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ويسرنا تهنئتكم وإعلامكم بأن **المجلة المصرية للدراسات المتخصصة** الصادرة عن **جامعة عين شمس، كلية التربية النوعية، القاهرة، مصر، قد نجحت في تحقيق معايير اعتماد معامل "ارسيف Arcif"** المتوافقة مع المعايير العالمية، والتي يبلغ عددها **(32) معياراً**، وللاطلاع على هذه المعايير يمكنكم الدخول إلى الرابط التالي:

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تابع محتويات العدد

بحوث علمية محكمة باللغة الإنجليزية :

Effect of Different Doses of Samwa and Curry Aqueous Extracts on Blood Sugar and Lipid Profile on diabetic rats.

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Effect of Different Doses of Samwa and Curry Aqueous Extracts on Blood Sugar and Lipid Profile on diabetic rats.

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Hoda Abdelrazek Mahmoud

Abstract

Methods: 56 adult male albino rats were divided into two main groups; the first main group (7 rats) was fed on basal diet and was kept as a negative control group, the second main group (49 rats) were injected with alloxan to induce diabetes and were fed on basal diet. Diabetic rats were divided into seven groups, first group was kept as a positive control group while the other (6) groups divided to groups (1-2) were fed on basal diet + Samwa extract (150-250) ml/kg of rat weight, respectively, and groups (3-4) were fed on basal diet + curry extract (350-450)ml/kg of rat weight) respectively, and groups (5-6) were fed on basal diet + the extracts of Samwa and curry mixture (150-350, 250-450) ml/kg respectively at the end of the experiment (6 weeks). Rats were fasted for 12 hours before slaughter and collected blood samples to obtain Fasting serum glucose, lipid profile and (pancreas - kidneys and liver) functions. Results: The results showed that the best increase in body weight in group 4, and the best results of feed efficiency ratio in group 7, and the mixture of Samwa and curry in group 8 achieved a significant decrease in fasting glucose, about lipemia the best result of cholesterol in groups 7-8 and triglycerides in group 8 and The best results were low-density lipoprotein in group 7, very low-density lipoprotein in group 8, and high-density lipoprotein in group 6, and there was a significant improvement in liver and kidney functions, and the best results were for examination of pancreatic, kidney and liver tissues for group 8. Conclusion: The results showed that the mixture of Samwa and curry extracts achieved better results than the extract of individual leaves. Therefore, we recommend taking the mixture of Samwa and curry leaves to control the high level of glucose and lipid imbalance in diabetic patients.

Keywords: Leaves, Sama, curry, aqueous extracts, their mixtures, diabetes Experimental rats.

Introduction

Samwa (Cleome droserifolia) is one of the most popular medicinal herbs common in South Sinai – Egypt, it is an aromatic shrub. Bedouin of South Sinai use samwa medicinally to treat a variety of ailments in both people and animals, including bee stings, internal and external infections, and diabetes **(Dina Aly and Rafik Khalil 2019).** It also has a long history of medicinal use, especially in Sinai for the treatment of diabetes mellitus in individuals with non-insulin dependent diabetes. **(El-Askary, 2005).**

Samwa leaves (Cleome droserifolia) has an immediate effect on abdominal a rheumatic pains and inflammations. In addition, Cleome droserifolia extracts has specific biological effects in improving the carbohydrate metabolism **(Mikhail, 2000).** It was found that the 100 g of samwa leaves contained in average 81.8 - 89.6 % moisture, 3.1 - 7.7 % protein, 0.4 - 0.9 % fat, 4.4 - 6.4% carbohydrate, 1.3 - 1.4 % fiber, 2.1 - 3.0 % ash and 213 - 434 mg calcium plus many other components **(Chweya and Nameus (1997).**

Curry leaves (Murrya koenigii) constitutes of important ingredient in the Indian diet to improve appetite and digestion. It is being used as stimulant for the management of diabetes mellitus. The leaves root and bark possess tonic, stomachic and carminatives properties. Antiemetic property too is seen in the leaves. External applications of the leaves have been beneficial in bruises, eruption, and to treat bites of poisonous animals. The leaves being bitter, acrid and cooling have been shown to have cooling, anthelmintic and analgesic action. It is known to cure piles, reduce body heat, thirst, inflammation and itching. Even leukoderma and blood disorders have been controlled. **(Gupta S *et al.*, 2010).**

Nutrition content of 100 gm dehydrated curry leaf protein (12) gm, fat (5.4) gm Carbohydrate (64.31) gm, calcium (2040)

mg, iron (12) mg and B-carotene (5292) µg. **(Singh, S. *et al.*, 2014).**

Diabetes is a syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion or action **(WHO, 2016).**

Diabetes mellitus is classified into different categories, based on the etiology of the disease, but it is widely accepted that the two main types are; type 1 and type 2 **(ADA, 2017)**.

Type 1 diabetes, which accounts for only 5–10% of those with diabetes, previously encompassed by the terms insulin dependent diabetes **(ADA, 2010).**

Type 2 diabetes, which accounts for 90–95% of diabetic patient, previously referred to as non–insulin dependent diabetes, type 2 diabetes, or adult-onset diabetes, encompasses individuals who have insulin resistance and insulin deficiency but these individuals do not need insulin treatment to survive. **(Zimmet *et al*., 2003)**.

Diabetes mellitus is taking place as one of the main threats to human health in the 21st century **(ADA, 2017).** It is the most common non communicable disease worldwide and the fourth to fifth leading cause of death in developed countries, the global figure of people with diabetes is set to rise from the current estimate of 150 million to 220 million in 2010 and 300 million in 2025 **(Tripathi *et al.*, 2011).**

Currently available therapies include insulin and various synthetic antidiabetic agents but these agents can produce side effects and sometimes not recommended in conditions like pregnancy. Therefore, it is necessary to look for new solution to manage this health problem. (**Satyavati G.V. *et al,* 1987)**

There are large randomized controlled trials that show the benefit of a tight blood glucose control which reduces microvascular and macrovascular complications, but despite this,

many diabetics do not keep control of their blood glucose levels or this control is poorly done. Poor and inadequate glycemic control constitutes a major public health problem and thus research on new substances with hypoglycemic properties is required **(Tricco *et al.*, 2012)**.

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 **(Fonseca *et al.*, 2012).**

In 2012 Talukdar refers that the anti- diabetic activity of medicinal plants is due to the presence of phenolic compounds, flavonoids, terpenoid, coumarins and other ingredients which show hypoglycemic activity. It is very common for people to wonder how to best prepare and consume many herbs; many people like to drink as tea; however, it can also be consumed by other means such as powdered form through capsules, but tea is the probably most popular **(Reay *et al.*, 2012).**

AIM OF THE STUDY:

The present study is aimed to evaluate the effect of different doses of Samwa and Curry leaves on lipid profile and pancreatic sensitivity of the diabetic rats.

MATERIALS AND METHODS:

Fifty-six adult male albino rats weighing from (120 to 140 g) were obtained from Animal House Colony of Agriculture and Land Reclamation. Cairo, Egypt.

Alloxan (5, 5-Dihydroxybarbituric acid), was obtained from El-Gomhoria Company, Cairo, Egypt. Diabetes mellitus was induced by inter-peritoneal injection (150 mg/kg Body weight) with freshly prepared alloxan monohydrate dissolved in a 0.1M sodium citrate buffer (pH3) according to **(Luka and Mohammed, 2012).**

After a period of 2 days fasting blood samples were obtained by retro-orbital method to estimate fasting serum glucose. Rats having fasting serum glucose more than 250 mg\dl were considered diabetic **(Luka *et al.*, 2013).**

- Casein, all vitamins, minerals, cellulose and choline bitartrate were obtained from El-Gomhoria Company, Cairo, Egypt.
- Samwa leaves (Cleome droserifolia) and Curry leaves (Murrya koenigii) were purchased from herbal local market, Cairo, Egypt.
- Animals were obtained from the animal colony Agricultural Research Center, Giza, Egypt. **Preparation of the basal diet:**

All rats were fed on basal diet based on American Institute of Nutrition(AIN)93, diet that was described by **Reeves *et al.*, (1993).**

Induction of diabetes mellitus:

Diabetes mellitus was induced by inter-peritoneal injection (150 mg/kg Body weight) with freshly prepared alloxan monohydrate dissolved in a 0.1 ml sodium citrate buffer (pH3) according to (**Luka and Mohammed, 2012**). After a period of 2 days fasting blood samples were obtained by retro-orbital method to estimate fasting serum glucose. Rats having fasting serum glucose more than 250 mg/dl were considered diabetic (**Luka *et al*., 2013**).

Preparation of the Aqueous:

Aqueous extract of samwa and curry, 100 gm of shade dried leaves were ground in an electrical grinder and dissolved in 500 ml distilled water at (40-60) ℃ for 48 hrs. The mixture was left for 24 hrs. with a magnetic stirrer at room temperature. The next day the mixture was strained out in a fine sieve and the crude extract was air evaporated for 3 days. The concentrated leaf extract of plant was then orally administered to the rats in 200

mg/kg body weight) using a syringe according to **(Gohil *et al.*, 2010).**

Note: We prepared the aqueous extract of Samwa and curry every week during four weeks to be fresh and keep its effects.

Experimental Design:

After acclimatization period, fifty-six rats were divided randomly into eight groups:

Negative control group (G1); fed on the basal diet during the experimental period (six weeks).

Positive control group (G2); (diabetic) fed on the basal diet during the experimental period.

First experimental group (G3); fed on the basal diet + samwa aqueous extract 150 ml \kg of the weight of the rat.

Second experimental group (G4); fed on the basal diet + samwa aqueous extract 250 ml \kg of the weight of the rat.

Third experimental group (G5); fed on the basal diet + curry aqueous extract 350 ml \kg of the weight of the rat.

Fourth experimental group (G6); fed on the basal diet + curry aqueous extract 450 ml \kg of the weight of the rat.

Fifth experimental group (G7); fed on the basal diet + samwa aqueous extract 150 ml + curry aqueous extract 350 ml \kg of the weight of the rat.

Sixth experimental group (G8); fed on the basal diet + samwa aqueous extract 250 ml + curry aqueous extract 450 ml \kg of the weight of the rat. Feed intake was calculated daily and the body weight gain was recorded weekly. Feed efficiency ratio was calculated according to the method of **(Chapman et al., 1959).**

Biochemical analysis: (Allain et al., 1974). Enzymatic determination of triglycerides in serum was conducted by

Biomed- L.S kit **(Fossatip and Prancipel, 1982).** HDL-Cholesterol was determined after separation of high density lipoprotein and determination of cholesterol bound to this fraction using Stanbio kit **(Burstein, 1970).** The determinations of very low density lipoprotein (VLDLc) and low density lipoprotein (LDLc) were calculated according to the method of **(Lee and Nieman, 1996).** The determinations of very low density lipoprotein (VLDLc) and low density lipoprotein (LDLc) were calculated according to the method of **(Lee and Nieman, 1996).** AST (GOT) and ALT (GPT) activities were measured calorimetrically according to method described by **(Reitman and Frankel, 1957).**

Histological study:

Specimen from liver, pancreas and kidney of from all groups were washed, dehydrated in ascending grades in 85% alcohol for 24 hours, cleared in xylene and embedded in paraffin wax. Histological sections of 5-6 µm in thickness were cut out, deparaffinized and stained with heamatoxylin and eosin for examination under the light microscope **(Bancroft *et al*., 1994).**

Statisticalanalysis:

The obtained data were statistically analyzed using statistical analysis system **(SAS, 2006).** One-way analysis of variance (ANOVA) was used to test the variations among groups and post Hoc test (Duncan's test) was used to compare group means.

RUSULTS:

Table (1) illustrates the effect of Samwa and Curry extracts on mean values ± SD of feed intake (FI), body weight gain (BWG) and feed efficiency ratio (FER) of diabetic male rats. The results of FI, shows that group **1**, -ve control shows the value of 18.4±1.22 g/d. The value of group **2**, +ve control, is 18.2±1.12 g/d. This value is insignificantly decreased compared to group **1**, while treated rats (groups **3, 4, 5, 6, 7** and **8**) are 19.2±1.2,

19.1±0.95, 18.3±0.75, 18.7±1.05, 18.4±1.22 and 18.2±1.2, respectively. This means that the most feed intake can be seen in group **3** (150 mg/kg Samwa)**.** With regard to BWG, group **1**, shows the value of (0.9±0.2 g/d), while group **2** with value (-0.7±0.4 g/d) shows a significant decreased value compared to –ve control. Rats in treated groups **(3, 4, 5, 6, 7** and **8)** were 0.8±0.1, 0.6±0.2, 1.0±0.7, 1.0±1.1, 1.3±0.3 and 1.0±0.3 (g/d) respectively, which shows significantly increased values compared to group **2** (+ve control). This means that the most weight gain can be seen in rats of group **4** (250 mg/kg Samwa). In the case of FER shows the mean value ±SD in group **1** (-ve control) was 0.051±0.045, group **2** (+ve control) was -0.040±0.004 shows a decreased significantly results compared to group **1** (-ve control), while rats in treated groups **(3, 4, 5, 6, 7** and **8)** were (0.039±0.006, 0.033±0.055, 0.055±0.064, 0.052±0.039, 0.070±0.042 and 0.055±0.053) respectively, shows an increased significantly values compared to group **2** (+ve control). The highest value in treated groups (0.070±0.042 g/d) was seen in rats of group **7** (150 mg Samwa + 350 mg Curry /kg).

Table (1) Effect of Samwa and Curry extracts on feed intake (FI), body weight gain (BWG) and feed efficiency ratio (FER) of diabetic male rats.

Tested Groups	FI (g/d)		BWG (g/d)		FER	
	Mean ± SD		Mean ± SD		Mean ± SD	
G1: –ve control	18.4 [a]	±1.22	0.9 [a]	±0.2	0.051 a	± 0.045
G2: +ve control	18.2 [a]	±1.12	-0.7 [c]	±0.4	-0.040 b	± 0.004
G3: 150 mg/kg Samwa	19.2 [a]	±1.2	0.8 [ab]	±0.1	0.039 a	± 0.006
G4: 250 mg/kg Samwa	19.1 [a]	±0.95	0.6 [b]	±0.2	0.033 a	± 0.055
G5: 350 mg/kg Curry	18.3 [a]	±0.75	1.0 [a]	±0.7	0.055 a	± 0.064
G6: 450 mg/kg Curry	18.7 [a]	±1.05	1.0 [a]	±1.1	0.052 a	± 0.039
G7: 150 mg Samwa +350 mg Curry /kg	18.4 [a]	±1.22	1.3 [a]	±0.3	0.070 a	± 0.042
G8: 250 mg Samwa +450 mg Curry /kg	18.2 [a]	±1.12	1.0 [a]	±0.3	0.055 a	± 0.053
F	18.9		1.373		1.373	
Sig.	0.00		0.00		0.00	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (2) illustrates the effect of Samwa and Curry extracts on Liver and Kidney relative weights of diabetic male rats. The

results of liver relative weight (%), group **1** (-ve control) shows the value of (7.2±0.9 %). While the highest value of (9.0±1.6%) was seen in group **2** of +ve control rats, which increased significantly compared to group **1** (-ve control). Rats in groups (**3, 4, 5, 6** and **8**) have the values of 8.6±1.5, 8.3±1.7, 8.5±2.8, and 7.2±2.0 % respectively showed insignificantly decreasing values compared to group **2** (+ve control). The lowest value in treated groups was detected in group **7** (150 mg Samwa +350 mg Curry /kg) which shows the value of (7.1±0.6). The value of Kidney relative weight was seen in group **1** (1.5±0.1 %.) This value shows insignificant decrease compared to group **2** (1.7±0.2). Rats in groups **(3, 4, 5, 6, 7** and **8)** show the values of (1.7±0.1, 1.7±0.2, 1.6±0.2, 1.9±0.1, 1.6±0.1 and 1.5±0.2 %) respectively. These values were insignificantly change results when compared to group **2** (+ve control). The best value (1.5±0.2) was seen in rats of group **8** (250 mg Samwa +450 mg Curry /kg).

Table (2) Effect of Samwa and Curry extract on Liver and Kidney relative weights of diabetic male rats.

Tested Groups	Liver (%)		Kidney (%)	
	Mean ± SD		Mean ± SD	
G1: –ve control	7.2^{b}	±0.9	1.5^{a}	±0.1
G2: +ve control	9.0^{a}	±1.6	1.7^{a}	±0.2
G3: 150 mg/kg Samwa	8.6^{a}	±1.5	1.7^{a}	±0.1
G4: 250 mg/kg Samwa	7.5^{a}	±2.1	1.7^{a}	±0.2
G5: 350 mg/kg Curry	8.3^{a}	±1.7	1.6^{a}	±0.2
G6: 450 mg/kg Curry	8.5^{a}	±2.8	1.9^{b}	±0.1
G7: 150 mg Samwa +350 mg Curry /kg	7.1^{b}	±0.6	1.6^{a}	±0.1
G8: 250 mg Samwa +450 mg Curry /kg	7.2^{ab}	±2.0	1.5^{a}	±0.2
F	7.96		1.62	
Sig.	00.0		00.0	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (3) illustrates the effect of Samwa and Curry extracts on Liver and Kidney relative weights of diabetic male rats. The result of Pancreas relative weight (%) group **1** (-ve control) shows the value of (0.8±0.14 %). While the value of (0.6±0.1 %) was seen in group **2** of +ve control rats, which is significantly decreased compared to group **1** (-ve control). Rats in groups **(3, 4, 5, 6** and **8**) have the values of (0.7±0.2, 0.8±0.1, 0.7±0.1, 0.8±0.1,

0.9±0.1 and 0.7±0.1 %) respectively, show insignificantly increasing values compared to group **2** (+ve control). The best values in treated groups was detected in groups **4** (250 mg/kg Samwa) and **6** (450 mg/kg Curry). The value of Heart relative weight was seen in group **1** (0.9±0.3 %.) This value shows insignificant decreased value compared to group **2** (1.0±0.2). Rats in groups **(3, 4, 5, 6, 7** and **8)** show the values of (1.0±0.5,) (1.1±0.2,) 0.9±0.1, 0.9±0.2, 1.1±0.3 and 0.9±0.2 (%) respectively. These values show insignificantly change results when compared to group **2** (+ve control).

Table (3) Effect of Samwa and Curry extracts on Pancreas and Heart relative weights of diabetic male rats.

Tested Groups	Pancreas (%)		Heart (%)	
	Mean ± SD		Mean ± SD	
G1: –ve control	0.8[a]	±0.14	0.9[a]	±0.3
G2: +ve control	0.6[a]	±0.1	1.0[a]	±0.2
G3: 150 mg/kg Samwa	0.7[a]	±0.2	1.0[a]	±0.5
G4: 250 mg/kg Samwa	0.8[a]	±0.1	1.1[a]	±0.2
G5: 350 mg/kg Curry	0.7[a]	±0.1	0.9[a]	±0.1
G6: 450 mg/kg Curry	0.8[a]	±0.1	0.9[a]	±0.2
G7: 150 mg Samwa +350 mg Curry /kg	0.9[a]	±0.2	1.1[a]	±0.3
G8: 250 mg Samwa +450 mg Curry /kg	0.7[a]	±0.1	0.9 [a]	±0.2
F	7.23		1.13	
Sig.	00.0		00.0	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (4) illustrates the effect of Samwa and Curry extracts on blood glucose levels of diabetic male rats. The result of blood glucose levels, group **1** (-ve control) shows the lowest value (83.5±2.8 mg/dl). While the highest value (165.3±6.0 mg/dl) was seen in group **2** of +ve control rats, which increased significantly compared to group **1** (-ve control). Rats in treated groups **(3, 4, 5, 6** and **8)** have the values of (135.8±4.9, 139.7±5.1, 120.0±4.4, 100.4±3.6, 122.3±8.3 and 97.4±12.4 mg/dl) respectively and showing significantly decreasing values compared to group **2** (+ve control). The best values in treated groups 97.4±12.4 was detected in group 8 (250 mg Samwa + 450 mg Curry /kg).

Table (4) Effect of Samwa and Curry extracts on blood glucose levels of diabetic male rats.

Tested groups	Blood glucose (mg/dl)	
	Mean ± SD	
G1: –ve control	83.5 [a]	±6.0
G2: +ve control	165.3[e]	±2.8
G3: 150 mg/kg Samwa	135.8 [d]	±4.9
G4: 250 mg/kg Samwa	139.7 [d]	±5.1
G5: 350 mg/kg Curry	120.0 [c]	±4.4
G6: 450 mg/kg Curry	100.4[b]	±3.6
G7: 150 mg Samwa +350 mg Curry /kg	122.3 [c]	±8.3
G8: 250 mg Samwa +450 mg Curry /kg	97.4 [b]	±12.4
F	59.05	
Sig.	0.00	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (5) illustrates the effect of Samwa and Curry extracts on Cholesterol and Triglyceride of diabetic male rats. The result of Cholesterol shows that group **1** -ve control shows the value of (152.5±5.5 mg/d). The value of group **2** +ve control, is 183.8±4.2 mg/dl. This value decreased significantly compared to group **1**, while treated rats of groups (**3, 4, 5, 6, 7** and **8**) are (158.4±5.7, 156.3±5.7, 141.3±5.1, 163.1±5.9, 130.9±8.8 and 133.2±4.1 mg/dl) respectively. These values show significantly decreased compared to group **2.** While, Triglyceride, group **1**, shows the value of (115.6 ± 7.5 mg/dl), while group **2** was (206.1±3.9 mg/dl) shows a significantly increasing value compared to –ve control. Rats in treated groups **(3, 4, 5, 6, 7** and **8)** were 177.1±6.4, 171.2±6.2, 86.6±3.1, 156.5±5.7, 97.5±10.4 and 123.8±14.8 (mg/dl) respectively, which shows significantly decreased values compared to group **2** (+ve control). The best result in diabetic rats can be seen in group **8** (250 mg Samwa +450 mg Curry /kg) was 123.8±14.8 mg/dl.

Table (5) Effect of Samwa and Curry extracts on Cholesterol and Triglyceride levels of diabetic male rats.

Tested Groups	Cholesterol (mg/dl)		Triglyceride (mg/dl)	
	Mean ± SD		Mean ± SD	
G1: –ve control	152.5^{c}	±5.5	115.6^{d}	±7.5
G2: +ve control	183.8^{a}	±4.2	206.1^{a}	±3.9
G3: 150 mg/kg Samwa	158.4^{bc}	±5.7	177.1^{b}	±6.4
G4: 250 mg/kg Samwa	156.3^{c}	±5.7	171.2^{b}	±6.2
G5: 350 mg/kg Curry	141.3^{d}	±5.1	86.6^{f}	±3.1
G6: 450 mg/kg Curry	163.1^{b}	±5.9	156.5^{c}	±5.7
G7: 150 mg Samwa +350 mg Curry /kg	130.9^{e}	±8.8	97.5^{e}	±10.4
G8: 250 mg Samwa +450 mg Curry /kg	133.2^{e}	±4.1	123.8^{d}	±14.8
F	17.74		32.14	
Sig.	00.0		00.0	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (6) illustrates the effect of Samwa and Curry extracts on mean values ± SD of LDL, HDL and VLDL of diabetic male rats. The result of LDL shows that group **1**, -ve control has the value of (88.6±3.2 mg/dl). The value of group **2**; +ve control, is 102.4±2.1 mg/dl. This value increased significantly compared to group **1**, while treated rats (groups **3, 4, 5, 6, 7** and **8**) are 96.4±3.5, 90.5±3.3, 100.4±3.6, 98.4±3.6, 86.8±3.7 and 82.7±3.0 (mg/dl), respectively. These values show significantly decreased values compared to group **2**. This mean that best result 86.8±3.7 can be seen in group **7** (150 mg Samwa +350 mg Curry /kg) With regard to HDL, group **1**, show the value (38.4±0.8 mg/dl), while group **2** was (22.6±1.3 mg/dl) shows a decreased significantly value compared to –ve control. Rats in treated groups **3, 4, 5, 6, 7** and **8** were 26.6±1.2, 31.5±1.1, 23.6±0.9, 33.5±1.2, 23.9±3.5 and 27.8±2.4 (mg/dl) respectively, which shows significantly increased values compared to group **2** (+ve control). This means that the best HDL levels in treated rats was 33.5±1.2 33.5±1.2 can be seen in group **6** (450 mg/kg Curry). In the case of VLDL shows the mean value ±SD in group **1** (-ve control) was 23.0±1.8, group 2 (+ve control) was 41.3±1.5 shows increased significantly results compared to group **1** (-ve control), while rats in treated groups **(3, 4, 5, 6, 7** and **8)**, were 35.4±1.3, 34.2±1.2, 17.3±0.6, 31.3±1.1, 19.5±2.9 and 24.8±3.0 shows a decreased significantly

values compared to group **2** (+ve control). The best value in treated groups (24.8±3.0 mg/dl) was seen in rats of group **8** (250 mg Samwa +450 mg Curry /kg).

Table (6): Effect of Samwa and Curry extracts on LDL, HDL and VLDL levels of diabetic male rats.

Tested Groups	LDL (mg/dl)		HDL (mg/dl)		VLDL (mg/dl)	
	Mean ± SD		Mean ± SD		Mean ± SD	
G1: –ve control	88.6^{c}	±3.2	38.4^{a}	±0.8	23.0^{d}	±1.8
G2: +ve control	102.4^{a}	±2.1	22.6^{e}	±1.3	41.3^{a}	±1.5
G3: 150 mg/kg Samwa	96.4^{b}	±3.5	26.6^{d}	±1.2	35.4^{b}	±1.3
G4: 250 mg/kg Samwa	90.5^{c}	±3.3	31.5^{c}	±1.1	34.2^{b}	±1.2
G5: 350 mg/kg Curry	100.4^{a}	±3.6	23.6^{de}	±0.9	17.3^{e}	±0.6
G6: 450 mg/kg Curry	98.4^{ab}	±3.6	33.5^{b}	±1.2	31.3^{c}	±1.1
G7: 150 mg Samwa +350 mg Curry /kg	86.8^{c}	±3.7	23.9^{de}	±3.5	19.5^{e}	±2.9
G8: 250 mg Samwa +450 mg Curry /kg	82.7^{d}	±3.0	27.8^{d}	±2.4	24.8^{d}	±3.0
F	54.836		35.024		30.619	
Sig.	00.0		00.0		00.0	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Table (7) illustrates the effect of Samwa and Curry extracts on mean values ± SD of GPT and GOT of diabetic male rats. The results of GPT shows that group **1** (-ve control) was the normal value of GPT (40.3±1.4 IU/L) while, group **2** (+ve control) was (86.6±3.1 IU/L) shows a significantly increasing values compared to the (-ve control group **1**). For rats in treated groups **(3, 4, 5, 6, 7** and **8)** have values of (37.4±3.4, 39.4±1.4, 43.3±1.6, 40.3±1.5, 51.5±7.6 and 38.4±7.6) respectively, which show significantly decreasing results compared to +ve control group **2**. The best result in the treated groups (37.4±3.4 IU/L) was seen in rats of group **3** (150 mg/kg Samwa). The result of GOT shows the value of (37.4±1.3 IU/L) for group **1**. Group **2** (+ve control) has the highest value (90.5±3.3 IU/L) which shows a significantly increasing results compared to group **1**, (-ve control), while, rats in groups **(3, 4, 5, 6, 7** and **8)** were (21.6±0.8, 26.6±1.0, 32.5±1.2, 32.5±1.2, 30.5±3.0 and 17.7±7.0 IU/L) respectively, show a significantly decreasing values compared to group **2**, (+ve control). The best result in treated groups (17.7±7.0 IU/L) was seen in rats of group **8** (250 mg Samwa + 450 mg Curry /kg).

Table (7) Effect of Samwa and Curry extracts on liver enzymes GPT and GOT of diabetic male rats.

Tested Groups	GPT (IU/L)		GOT (IU/L)	
	Mean ± SD		Mean ± SD	
G1: –ve control	40.3^{d}	±1.4	37.4^{b}	± 1.3
G2: +ve control	86.6^{a}	±3.1	90.5^{a}	± 3.3
G3: 150 mg/kg Samwa	37.4^{d}	±3.4	21.6^{e}	± 0.8
G4: 250 mg/kg Samwa	39.4^{d}	±1.4	26.6^{d}	± 1.0
G5: 350 mg/kg Curry	43.3^{c}	±1.6	32.5^{c}	± 1.2
G6: 450 mg/kg Curry	40.3^{d}	±1.5	32.5^{c}	± 1.2
G7: 150 mg Samwa +350 mg Curry /kg	51.5^{b}	± 7.6	30.5^{c}	± 3.0
G8: 250 mg Samwa +450 mg Curry /kg	38.4^{d}	± 7.6	17.7^{f}	± 7.0
F	60.59		71.11	
Sig.	00.0		00.0	

Values were represented as mean ± SD. Means with different superscript letters are significantly different at $p < 0.05$.

Histopathological changes of the pancreas:

Pancreas of rats from group **1** showed vacillation of cells of islets of Langerhans's (Figs. 1 & 2) and thickening in the wall of pancreatic duct (Fig. 2). Moreover, pancreas of rats from group **2** revealed vacillation of cells of islets of Langerhans's (Figs. 3 & 4). Meanwhile, some sections from groups **3** & **4** showed vacillation of cells of islets of Langerhans's (Figs. 5 & 7), whereas, other sections revealed no histopathological changes (Figs. 6 & 8). Pancreas of rats from group **5** showed no histopathological changes (Fig. 9) except slight vacillation of some cells of islets of Langerhans's (Fig. 10). Moreover, pancreas of rats from group **6** revealed no histopathological changes (Fig. 11) except congestion of pancreatic blood vessel (Fig. 12). Meanwhile, pancreas of rats from group **7** showed marked vacillation of cells of islets of Langerhans's (Figs. 13 & 14). On the other hand, pancreas from group **8** revealed the normal histological structure from endocrine and exocrine parts (Figs. 15 & 16).

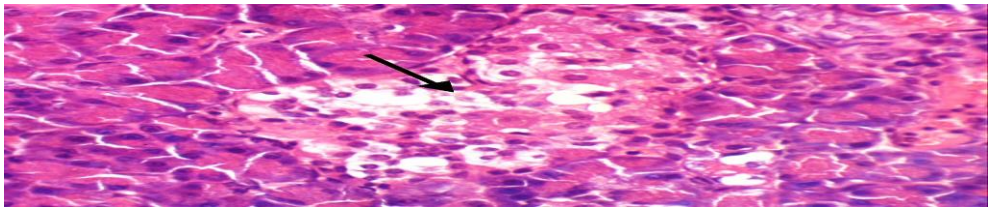

Fig. (1): Pancreas of rat from group 1 showing vacillation of cells of islets of Langerhans's (H & E X 400).

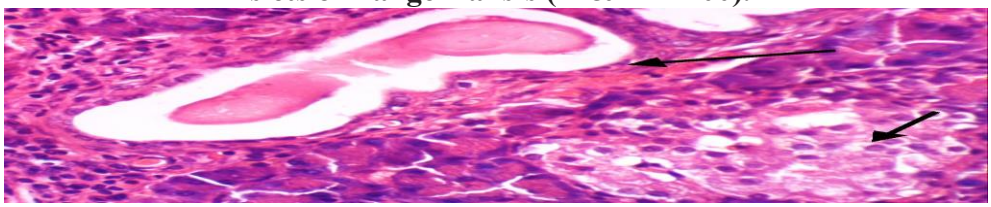

Fig. (2): Pancreas of rat from group 1 showing vacillation of cells of islets of Langerhans's and thickening in the wall of pancreatic duct (H & E X 400).

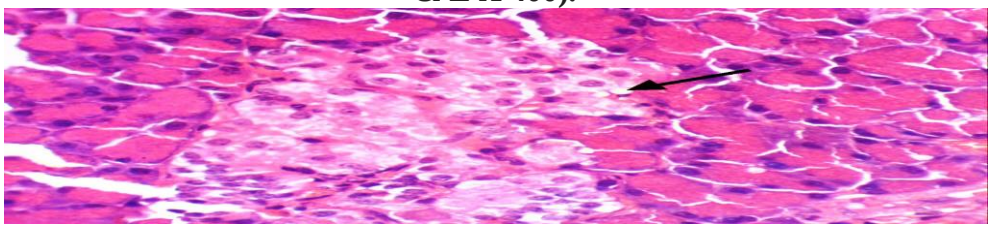

Fig. (3): Pancreas of rat from group 2 showing vacillation of cells of islets of Langerhans's (H & E X 400).

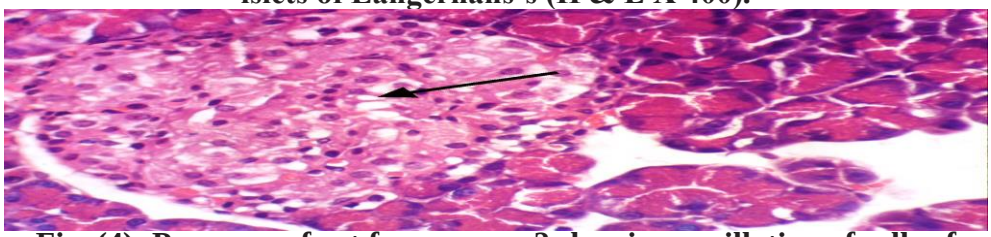

Fig. (4): Pancreas of rat from group 2 showing vacillation of cells of islets of Langerhans's (H & E X 400).

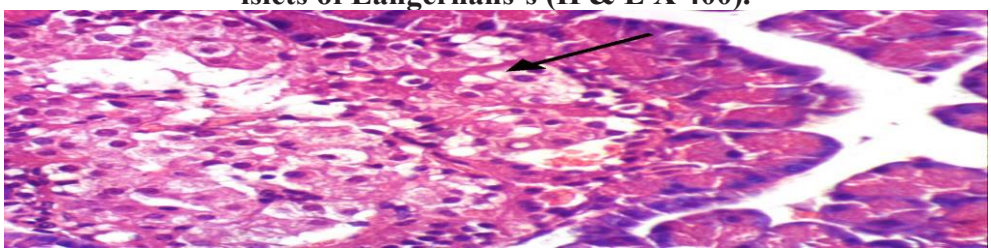

Fig. (5): Pancreas of rat from group 3 showing vacillation of cells of islets of Langerhans's (H & E X 400).

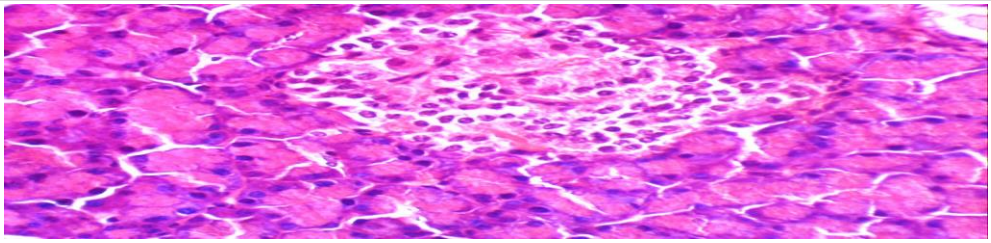

Fig. (6): Pancreas of rat from group 3 showing no histopathological changes (H & E X 400)

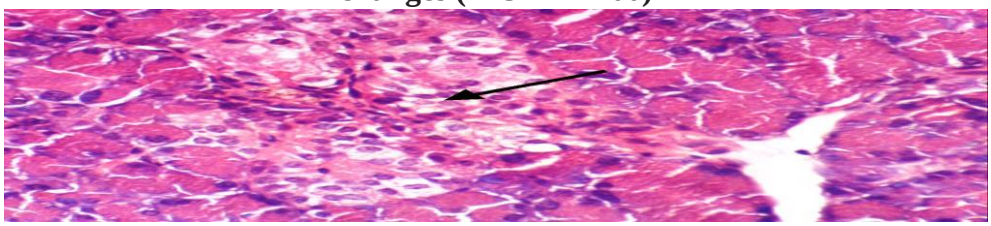

Fig. (7): Pancreas of rat from group 4 showing vacillation of cells of islets of Langerhans's (H & E X 400).

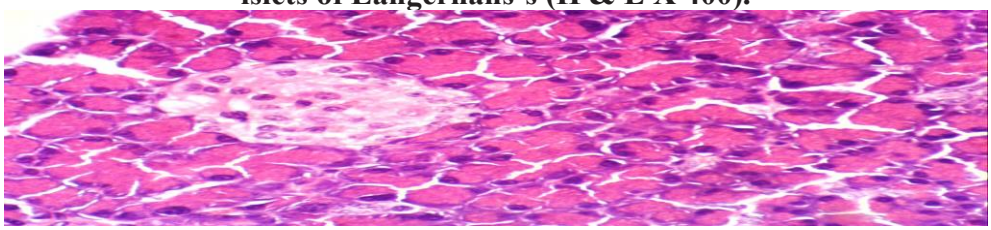

Fig. (8): Pancreas of rat from group 4 showing no histopathological changes (H & E X 400).

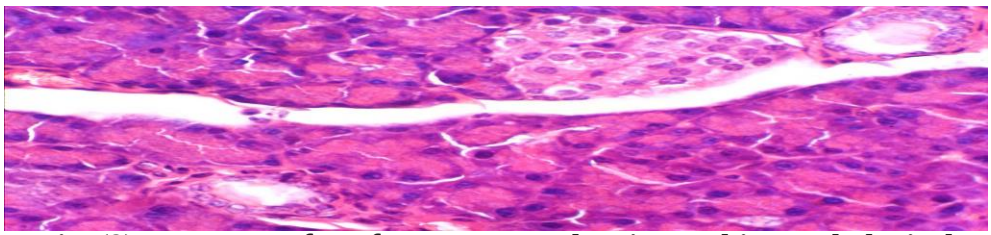

Fig. (9): Pancreas of rat from group 5 showing no histopathological changes (H & E X 400).

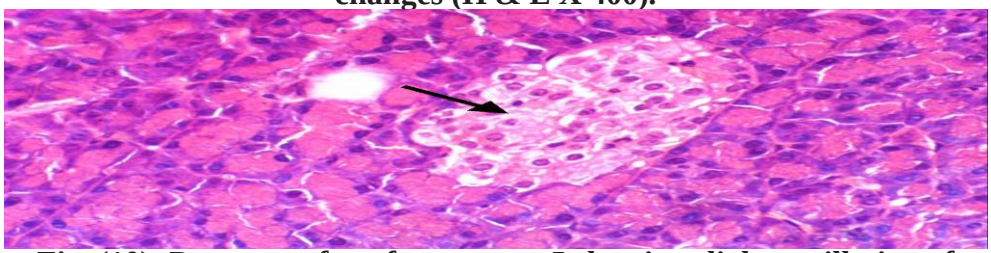

Fig. (10): Pancreas of rat from group 5 showing slight vacillation of some cells of islets of Langerhans's (H & E X 400).

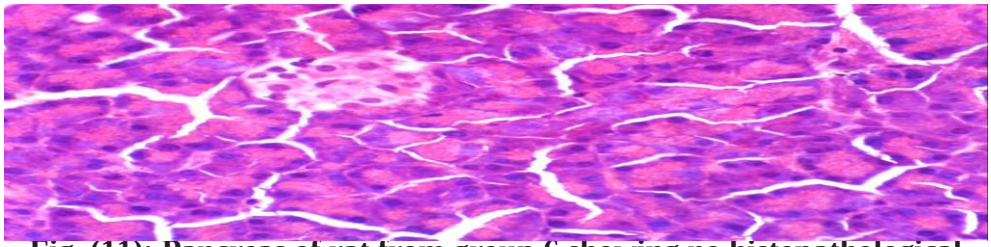

Fig. (11): Pancreas of rat from group 6 showing no histopathological changes (H & E X 400).

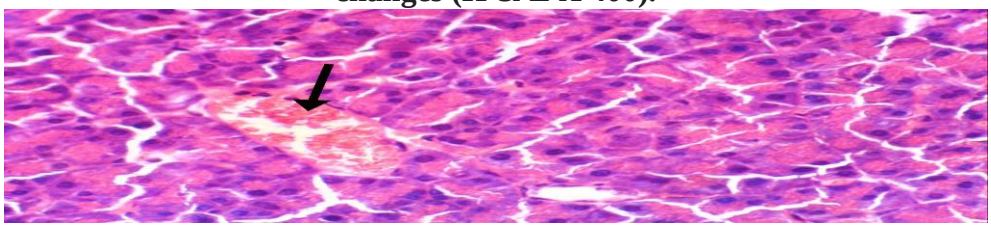

Fig. (12): Pancreas of rat from group 6 showing congestion of pancreatic blood vessel (H & E X 400).

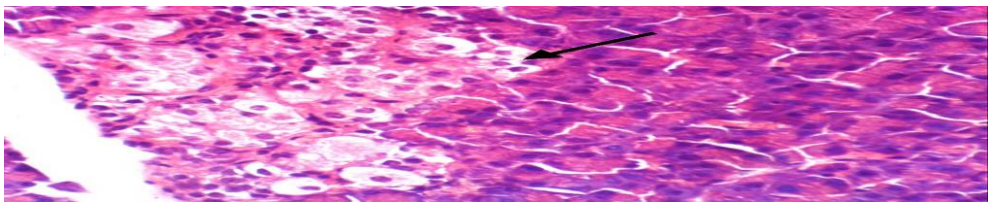

Fig. (13): Pancreas of rat from group 7 showing marked vacillation of cells of islets of Langerhans's (H & E X 400).

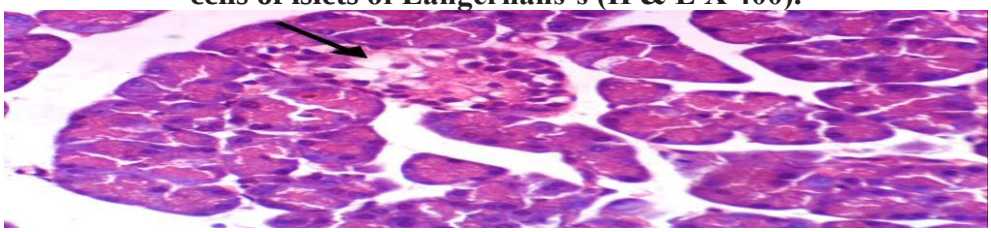

Fig. (14): Pancreas of rat from group 7 showing vacillation of cells of islets of Langerhans's (H & E X 400).

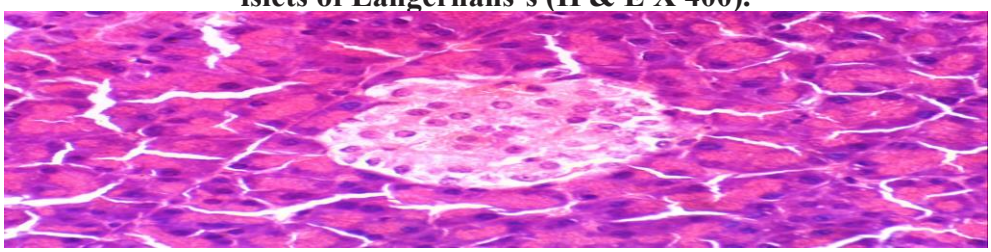

Fig. (15): Pancreas of rat from group 8 showing the normal histological structure from endocrine and exocrine parts (H & E X 400).

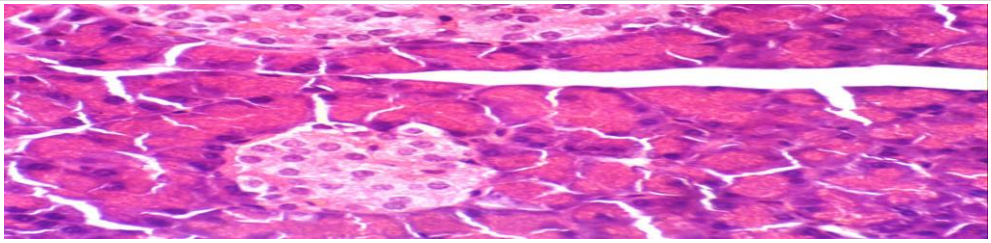

Fig. (16): Pancreas of rat from group 8 showing the normal histological structure from endocrine and exocrine parts (H & E X 400).

Histopathological examination of kidneys:

Microscopically, kidneys of rats group **1** revealed no histopathological alterations (Fig. 1) except congestion of renal blood vessel (Fig. 2). Some sections from group **2** showed vacillation of epithelial lining renal tubules (Fig. 3), whereas, other sections revealed no histopathological alterations (Fig. 4). Moreover, some sections from group **3** showed congestion of renal blood vessel (Fig. 5) and vacillation of epithelial lining some renal tubules (Fig. 6), whereas, other sections revealed no histopathological alterations (Fig. 7). However, kidneys of rats from group **4** showed vacillation of epithelial lining some renal tubules (Figs. 8 & 9). Meanwhile, kidneys from group **5** revealed no changes except congestion of renal blood vessel (Figs. 10 & 11). No histopathological alterations were noticed in kidneys of rats from group **6** (Figs. 12 & 13). On the other hand, kidneys of rats from group **7** showed marked vacillation of epithelial lining renal tubules (Fig. 14), congestion of the glomerular tuft and intertubular mononuclear inflammatory cells infiltration (Fig. 15). Meanwhile, kidneys of rats from group **8** revealed the normal histological structure of renal parenchyma (Figs. 16 & 17).

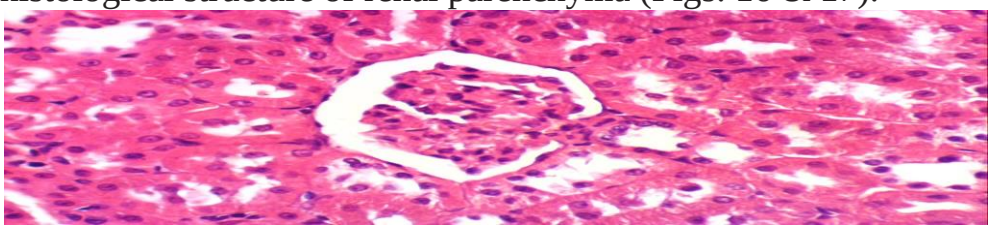

Fig. (1): Kidney of rat from group 1 showing no histopathological alterations (H & E X 400).

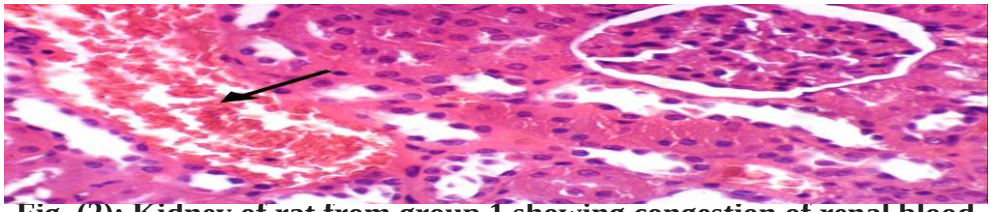

Fig. (2): Kidney of rat from group 1 showing congestion of renal blood vessel (H & E X 400).

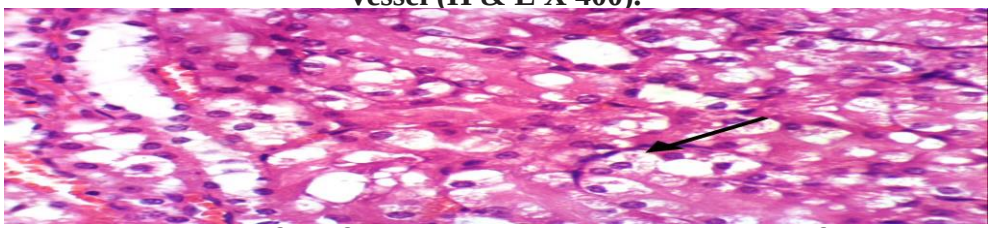

Fig. (3): Kidney of rat from group 2 showing vacillation of epithelial lining renal tubules (H & E X 400).

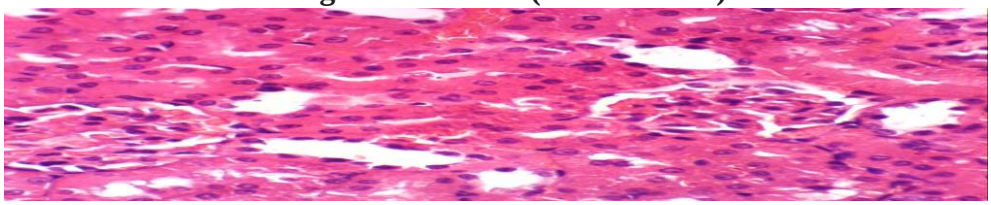

Fig. (4): Kidney of rat from group 2 showing no histopathological alterations (H & E X 400).

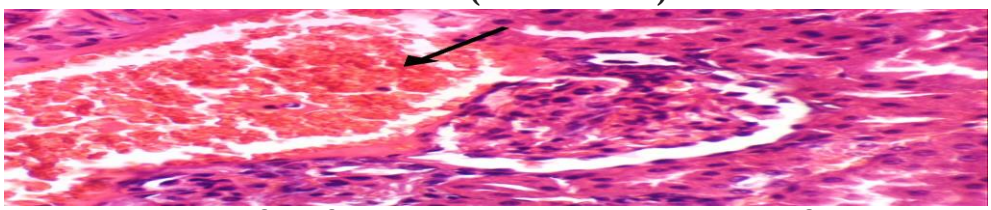

Fig. (5): Kidney of rat from group 3 showing congestion of renal blood vessel (H & E X 400).

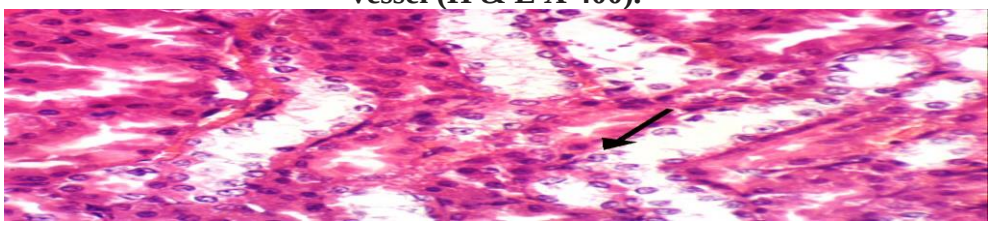

Fig. (6): Kidney of rat from group 3 showing vacillation of epithelial lining some renal tubules (H & E X 400).

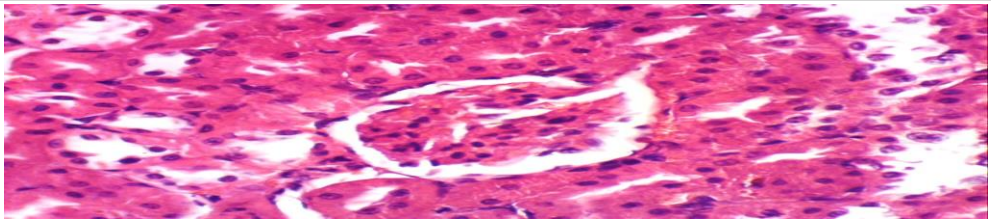

Fig. (7): Kidney of rat from group 3 showing no histopathological alterations (H & E X 400).

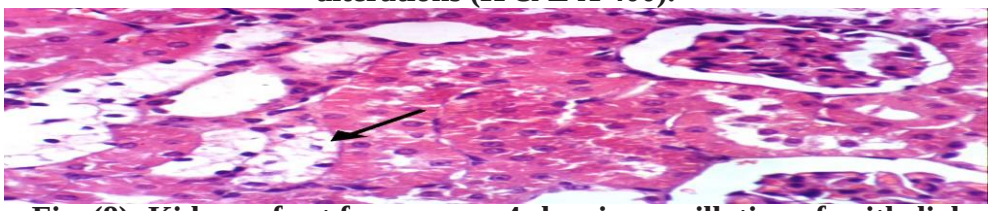

Fig. (8): Kidney of rat from group 4 showing vacillation of epithelial lining some renal tubules (H & E X 400).

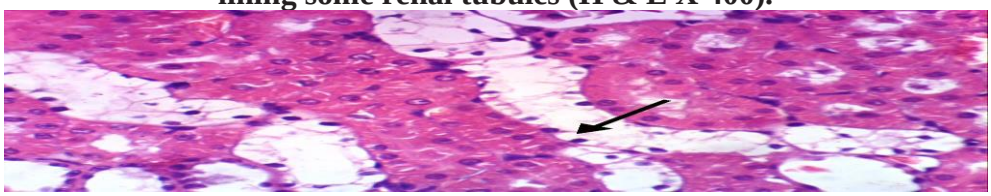

Fig. (9): Kidney of rat from group 4 showing vacillation of epithelial lining some renal tubules (H & E X 400).

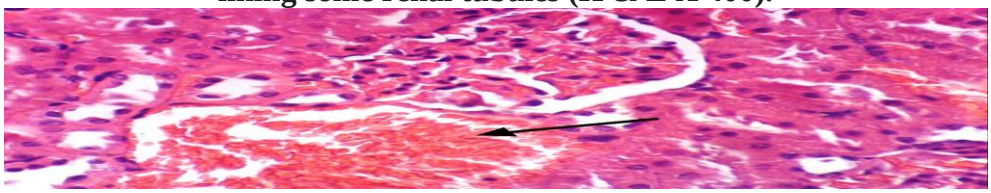

Fig. (10): Kidney of rat from group 5 showing congestion of renal blood vessel (H & E X 400).

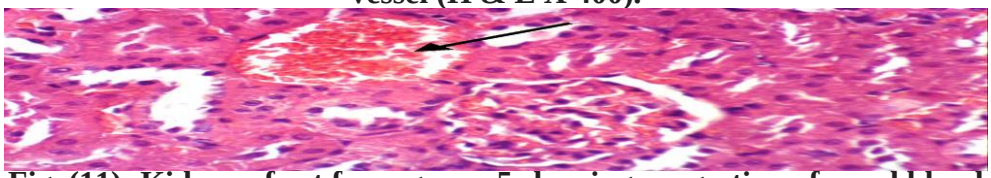

Fig. (11): Kidney of rat from group 5 showing congestion of renal blood vessel (H & E X 400).

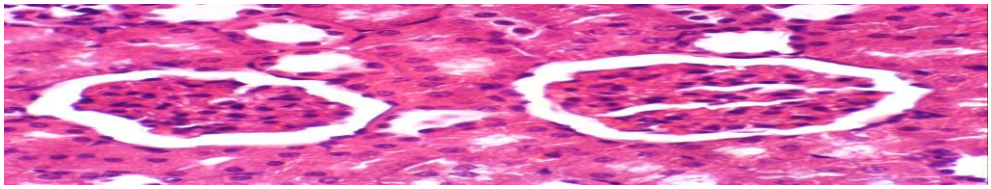

Fig. (12): Kidney of rat from group 6 showing no histopathological alterations (H & E X 400).

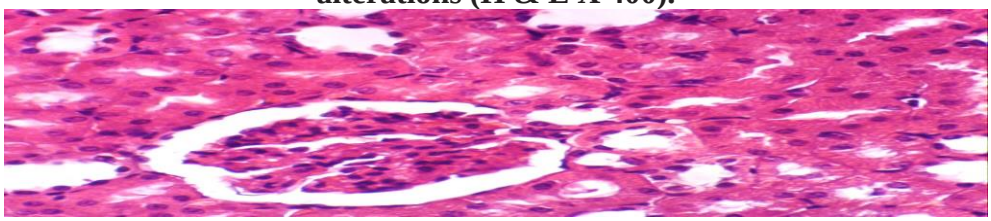

Fig. (13): Kidney of rat from group 6 showing no histopathological alterations (H & E X 400).

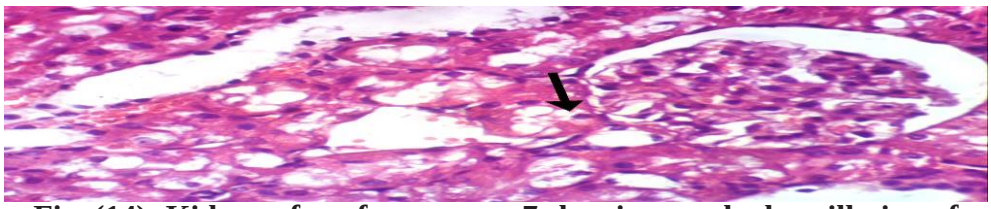

Fig. (14): Kidney of rat from group 7 showing marked vacillation of epithelial lining renal tubules (H & E X 400).

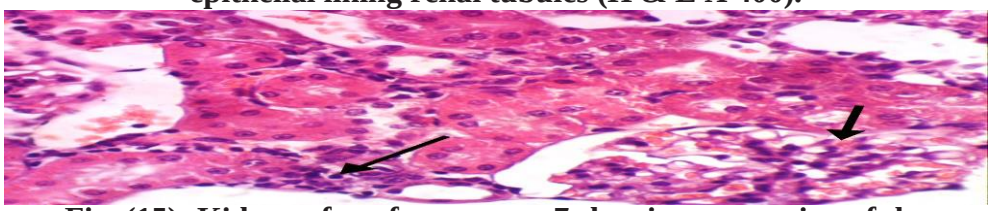

Fig. (15): Kidney of rat from group 7 showing congestion of the glomerular tuft and intertubular mononuclear inflammatory cells infiltration (H & E X 400).

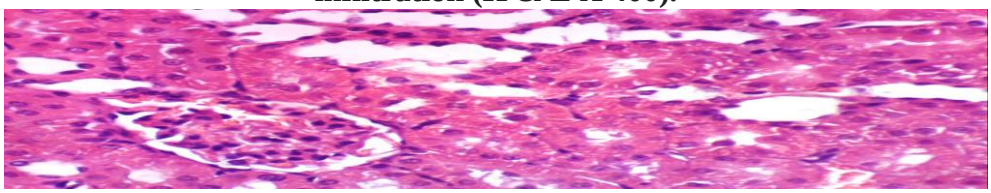

Fig. (16): Kidney of rat from group 8 showing the normal histological structure of renal parenchyma (H & E X 400).

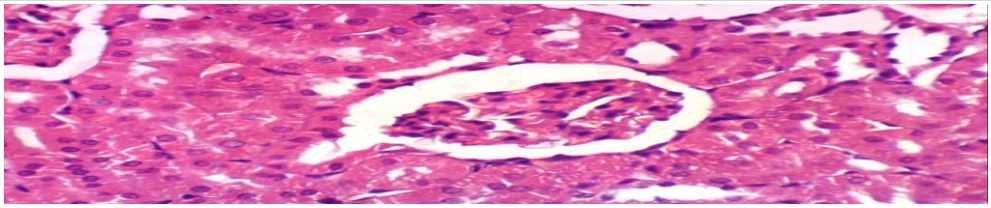

Fig. (17): Kidney of rat from group 8 showing the normal histological structure of renal parenchyma (H & E X 400).

Histopathological examination of Liver:

Microscopically, liver of rats from group **1** revealed no histopathological alterations (Fig. 1) except portal infiltration with inflammatory cells (Fig. 2). However, liver of rats from group **2** showed slight activation of Kupffer cells (Fig. 3) and congestion of hepatic sinusoids (Fig. 4). Some examined sections from group **3** revealed congestion of central vein and hepatic sinusoids (Fig. 5), whereas, other sections showed no histopathological changes (Fig. 6). Meanwhile, liver of rats from group **4** showed slight cytoplasmic vacillation of hepatocytes (Fig. 7), slight activation of Kupffer cells and necrosis of sporadic hepatocytes (Fig. 8). No histopathological changes (Fig. 9) were noticed in liver from group **5** except fibroplasia in the portal triad (Fig. 10) in some examined sections. Moreover, congestion of central vein was the only histopathological finding observed in liver from group **6** (Figs. 11 & 12). Examined sections from group **7** showed congestion of central vein and hepatic sinusoids (Fig. 13) as well as Kupffer cells activation and fibroplasia in the portal triad (Fig. 14). On the other hand, liver of rats from group **8** revealed the normal histological structure of hepatic lobule (Fig. 15).

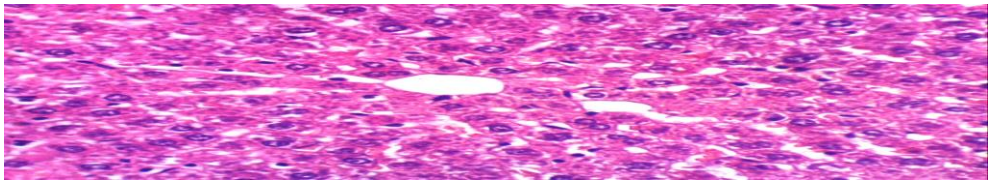

Fig. (1): Liver of rat from group 1 showing no histopathological alterations (H & E X 400).

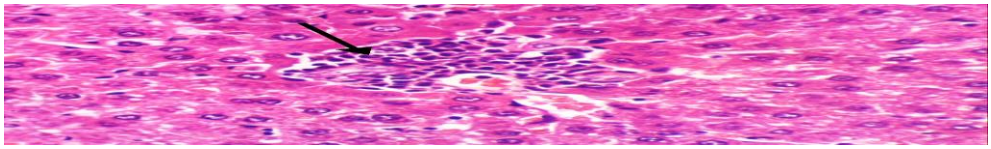

Fig. (2): Liver of rat from group 1 showing portal infiltration with inflammatory cells (H & E X 400).

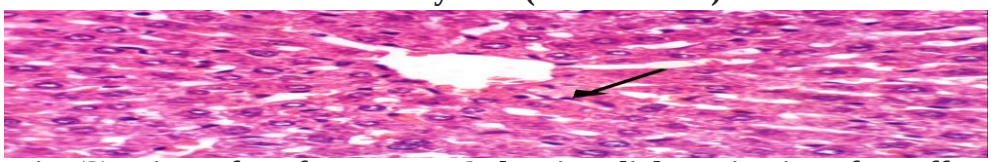

Fig. (3): Liver of rat from group 2 showing slight activation of Kupffer cells (H & E X 400).

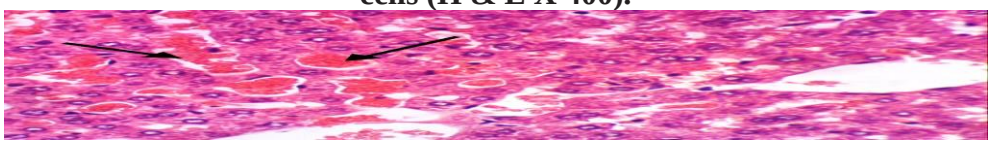

Fig. (4): Liver of rat from group 2 showing congestion of hepatic sinusoids (H & E X 400).

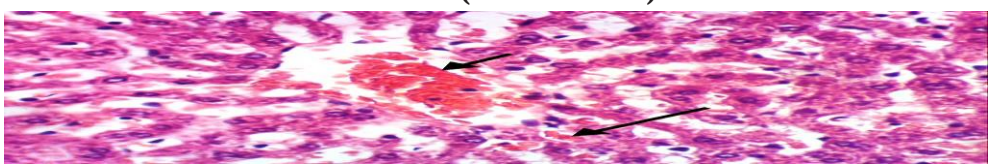

Fig. (5): Liver of rat from group 3 showing congestion of central vein and hepatic sinusoids (H & E X 400).

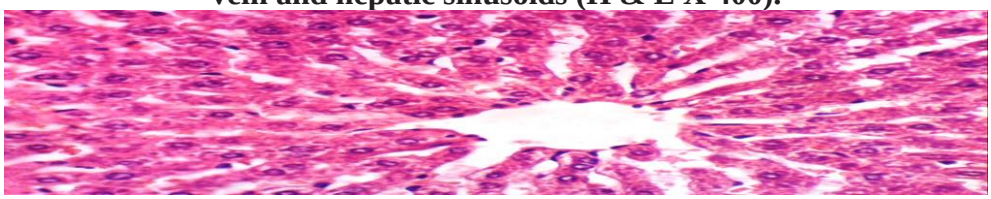

Fig. (6): Liver of rat from group 3 showing no histopathological changes (H & E X 400).

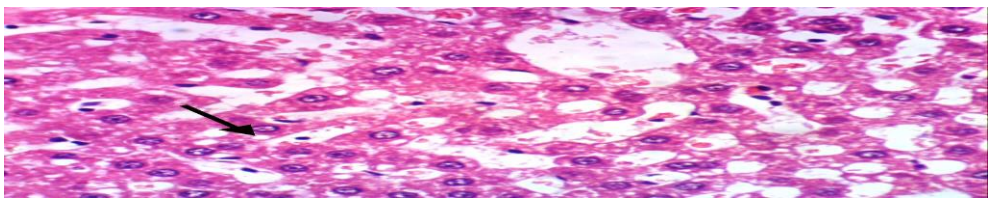

Fig. (7): Liver of rat from group 4 showing slight cytoplasmic vacillation of hepatocytes (H & E X 400).

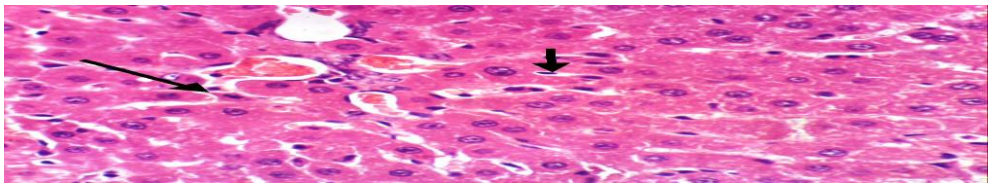

Fig. (8): Liver of rat from group 4 showing slight activation of Kupffer cells and necrosis of sporadic hepatocytes (H & E X 400).

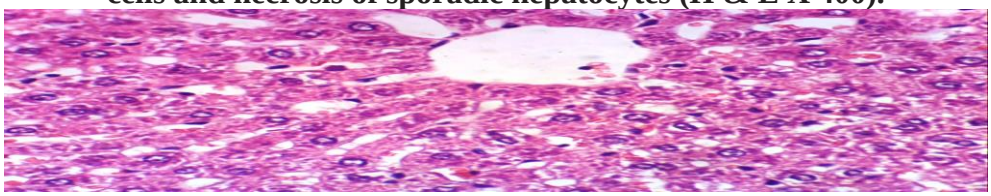

Fig. (9): Liver of rat from group 5 showing no histopathological changes (H & E X 400).

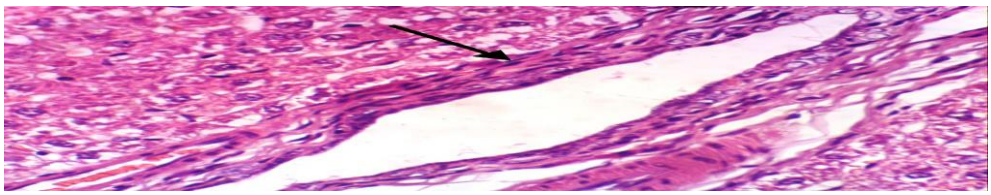

Fig. (10): Liver of rat from group 5 showing fibroplasia in the portal triad (H & E X 400).

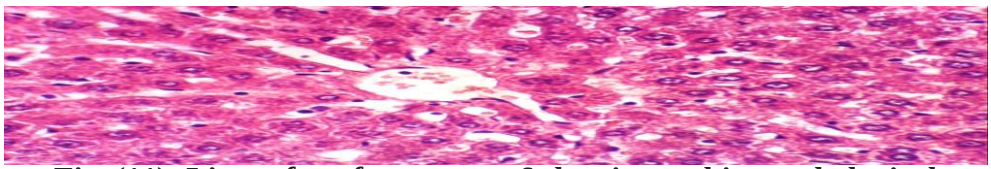

Fig. (11): Liver of rat from group 6 showing no histopathological changes (H & E X 400).

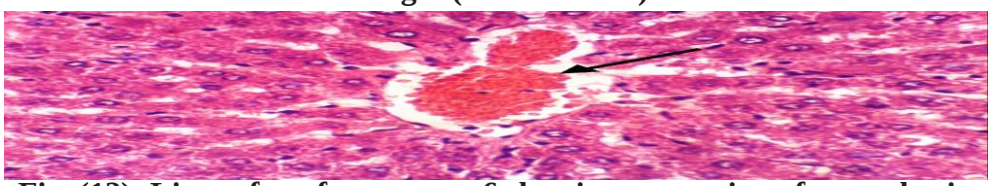

Fig. (12): Liver of rat from group 6 showing congestion of central vein (H & E X 400).

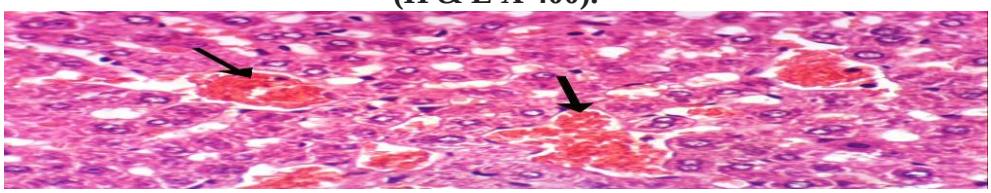

Fig. (13): Liver of rat from group 7 showing congestion of central vein and hepatic sinusoids (H & E X 400).

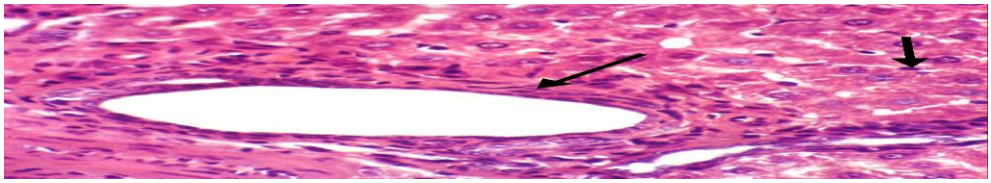

Fig. (14): Liver of rat from group 7 showing Kupffer cells activation and fibroplasia in the portal triad (H & E X 400).

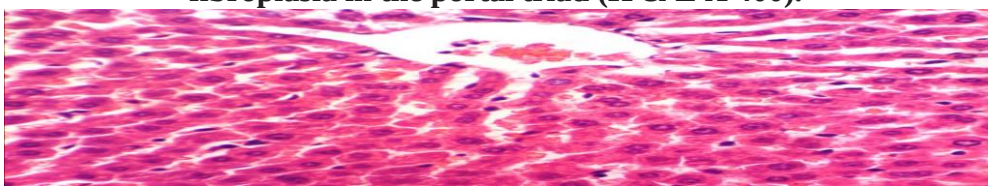

Fig. (15): Liver of rat from group 8 showing the normal histological structure of hepatic lobule (H & E X 400).

DISCUSSION

The present study is performed to investigate the effect of different doses of samwa and curry extracts on the internal organs, sensitivity of pancreas and lipid profile on diabetic rats. Rats were fed on basal diet and received water extract of (Samwa 150 & 250 ml/kg Curry 350 & 450 mg/kg), mixture (Samwa 150 ml/kg + Curry 350 ml/kg) and mixture (Samwa 250 ml/kg + Curry 450 ml/kg). Biological parameters as well as analysis of blood glucose, lipid profile, liver function and histopathological studies of pancreas, liver and kidney were done.

Medicinal plants and herbs played an important role in the prevention and treatment of diabetes mellitus. Samwa (Cleome droserifolia) has an immediate effect on abdominal a rheumatic pains and inflammations. In addition, Cleome droserifolia extracts has specific biological effects in improving the carbohydrate metabolism **(Mikhail, 2000).** Samwa leaves (Cleome droserifolia) is one of the most popular medicinal herbs common in South Sinai –Egypt, it is an aromatic shrub. Bedouin of South Sinai use samwa medicinally to treat a variety of ailments in both people and animals, including bee stings, internal and external infections, and diabetes **(Dina Aly and Rafik Khalil 2019).** It also has a long history of medicinal use, especially in Sinai for the treatment

of diabetes mellitus in individuals with non-insulin dependent diabetes **(El-Askary, 2005).**

Curry leaves (Murrayakoenigiia) tropical and subtropical aromatic plant with white fragrant flower. It has been reported that anti-diabetic, antioxidant hepatoprotective. Curry leaves have been found to reduce blood sugar in diabetic rats in a study published in march 2007 in the "journal of ethno pharmacology". Curry leaves have some phytochemical that inhibit enzyme alpha amylase present in human pancreas. This enzyme breaks down starch in small intestine and its inhibition can help to control blood sugar level in patients with type 2 diabetes. It is found that if they take in a dose of about 12gm /day for a month can reduce fasting and post prandial blood sugar level **(Wasink, S.V. *et al.*, 2016).**

Our results revealed that injection of rats with Aloxan 150 mg/kg compared to control negative rats, caused significant decreasing in body weight gain and feed efficiency ratio, while insignificant decrease in pancreas relative weight, more than significant increase in blood glucose levels, significant increase in triglyceride, cholesterol, LDL and VLDL agree with previous results as diabetes mellitus causes disorders in lipid profile measurements. Moreover, Histopathological analysis for Pancreas showing vacuolation of cells of islets of Langerhans's, these results are agreed with **(Osasenaga *et al.*, 2017).**

Results of the present study showed; the rats injected by Aloxan diabetogenic can be protected with Curry and Samwa, as compared to unprotected rats in group (+ve) which shows significant increase in body weight gain and feeding efficiency ratio. The increasing in BWG in treated groups is an indicator that Curry, Samwa and its mixture had ability for decreasing side effects of diabetes mellitus, such as weight loss. This finding agreed with **El-Askary, 2005** who stated that Samwa has a long history of medicinal use, especially in Sinai for the treatment of diabetes mellitus in individuals with non-insulin dependent diabetes. Its decoction of leaves and stems is widely used by the Bedouins of the southern Sinai for the treatment of diabetes.

Furthermore, **Farhat, *et al.*, 2000** find that the leaves of Curry are used as an herb in Ayurvedic medicine. They are believed to have an adjuvant action on non-insulin dependent diabetics (people with type- 2 diabetes).

Insignificant increase in Pancreas relative weight approved the vacuolation of cells of islets of Langerhans's, which observed in histopathological examination of unprotected rats, specially it observed that rats received 250 mg/kg Samwa, 450 mg/kg Curry and 250 mg Samwa + 450 mg Curry /kg, showed normal histological structure. While insignificant decrease in liver relative weight in protected rats compared to (+ve) control rats also observed, it may be an indicator that Samwa and Curry had protective effect to the liver from the deferens toxins, this result was approved with **Abd- El Kader *et al*., 2009** who reported that Samwa leaves was reported to exhibit several bioactivities and uses, such as antioxidant, antimicrobial, anticancer, antiviral, hepatoprotective and immunomodulatory. More ever **WanYong, *et al*., 2015** suggested that aqueous extract of curry which possessed antioxidant and anti-inflammatory effects, can be used as a potential treatment for liver diseases caused by oxidative stress.

Significant decrease in blood glucose level compared to group (+ve) observed in our study, these findings agreed with those previously reported b**y El-Askary, 2005; El-Komy *et al*., 2017** and **Farhat, *et al.*, 2000.**

Significant decrease in levels of Cholesterol, Triglyceride, LDL and VLDL while significant increase in HDL levels compared to +ve control group approved with decreasing in liver relative weight and those previous studies with **Wan Yong, *et al.*, 2015; Iyer and Mani, 1990; 2016; El-Komy *et al.*, 2017 and Abd- El Kader *et al.*, 2009.**

Our results showed Significant decrease in levels of liver enzymes GPT and GOT in treated rats compared to untreated rats (+ve control group) approved with previous results which showing decreasing in triglyceride, LDL, cholesterol and VLDL

also decreasing in liver relative weight. These results approved with **WanYong, *et al*., 2015 and Abd- El Kader *et al*., 2009.**

CONCLUSION

The results were that the mixture of Samwa and curry extracts achieved better results than the extract of individual leaves. Therefore, we recommend taking the mixture of Samwa and curry leaves to control the high level of glucose and lipid imbalance in diabetic.

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