, G7 and G8 recorded a significant decrease in serum glucose, which were 128, 119, 110, 99, 162.66 and 150.83 mg/dl, respectively, with significant difference when compared with positive control. The best results were recorded for G6. These results are in agreement with **Apichai et al., (2012)**, they reported that a diet containing 5% purple rice bran (black rice) improved the diabetic conditions in streptozotocin-induced diabetic rats by 8-week ingestion in this previous study, the diet decreased fasting blood glucose and triglyceride, and enhanced glucose transporter 4 (Glut4) level in the soleus muscle.

Data given in Table (2) show the effect of black rice and their extracts on (ALP), (GOT) and (GPT) of diabetic rats. Concerning GPT (ALT), results indicated that the mean value of positive control group was significantly higher than that of negative control group (healthy rats), which were 45.33 (U/L) and 20.43 (U/L), respectively with percentage of decrease -54.93%. The mean values of G3, G4, G5, G6, G7 and G8 were lower than positive control group. Percent of decrease was -20.65%, -32.26%, -37.19%, -48.29%, -4.77% and -13.74% for groups 3, 4, 5, 6, 7 and 8, respectively as compared with positive control group. Rats fed on ethanolic black rice extract 1000mg/kg B.W. (G6) showed non-significant difference as compared with negative control group and recorded the best treatment.

As for GOT (AST) (U/L), it could be noticed that the mean value of positive control group was significantly higher than that of negative control group (healthy rats), which were 184.5 and 140 (U/L), respectively, the mean value of G3, G4, G5, G6, G7 and G8 were lower than positive control group, which was 153.9, 149.6, 145.9, 142.4, 164.6 and 157.2 (U/L), respectively. Rats fed on ethanolic black rice extract (500mg/kg B.W.), (G6) showed non-significant difference as compared with negative control group and recorded the best treatment. As for ALP, it could be noticed that the mean value of positive control group was significantly higher than that of negative control group, which was 310 and 222.66 (U/L), respectively with percentage of decrease -28.17%. The mean value of G3, G4, G5, G6, G7 and G8 were lower than positive control group, which was 244, 236, 231, 225.33, 246 and 254.33 (U/L), respectively. The best result was recorded for (G6). These results are supported by published by **Zhaohua et al., (2010)** indicated that chronic ethanol consumption caused a significant increase in the activities of AST, ALT and GGT which could cause severe damage to tissue membrane. In this study, the decreased activities of these enzymes on AEBR administrated rats indicate the Hepatic protective effect.

The effect of black rice and their extracts on the serum lipid profiles of diabetic rats are shown in Table (3). Results recorded that the mean value of T.C. of positive control group was significantly higher than negative control group, it was 144.67 and 83.67 mg/dl, respectively. The mean value of G3, G4, G5, G6 and G8 was 117.67, 107.27, 99, 85.63 and 132.27 mg/dl and showed a significant difference when compared with positive control group. When compared the G6 with

negative control group showed a non-significant difference between them. These results are in agreement with **Um *et al.*, (2013)**, who found also that the black rice intake is associated with reduced levels of plasma cholesterol.

Concerning triglycerides, results showed that the mean value of serum triglycerides of positive control group) was significantly higher than negative control group, it was 143.33 and 66.57 mg/dl, respectively. The mean value of group (7) was 138.8 mg/dl. Feeding rats on aqueous black rice extract (1000mg/kg B.W.)(G8) indicated a significant decrease in triglycerides, which was (-12.75%) when compared with positive control group. The mean value of group (3) was 110 mg/dl. Feeding diabetic rats on (black rice powder 5% of the weight of the diet) significantly decreased the mean T.G. value of group (4), which was 95 mg/dl. The mean T.G. value of group (5) was 84.33 mg/dl. Feeding rats on Ethanolic black rice extract (1000mg/kg B.W.) significantly decreased the mean T.G. value of group (6) which was 72.33 when compared with positive control group. The best result was recorded for group (6). These results are in agreement with **Soheir *et al.*, (2016)**, they indicated that the rats fed on black rice reduce the levels of serum Triglycerides (T.G.).

Data presented in Table (4) show the effect of black rice and its extracts on high density lipoprotein (HDL-c), Low density lipoprotein (LDL-c) and very Low density lipoprotein (VLDL-c) of diabetic rats. Results recorded that the mean value of HDL-c of positive control group was significantly lower than negative control group, it was 25.37 and 54.23mg/dl, respectively. The mean value of G3, G4, G5, G6, G7 and G8 was 37.27, 41.3, 46.67, 51.9, 27.97 and 31.5mg/dl and showed a significant difference when compared with positive control group. These results are in agreement with **Wang *et al.*, (2007)**.

As for LDL-c results showed that the mean value for positive control group was significantly higher than negative control group, which was 88.59 and 32.88 mg/dl, respectively. Results obtained for group 3 showed a significant difference when compared to positive control group. The mean value of group 4 was significantly lower than positive control group which was 52.53mg/dl with percentage of decrease -40.7%. The mean value of G8 was significantly lower than positive control group which was percentage of decrease -19.37%. Feeding rats on aqueous black rice extract 500mg/kg B.W. showed a significant decrease in LDL-c, the percentage of decrease was -7.47% as compared to positive control group. Feeding rats on Ethanolic black rice extract 500mg/kg B.W. showed a significant decrease in LDL-c, the

percentage of decrease was -48.11% as compared to positive control group. It could notice that the mean value of G6 was significantly lower than positive control group; it was 35.83 mg/dl. These results are in agreement with **Zawistowski et al., (2009)**.

Concerning VLDL-c, results indicated that the mean value of positive control group was significantly higher than negative control group. The mean value of G3 and G4 showed a significant difference when compared with positive control group. Data showed that the mean value of G8 was 25.01 ± 0.5 mg/dl. It could be notice that the mean value of G7 was 27.75 mg/dl. Feeding rats on Ethanolic black rice extract 500mg/kg B.W. showed a significant decrease in VLDL-c, the percentage of decrease was -41.16% as compared to positive control group. It could be notice that the mean value of G6 was significantly lower than positive control group, which was percentage of decrease -29.53%. The best result was recorded for group(6). These results are in agreement with **Suh et al., (2005)**.

Data presented in Table (5) show the effect of black rice and their extracts on kidney function of diabetic rats. Concerning uric acid (mg/dl), data revealed that the mean value of positive control group was significantly higher than that of negative control group. The mean value of G3, G4, G5 and G6 indicated a significant difference; it was 3.76, 3.27, 2.77 and 1.9 (mg/dl), respectively when compared with positive control group. Data showed nosignificant difference between G7 and G8 as regard to uric acid mg/dl.

As for urea, it could be noticed that the mean value of positive control group was significantly higher than that of negative control group, which was percentage of decrease 45.22%. The mean value of G3, G4, G5, G6 and G8 indicated a significant difference, it was 36.96, 33.9, 29.6, 26.83 and 39.3 (mg/dl), respectively when compared with positive control group. Data showed nosignificant difference between G7 and positive control group as regard to urea mg/dl.

As for Creatinine, results indicated that the mean value of positive control group was significantly higher than that of negative control group, which was 0.87 and 0.365 (mg/dl), respectively. The mean value of G3, G4, G5, G6 and G8 indicated a significant difference; it was percentage of decrease was -20.11%, -27.59%, -39.08%, -52.87% and -16.07% for G3, G4, G5, G6 and G8 respectively, when compared with positive control group. Data showed no significant difference between G7 and positive control group as regard to urea mg/dl. The best result was recorded G6. These results are in agreement with **Missoun et al., (2010)** who found also that the black rice reduced levels of serum urea. Also, **Heba et al., (2018)**, found that the activities of uric acid in senescence accelerated mice treated with black rice extract showed a marked decrease.

Table (1): Effect of *black rice* and their extracts on glucose of diabetic rats

(Glucose (mg/dl SD ±Mean	Groups
^g ±2.0895.66	Control –Ve (G1)
210 ^a ±2.00	Control +Ve (G2)
^d ±2.65128	Black rice powder 2.5% (G3)
^e ±1.53119	Black rice powder 5% (G4)
110 ^f ±2.00	Ethanollic black rice extract 500mg/kg (G5)
99 ^g ±1.00	Ethanollic black rice extract 1000mg/kg (G6)
^b ±2.52162.66	Aqueous black rice extract 500mg/kg (G7)
^c ±2.02150.83	Aqueous black rice extract 1000mg/kg (G8)
6.95	LSD

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 (2): Effect of black rice and their extracts on (ALP), (GOT) and (GPT) of diabetic rats

ALP) U/L) SD ±Mean	GOT)U/L) SD ±Mean	GPT)U/L) Mean±SD	Groups
^f ±1.53222.66	0.5± ^g 140	20.43 ^g ±0.93	Control –Ve (G1)
^a ±2.0310	0.5± ^a 184.5	45.33 ^a ±2.52	Control +Ve (G2)
^c ±2.0244	1.1± ^d 153.9	35.97 ^c ±0.95	Black rice powder 2.5% (G3)
^d ±2.0236	^e ±1.52149.6	31.17 ^d ±1.04	Black rice powder 5% (G4)
^e ±2.0231	0.9± ^f 145.9	28.47 ^e ±1.45	Ethanollic black rice extract 500mg/kg (G5)
^f ±1.53225.33	^g ±1.2142.4	^f 23.4 0.65±	Ethanollic black rice extract 1000mg/kg (G6)
^c ±2.0246	^b ±2.52164.6	43.17 ^a ±1.04	Aqueous black rice extract 500mg/kg (G7)
^b ±2.53254.33	^c ±1.62157.2	^b 39.1 1.85±	Aqueous black rice extract 1000mg/kg (G8)
3.41	2.39	2.47	LSD

Each value is represented as mean ± standard deviation ($n = 6$).

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

Table (3): Effect of black rice and their extracts on the serum cholesterol and triglyceride of diabetic rats

T.G. (mg/dl)	T.C. (mg/dl)	Groups
Mean ± SD	Mean±SD	
66.57 ^h ±2.11	83.67 ^f ±1.53	Control -Ve (G1)
143.33 ^a ±1.53	144.67 ^a ±3.51	Control +Ve (G2)
110 ^d ±2.00	117.67 ^c ±2.08	Black rice powder 2.5% (G3)
95 ^e ±2.65	107.27 ^d ±2.05	Black rice powder 5% (G4)
84.33 ^f ±3.05	99 ^e ±2.00	Ethanollic black rice extract 500mg/kg (G5)
72.33 ^g ±2.52	85.63 ^f ±2.12	Ethanollic black rice extract 1000mg/kg (G6)
138.8 ^b ±2.85	141.9 ^a ±1.65	Aqueous black rice extract 500mg/kg (G7)
125.06 ^c ±2.79	132.27 ^b ±2.61	Aqueous black rice extract 1000mg/kg (G8)
4.29	3.93	LSD

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

T.G= Triglyceride.

T.C= Total Cholesterol.

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

Table (4) : (Effect of black rice and their extracts on serum lipid profiles of diabetic rats

VLDL(mg/dl)	(LDL(mg/dl)	(HDL(mg/dl)	Groups
SD ±Mean	SD ±Mean	Mean±SD	
g ±0.4213.31	g ±2.2932.88	a ±1.2954.23	Control -Ve (G1)
a ±0.3128.67	a ±1.4488.59	25.37h±1.78	Control +Ve (G2)
d ±0.4022	d ±2.4161.67	0.64±e 37.27	Black rice powder 2.5% (G3)
e ±0.5319	e ±2.3452.53	d ±0.9841.3	Black rice powder 5% (G4)
f ±0.6116.87	f ±1.045.97	c ±1.746.67	Ethanollic black rice extract 500mg/kg (G5)
g ±0.514.47	g ±1.1535.83	b ±1.1551.9	Ethanollic black rice extract 1000mg/kg (G6)
b ±1.5627.75	b ±1.9581.97	g ±0.9527.97	Aqueous black rice extract 500mg/kg (G7)
c ±0.525.01	c ±2.1871.43	f ±1.531.5	Aqueous black rice extract 1000mg/kg (G8)
0.87	3.33	2.26	LSD

HDL-c= High density lipoprotein Cholesterol. LDL-c =Low density lipoprotein Cholesterol. 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): Effect of black rice and their extracts on kidney function of diabetic rats

Creatinine (mg/dl) SD \pm Mean	Urea (mg/dl) Mean \pm SD	Uric acid ((mg/dl) SD \pm Mean	Groups
0.365 h \pm 0.022	g \pm 1.2624.83	0.51 \pm e 1.93	Control -Ve (G1)
0.87 a \pm 0.024	1.53 \pm a 45.33	a \pm 0.44.43	Control +Ve (G2)
0.695 d \pm 0.013	1.0 \pm d 36.96	b \pm 0.153.76	Black rice powder 2.5% (G3)
0.63 e \pm 0.016	1.85 \pm e 33.9	c \pm 0.123.27	Black rice powder 5% (G4)
0.529 f \pm 0.032	0.53 \pm f 29.6	d \pm 0.312.77	Ethanolic black rice extract 500mg/kg (G5)
g \pm 0.040.41	1.26 \pm g 26.83	e \pm 0.101.9	Ethanolic black rice extract 1000mg/kg (G6)
b \pm 0.030.82	1.08 \pm b 42.7	ab 4.17 \pm 0.15	Aqueous black rice extract 500mg/kg (G7)
0.729 c \pm 0.014	0.61 \pm c 39.3	3.91ab \pm 0.0 15	Aqueous black rice extract 1000mg/kg (G8)
0.057	2.097	0.47	LSD

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

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

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التأثير المضاد للسكر للأرز الأسود ومستخلصاته في الفئران المصابة بالسكر بتأثير الألوكسان

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الملخص العربي

تم تقييم تأثير تركيبات مختلفة (2,5,5%) من الأرز الأسود، (500 ، 1000 ملجم/كجم) من مستخلصاته علي الفئران المصابة بمرض السكري. واستخدم 48 فأر في هذه الدراسة وتم تقسيمها إلى 8 مجموعات، كل مجموعة تحتوي على 6 الفئران. وتم اصابة الفئران (150 مجم/ كجم من وزن الجسم) بمرض السكر بواسطة الألوكسان، وأظهرت النتائج أن مجموعة الفئران التي تغذت على المستخلص الكحولي للأرز الأسود بتركيز 1000 ملجم/كجم من وزن الجسم أقل مستوى لسكر الجلوكوز مع وجود فرق معنوي، حيث كانت القيمة 99 ملجم / ديسيلتر. أعلى انخفاض لإنزيمات الكبد GOT, ALT, ALP سجلت مع مجموعة الفئران التي تغذت على المستخلص الكحولي للأرز الأسود بتركيز 1000 ملجم/كجم من وزن الجسم ، بينما أقل قيم كانت مع المستخلص المائي للأرز الأسود بتركيز 500 ملجم/كجم من وزن الجسم مع وجود فرق معنوي. أقل قيمة من الدهون الثلاثية والكوليسترول سجلت مع مجموعة الفئران التي تغذت التي تغذت على المستخلص الكحولي للأرز الأسود بتركيز 1000 ملجم/كجم من وزن الجسم. أعلى قيم للكوليسترول عالي الكثافة سجلت مع مجموعة الفئران التي تغذت على المستخلص الكحولي للأرز الأسود بتركيز 1000 ملجم/كجم من وزن الجسم . في حين أعلى قيم من الكوليسترول منخفض الكثافة والكوليسترول منخفض الكثافة جدا سجلت مع المستخلص المائي للأرز الأسود بتركيز 500 ملجم/كجم من وزن الجسم مع وجود فرق معنوي . أعلى قيم لليوريا و حمض اليوريك سجلت مع مجموعة الفئران التي تغذت على المستخلص المائي للأرز الأسود بتركيز 500 ملجم/ كجم من وزن الجسم. في حين أعلى مستوى للكرياتينين سجلت مع مجموعة الفئران التي تغذت على المستخلص المائي للأرز الأسود بتركيز 500 مللي جرام / كجم من و زن الجسم.

الكلمات الكاشفة: مسحوق الأرز الأسود - المستخلص المائي والكحولي للأرز الأسود --

الفئران . التأثير المضاد للسكري- التحاليل الكيميائية الحيوية.