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Study of Potential Effect of Banana Flower and Papaya Leaves in Alloxan- Induced Diabetic Rats.

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Abstract:

This study was carried out to evaluate the antihyperglycaemic effects of banana flower (*Musa paradisiaca*) and papaya leaves (*Carica Papaya*, *Linn*) and their mixture as powder in rats. Forty eight male mature albino rats weighing 150-160g B.wt. each, were used in this study and divided into 8 equal groups, each group contain 6 rats, one was kept as a control -ve group, while the other groups were injected by alloxan (150mg/kg body weight). The tested plants powders were given to the rats as a percent of 2.5% and 5% from the Basel diet. At the end of the experiment, hematological parameters, (RBC-s, WBC-s, hemoglobin and platelet), serum liver functions (ALT- AST – ALP) , total protein, albumin, kidney functions (creatinine, uric acid and urea), total cholesterol (TC), triglycerides (TG), high density lipoprotein (HDL-c), low density lipoprotein (LDL-c) and very low density lipoprotein (VLDL-c) were assessed. The results of the obtained data indicated that tested plants improved glucose levels, liver functions, kidney functions and lipid profile. The obtained findings hypothezed that tested plant parts containing several compounds are able to improve the adverse effects and inhibited hyperglycemia in rats. According to these results, moderate amounts of banana flower and papaya leaves in our diets could be used for improvement glucose level.

Keywords: Banana flower, Papaya leaves, Glucose level, Hyperglycemic rats, Biochemical analysis

INTRODUCTION

Diabetes mellitus is a chronic metabolic defect caused due to the collective effect of altered carbohydrate, protein, and lipid metabolism. The sedentary lifestyle and improper diet have accounted for the disease reaching an epidemic proportion over the past decades and on these lines, the International Diabetes Federation (IDF) predicts an average of 592 million diabetic patients by 2035 **(IDF, 2013).**

Diabetes is characterized by persistent hyperglycaemia due to the defects in insulin secretion, insulin action, or both. Standard antihyperglycaemic drugs such as acarbose, miglitol, and voglibose mainly target the activity of α-glucosidase and α-amylase enzymes, which are the primary enzymes of the carbohydrate metabolism, responsible in converting complex carbohydrates into smaller sugar units. While hydrolysis of starch into smaller oligosaccharides is catalyzed by pancreatic α-amylase, its further breakdown to free glucose units is carried out by intestinal α-glucosidases and inhibiting these enzymes renders an overall smooth glucose profile **(Ramith *et al.*, 2015)**.

Banana blossom (*Musa paradisiaca*) or commonly known as banana heart belongs to the family of Musaceae. It is produced on the banana stem of a banana tree. Generally each banana stem has a single banana flower but in some cases there are more than one. Banana plant is known as the largest herbaceous flowering plant in the world **(Dury *et al.*, 2002).**

Musa species is one of the well-known plants of the musaeae family that have been used in traditional medicine since hundred years to alleviate various diseases and health problems. Blossom is generally valued as a fiber-rich source. Along with fibers, proteins and fatty acids, banana flowers also turn out to be a rich source of vitamin E and flavonoids**.** Banana flowers, also shown an exceptional resemblance to the fruit as they are good source of potassium, vitamin A, vitamin C and vitamin E. Finger shaped banana blossoms are subtended by large fleshy, reddish or purple coloured scales, which fall off as the fruit matures **(Singh, 2017).**

All the parts of a banana plant are beneficial to mankind in the medical aspects and ornamental uses. Banana blossom that is considered a vegetable is cooked in a variety of dishes in Asian countries like curry,

deep fried, cutlet and more. Besides cooked, banana flower is also used to treat some diseases. In China, this flower is used to treat heart pain, asthma and endocrine problem like diabetes. Consumption of banana flower also helps to treat diarrhea and stomach cramps. For women, eating this flower helps to reduce painful menses and menopausal bleeding. Banana blossom that carries many nutrients and vitamins is also used for infantile malnutrition and weak body **(Nimisha and Pradeep, 2016).**

Phytochemicals studies on banana flower extracts showed the presence of alkaloids, glycosides, steroids, saponins, tannins, flavonoids and terpenoids. Quantitative analysis by gravimetric method showed that the flower of *Musa paradisiaca* contains 1.56 ± 0.2 g/100g alkaloid and 1.43 ± 0.14 g/100g saponin. In spectrometric method, the flower also contains 5.83 ± 0.78 g/100g total phenolic, 88.31 ± 4.53 mg/100g tannin and 3.98 ± 0.01 mg/100g flavonoids. DPPH (1, 1- diphenyl-2-picrylhydrazyl) free radical scavenging assay of ethanol extract demonstrated stronger antioxidant activity than aqueous extract in which the IC50 value were 1.01 ± 0.16 mg/ml and 1.52 ± 0.13 mg/ml respectively **(Indera *et al.* , 2011)**.

Papaya (*Carica papaya*), an herbaceous plant, member of the small family Caricaceae. This plant is widely cultivated for its edible pleasant fruit, which provides good nutritional value and easy digestion. It can be found in all tropical and many subtropical regions of the world. Infusions made from different parts of the plant including leaves have been used as therapeutic remedies due to their medicinal properties **(Oliveira *et al.*, 2009).**

Traditionally leaves have been used for treatment of a wide range of ailments, like in treatment of malaria, dengue, diabetes, jaundice, immunomodulatory and antiviral activity. Young leaves are rich in flavonoids (kaempferol and myricetin), alkaloids (carpaine, pseudocarpaine, dehydrocarpaine I and II), phenolic compounds (ferulic acid, caffeic acid, and chlorogenic acid), and the cynogenetic compounds (benzylglucosinolate) found in leaves.

Both leaf and fruit of the *Carica papaya, Linn*. possess carotenoids namely β- carotene, lycopene, anthraquinones glycoside, as compared to matured leaves and hence possess medicinal properties like anti-inflammatory hypoglycaemic, anti-fertility, abortifacient,

hepatoprotective, wound healing, recently its antihypertensive and antitumor activities have also been established. Leaves being an important part of several traditional formulations are undertaken for standardization for various parameters like moisture content, extractive values, ash values, swelling index, etc. Other reports suggest that a fermented papaya preparation significantly reduces plasma glucose levels in healthy subjects and in patients with type 2 diabetes **(Lim, 2012).**

Material & Methods

Materials

Banana flowers (*Musa paradisiaca*) and papaya leaves (*Carica papaya Linn*) were collected freshly from local area of Menoufia..

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 48 adult normal male albino rats Sprague Dawley strain weighing 150 -160g each were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm,Cairo,Egypt.

The chemical kits

Alloxan as powder and chemical kits used for determination the (TC, TG, HDL-c, ALT, AST, ALP, urea, creatinine, and albumin) were obtained from AlGomhoria Company, Cairo, Egypt.

Methods

Preparation of banana blossom powder (BBP)

Banana **(***Musa paradisiaca***)** is the most popular banana blossoms were collected in local area of Menoufia. The bracts were removed and the sandal white blossoms were taken out and spread in filter paper for 2 minutes to remove moisture present in surface. Then cut the banana blossoms for 3mm as per the previous study and immersed in different solutions like citric acid solution (0.2%).Citric acid acts like natural antioxidant and avoids formation of brown pigments, it act as antioxidants and minimize enzymatic browning reaction occurs in banana blossoms. After pre-treatment, the sliced blossoms are drained

and loaded in to an electric tray dryer and dried for 50˚C for 5-6 hours. Then the dehydrated blossoms were ground into fine powder and this powder was used for further analysis.

Preparation of papaya leaves powder (PLP):

Leaves from *Carica papaya L.,* Caricaceae, were collected from June to September 2019 from Shebin El-kom, Menoufia, Egypt. The leaves of *C. papaya* were washed with tap water and cut into small slices. The slices were pulverized after being air-dried into fine powder and this powder was used for further analysis.

Experimental design

Forty eight 48 adult male white albino rats, Sprague Dawley Strain, 10 weeks age, 130-150g per each, were housed individually in wire cages in a room maintained at 25 ± 2 0C, relative humidity (55±5%), and a 12-hr lighting cycle and kept under normal healthy conditions. All rats were fed on basal diet prepared according to **AIN (1993)** for one-week before starting the experiment for acclimatization. After one week period, the rats were divided into 8 groups, each group which consists of 6 rats as follow: Group (1): Rats were fed on basal diet as a control negative. Group (2): Rats were injected by alloxan a dose of 150mg per kg of rat's body weight and used as a positive control group. Group (3): A group injected diabetic rats was fed on the banana flower as powder by 2.5% of the weight of the diet. Group (4): A group injected diabetic rats was fed on the banana flower as powder by 5% of the weight of the diet. Group (5): A group injected diabetic rats was fed on Papaya leaves as powder by 2.5% of the weight of the diet. Group (6): A group injected diabetic rats was fed on Papaya leaves as powder by 5% of the weight of the diet. Group (7): A group injected diabetic rats was fed on mixture of banana flower and Papaya leaves as powder by 2.5% of the weight of the diet. Group (8): A group injected diabetic rats was fed on mixture of banana flower and Papaya leaves as powder by 5% of the weight of the diet. During the experiment period, the body weight and feed intake were estimated weekly and the general behavior of rats was observed. The experiment took 28 days, at the end of the experimental period each rat weighted separately then, rats were slaughtered and collected blood samples.

Blood sampling

At the end of experiment period, 4 weeks, blood samples were collected after 12 hours fasting using the abdominal aorta and rats were scarified under ether anesthetized. 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 **Yound (1975) and Fossati and Prencipe (1982)**.

Determination of high density lipoprotein (HDLc)

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

Calculation of very low density lipoprotein cholesterol (VLDLc)

VLDLc was calculated in mg/dl according to **Lee and Nieman (1996)** using the following formula:

VLDLc (mg/dl) = Triglycerides / 5

Calculation of low density lipoprotein cholesterol (LDLc)

LDLc was calculated in mg/dl according to **Lee and Nieman (1996)** as follows:

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

Liver functions

Determination of serum alanine aminotransferase (ALT), serum asparatate aminotransferase (AST), serum alkaline phosphatase (ALP) activities were carried out according to the method of **(Clinica Chimica Acta 1980**, **Hafkenscheid 1979 and Moss 1982**), respectively.

Kidney functions

Determination of serum urea, serum creatinine and serum uric acid

Serum urea and serum creatinine were determinated by enzymatic method according to **(Patton and Crouch 1977** and **Henry**

1974).While, serum uric acid was determined colorimetrically according to the method of **Barham and Trinder (1972)**.

Determination of blood glucose

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

Statistical analysis

The data were analyzed using a completely randomized factorial design **(SAS, 2000)** 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 given in table (1) show the effects of banana flower, papaya leaves and their mixture on glucose level of diabetic rats' .It could be observed that the highest glucose recorded for positive control group, while the lowest glucose recorded for negative control group with significant differences. The mean values were203.5±5.894 and 97.833±1.756 mg/dl, respectively.

On the other hand, the highest glucose of treated groups (diabetes groups) was recorded for2.5% banana flower group, while the lowest glucose recorded for5% mixture plants with significant differences. The mean values were155.67 and111.33 mg/dl, respectively. The best treatment was recorded for group (8) banana flower and papaya leaves mixture 5% as compared to negative control group. These results are in agreement with **Shanmuga and Subramanian (2011),** they showed that the impaired glucose tolerance observed in STZ induced diabetic group of rats were altered to near normal by the treatment with flower extract which proves the insulin stimulatory effects of banana flower extract to remnant beta cells, **sela *et al.*, (2011)** they showed that the *C. papaya* leaf aqueous ex-tract significantly diminished blood glucose levels ($p<0.05$) in diabetic rats.

Data given in table (2) show the effect of banana flower, papaya leaves and their mixture on serum ALP, AST and ALT activities of diabetic rats, it is clear to notice that the highest ALP recorded for positive control group, while the lowest ALP recorded for negative control group with significant differences. The mean values were

being72.133±3.384 and 29.367±3.647 U/L, respectively. On the other hand, the highest ALP liver enzyme of treated group recorded for group fed on 5% papaya leaves but, the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 55.2 and 38.76 U/L, respectively. The best treatment was recorded for group 8 (5%banana flower and papaya leaves mixture) as compared to negative control group.

The same table (2) illustrated that the mean value ALT liver enzyme of positive control rats group recorded the highest value when compared with control negative group with significant differences. The mean values were91.9±3.851 and28.833±2.939 U/L, respectively. On the other hand, the highest ALT liver enzyme of treated group recorded for group fed on 5% papaya leaves but, the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 70.2 and 54.13 U/L, respectively. The best serum (ALT) was recorded for group (8) (5%banana flower and papaya leaves mixture) when compared to control negative group.

As for ALT, the mean value of AST liver enzyme of positive control rats group recorded the highest value when compared with control negative group with significant differences. The mean values were74.167±4.805 and 19.867±2.899 U/l, respectively. On the other hand, the highest AST liver enzyme of treated group recorded for group fed on 5% papaya leaves but, the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 50.8 and 27.16 U/L, respectively. The best treatment was recorded for serum (AST) was recorded for group (8) (5%banana flower and papaya leaves mixture) when compared to control negative group. These results are in agreement with **Liyanage *et al.*, (2015)** who found that infected rats treated with banana flower diet restore the hepatic ALT and AST activities that were decreased Also, **sela *et al.*, (2011)** showed that *C. papaya* treatment produced a decrease in serum ALT, AST and ALP aminotranferases in diabetic rats. Liver damage as well as improvement in hepatocyte morphology revealed after the *C. papaya* treatment.

Data given in table (3) show the effect of banana flower, papaya leaves and their mixture on serum urea, serum uric acid and serum creatinine of diabetic rats. It is clear to mention that the urea level of positive control rats group recorded the highest value when compared

with negative control group with significant differences. The mean values were36.267±1.914 and 21.233±1.861mg/dl respectively. On the other hand, the highest urea level of treated group recorded for group fed on 5% papaya leaves while the lowest value recorded for group fed on 2.5% banana flower with significant differences. The mean values were 32.33±2.768 and 22.7±1.709 mg/dl, respectively. The best serum (urea) was recorded for group (3) (banana flower 2.5%) when compared to control negative group with non-significant difference compared to group (8).

The same table (3) illustrated that the uric acid level of positive control rats group recorded the highest value when compared with negative control group with significant differences. The mean values were10±0.1 and 6.033±0.513 mg/dl, respectively. On the other hand, the highest uric acid level of treated group recorded for group fed on 5% papaya leaves while the lowest value recorded for group fed on 2.5% banana flower with significant differences. The mean values were 8.1 and 6.733 mg/dl, respectively. The best serum (uric acid) was recorded for group (3) (2.5%banana flower) when compared to control negative group and with non-significant difference compared to group (8). As for as, creatinine of positive control rats group recorded the highest value when compared with negative control group with significant differences. The mean values were 1.623±0.171 and 0.943±0,268mg/dl respectively, On the other hand the highest creatinine level of treated group recorded for group fed on 5% papaya leaves while the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 1.437 and 0.943 mg/dl, respectively. The best serum (creatinine) was recorded for group (8) (5%banana flower and papaya leaves mixture) when compared to control negative group. These results are in agreement with **Shanmuga and Subramanian (2011)**, they indicated that the observed alteration in the levels of blood urea and serum creatinine in group of diabetic rats reverted to near normalcy by treatment with banana flower extract, indicating renal protective nature during glucose toxicity. Moreover, **Abiola *et al.*, (2014)** reviewed that aqueous extract *of (Carica papaya*) leaves in the dose of 1.0 ml of 250 mg/kg significantly decreased ($p < 0.05$) the concentration of serum urea (12.35 mg/dl) & creatinine.

Data given in table (4) show the effect of banana flower, papaya leaves and their mixture on serum triglycerides and serum total cholesterol of diabetic rat's .It is clear to notice that the triglyceride of positive control group recorded the highest value when compared with negative control group with significant differences. The mean values were116.133±1.205 and 70.333±7.024 mg/dl, respectively. While, the lowest triglyceride recorded for group fed on 5% mixture plants while the highest value recorded for 5% papaya leaves with significant differences. The mean values were 67± 1 and 81.5±3.279 mg/dl, respectively. The best serum (TG) was recorded for group (7) (2.5%banana flower and papaya leaves mixture) when compared to control negative group.

The same table (4) illustrated that the cholesterol levels of positive control group recorded the highest value when compared with negative control group with significant differences. The mean values were 124.733 ± 4.606 and 71.333± 2.021 mg/dl, respectively. On the other hand, the lowest cholesterol levels recorded for group fed on 5% mixture plants while the highest value recorded for 2.5% banana flower with significant differences. The mean values were 76.33±1.527 and 94.2±2.762 mg/dl, respectively. The best serum (TC) was recorded for group (8) (5%banana flower and papaya leaves mixture) when compared to control negative group. These results are in agreement with **Mukundam and Swarnamoni (2017),** they indicated that the significant decrease in the total cholesterol levels of the experimental rats may have resulted from the by decreasing dietary absorption of cholesterol **(Park *et al.*, 2002)**. Pectins present in juice of inflorescence have been shown to possess hypolipidemic effect **(Lattimer and Haub, 2010).** Gallic acid recently discovered in flower extract is also shown to have antihyperlipidemic effect by cholesterol esterase inhibitory action and increasing fecal excretion of primary bile acids. Moreover, **Augustine, (2019)** showed that total cholesterol and triglycerides concentrations were observed to decrease significantly when diabetic animals treated with varying doses of *C. papaya* leaf extract as compared with those of the negative control group (diabetic but untreated animals) at $p<0.05$.

Data presented in table (5) show the effect of banana flower, papaya leaves and their mixture on HDL-c, LDL-c and VLDL-c of

diabetic rats, it is clear to mention that the HDL-c of negative control rats group recorded the highest value when compared with positive control group with significant differences. The mean values were 43.4±2.623 and 26.166±2.255 respectively. On the other hand, the highest HDL-c of treated group recorded for group fed on 5% mixture plants while the lowest value recorded for group fed on 2.5% banana flower with significant differences. The mean values were 45.1±0.854 and 32± 2.5 mg/dl, respectively. The best serum (HDL-c) was recorded for group (7) 2.5% mixture and (8) 5% mixture when compared to control positive group.

The same table (5) illustrated that the LDL-c of positive control rats group recorded the highest value when compared with negative control group. The mean values were75.32±3.1 and 13.9±0.8 mg/dl, respectively. On the other hand, the highest LDL-c of treated group recorded for group fed on 2.5% banana flower while the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 46.23±0.53 and 17.95±2.15 mg/dl, respectively. The best serum (LDL-c) was recorded for group (8) (5%banana flower and papaya leaves mixture) when compared to control negative group.

As for the VLDL-c, value of positive control rats group recorded the highest level when compared with negative control group with significant differences between them being23.25±0.25 and 14±1.4 mg/dl, respectively. On the other hand the highest VLDL-c of treated group recorded for group fed on 5% papaya leaves while the lowest value recorded for group fed on 5% mixture plants with significant differences. The mean values were 16.35±0.65 and 13.4±0.2 mg/dl, respectively. The best serum (VLDL-c) was recorded for group (8) 5% mixture when compared to control negative group. These results are in agreement with **Ramith *et al.*, (2016)**, they mentioned that diabetic rats treated with extract of banana flower (EF) and its constituents exhibited a marked reversal of the serum lipid profile compared to the untreated diabetic group of rats. In addition, a decrease in (HDL-C/TC ratio) HTR (%) and a corresponding increase in AI (atherogenic index), LDL-C/HDL-C ratio, free fatty acids and phospholipids are evident in diabetic state. These were ameliorated by the effect of extract of banana flower (EF) and its compounds to a striking amount when compared to the

diabetic control group of rats at the end of the study. Also, **Yasmeen and Prabhu (2012)** reviewed that aqueous extract of *(Carica papaya*) leaves in the dose of 400 mg/kg b.w., reduced the triglyceride, LDL and cholesterol levels along with reduction in the blood glucose levels. This might be because of the presence of flavonoids, alkaloids, and tannins in CP *(Carica papaya*) extract.

Recommendations

As Conclusion the present study recommendeds use of 5% mixture of banana flower and papaya leaves as powder like tea improvement healthy status especially reduce markedly glucose level in type2 diabetes.

Table (1): Effect of banana flower, papaya leaves and their mixture on serum glucose of diabetic rats

Groups	Glucose mg/dl
	M±SD
G_1 C (-)	97.833^{f}±1.756
G_2 C (+)	203.5^{a}± 5.894
G_3 (2.5% Banana flower)	155.667^{b}± 3.055
G_4 (5% Banana flower)	147.667^{c}± 4.041
G_5 (2.5% Papaya leaves)	143.5^{c}± 2.784
G_6 (5% Papaya leaves)	137.6^{d}± 1.216
G_7 (2.5% mixture powder)	136.4^{d}± 1.931
G_8 (5% mixture powder)	111.333^{e}± 2.517
LSD ($p < 0.05$)	**5.006**

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

Table (2): Effect of banana flower, papaya leaves and their mixture on serum ALP, AST and ALT activities of diabetic rats (U/L)

Groups	ALP U/L	AST U/L	ALT U/L
	M±SD	M±SD	M±SD
G_1 C (-)	29.367^{e} ±3.647	19.867^{g}±2.899	28.833^{f}±2.939
G_2 C (+)	72.133^{a}±3.384	74.167^{a}±4.805	91.9^{a}±3.851
G_3 (2.5% Banana flower)	39.6^{d}±4.233	32.933^{e}±2.948	57.333^{de}±2.119
G_4 (5% Banana flower)	40.333^{d}±3.014	45.9^{c}±5.209	60.433^{cd}±2.183
G_5 (2.5% Papaya leaves)	48.3^{c}± 4.358	41.967^{d}±3.250	63.333^{c}±4.01
G_6 (5% Papaya leaves)	55.2^{b} ±3.804	50.8^{b}±5.216	70.2^{b}±4.133
G_7 (2.5% mixture powder)	49.5^{c}± 4.969	44.6^{cd}±4.9	60.5^{cd}±3.378
G_8 (5% mixture powder)	38.767^{d}± 3.317	27.167^{f}±1.159	54.133^{e}±3.062
LSD ($p < 0.05$)	**1.713**	**2.92**	**4.032**

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

Table (3): Effect of banana flower, papaya leaves and their mixture on serum urea serum uric acid and serum creatinine of diabetic rats

Groups	Parameters		
	Urea mg/dl	Uric acid mg/dl	Creatinine mg/dl
	M±SD	M±SD	M±SD
G_1 C (-)	21.233^{c}±1.861	6.033^{b}±0.513	0.943^{d}± 0.268
G_2 C (+)	36.267^{a}±1.914	10^{a}±0.1	1.623^{a}±0.171
G_3 (2.5% Banana flower)	22.7^{c}±1.709	6.733^{b}± 0.68	1.106^{cd}± 0. 1
G_4 (5% Banana flower)	28.56^{b}±2.773	7.833^{b}±0.351	1.327^{bc}± 0.04
G_5 (2.5% Papaya leaves)	30.267^{b}±1.815	7.5^{b}± 0.656	1.203^{bcd}± 0.221
G_6 (5% Papaya leaves)	32.333^{b}± 2.768	8.1^{b}± 1.345	1.437^{ab}± 0.03
G_7 (2.5% mixture powder)	29.433^{b}± 4.765	7.433^{b}± 2.003	1.273^{bcd}± 0.08
G_8 (5% mixture powder)	23.117^{c}±1.029	6.767^{b}±0.404	0.943^{d}± 0.12
LSD ($p < 0.05$)	**3.739**	**1.697**	**0.226**

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

Table (4): Effect of banana flower, papaya leaves and their mixture on serum triglycerides and serum total cholesterol of diabetic rats (mg/dl)

Groups	Triglycerides mg/dl	Total cholesterol mg/dl
	M±SD	M±SD
G_1 C (-)	70.333^{bc}± 7.024	71.333^{f}± 2.021
G_2 C (+)	116.133^{a}±1.205	124.733^{a}± 4.606
G_3 (2.5% Banana flower)	78.733^{b}± 3.951	94.2^{b}± 2.762
G_4 (5% Banana flower)	75.233^{bc}± 0.874	82.333^{d}± 1.258
G_5 (2.5% Papaya leaves)	79.4^{b}± 6.514	92.833^{b}± 2.255
G_6 (5% Papaya leaves)	81.5^{b}± 3.279	92.5^{b}± 2.291
G_7 (2.5% mixture powder)	73.066^{bc}± 1.101	87.5^{c}± 0.5
G_8 (5% mixture powder)	67^{c}± 1	76.333^{e}±1.527
LSD ($p < 0.05$)	**7.306**	**4.004**

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

Table (5): Effect of banana flower, papaya leaves and their mixture on HDL-c, LDL-c and VLDL-c of diabetic rats

Groups	Parameters		
	HDL-c mg/dl	LDL-c mg/dl	VLDL-c mg/dl
	M±SD	M±SD	M±SD
G_1 C (-)	43.4^{a}± 2.623	13.9^{f}± 0.8	14^{cd} ± 1.4
G_2 C (+)	26.166^{d}± 2.255	75.32^{a}± 3.1	23.25^{a}± 0.25
G_3 (2.5% Banana flower)	32^{c}±2.5	46.23^{b}± 0.53	15.82^{bc}± 0.78
G_4 (5% Banana flower)	33.7^{bc}±1.752	33.56^{d}±2.08	15.07^{bcd}±0.17
G_5 (2.5% Papaya leaves)	36.166^{bc}±1.041	40.65^{c}± 1.22	16.02^{bc}± 1.28
G_6 (5% Papaya leaves)	36.733^{b}±1.662	39.55^{c}±3.25	16.35^{b}±0.65
G_7 (2.5% mixture powder)	41.133^{a}±1.804	31.93^{d}±1.33	14.62^{bcd}±**0.22**
G_8 (5% mixture powder)	45.1^{a}±0.854	17.95^{e}±2.15	13.4^{d}±0.2
LSD ($p < 0.05$)	**3.447**	**2.963**	**1.450**

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

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التأثير المحتمل لزهرة الموز واوراق الباباز في الفئران المصابة بمرض السكر المستحث بالألوكسان

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الملخص العربى

تم اجراء الدراسة الحالية لمعرفة التأثيرات المحتملة لزهرة الموز واوراق الباباز ومخلوطهما معا في صورة مسحوق علي الخلل الفسيولوجي الحادث في البنكرياس .تم استخدام 48 فأر ابيض بالغ يتراوح وزن كل منهم 150-160 جم وتم تقسيمهم الي 8 مجموعات متساوية احدهما كمجموعة ضابطة سالبة اما المجموعات الأخري فتم احداث الاصابة بالسكر عن طريق الحقن بواسطة الالوكسان بتركيز 150 ملجم/كجم من وزن الجسم واضيفت زهور الموز واوراق الباباز المستخدمه بتركيز2,5% و5% لكل منهما من الوجبة الاساسية علي هيئة مطحون. وتم قياس مستوي السكر في الدم وعمل صورة دم كاملة (RBC, WBC and platelet) وقياس نسبة الهيموجلوبين ووظائف الكبد (ALT- AST – ALP) ووظائف الكلي (اليوريا- الكرياتينين - اليوريك اسيد) والكولستيرول الكلي الجلسريدات الثلاثية و البروتين الكلي والالبيومين والليبوبروتينات مرتفعة الكثافة HDL والليبوبروتينات منخفضة الكثافة LDL والليبوبروتينات منخفضة جدا في الكثافة VLDL وقد اظهرت النتائج ان تناول ازهار الموز واوراق الباباز وبصفة خاصة مخلوطهما ادي الي تحسن في مستوي السكر في الدم ووظائف الكبد والكلي ودهون الدم .

الكلمات الدالة : زهرة الموز- اوراق الباباز- سكر الدم - التحاليل البيوكيميائية.