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Study of The Effect of Muskmelon (*Cucumis melo L.*) Powder on Lowering the Blood Glucose of Alloxon -Injected Male Albino Rats

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ABSTRACT:

This research aims to estimate the chemical composition and phenolic compounds of Muskmelon (Cucumis melo L.) powder and evaluate its hypoglycemic effects. Thirty male adult Sprague-Dawley rats were divided into five groups: Group (1): Negative control group (-) fed on the basic diet only, Group (2): Hyperglycemic rats - positive control group (+) fed on the basic diet only, while the groups (3, 4, 5) were hyperglycemic rats and fed the basic diet with different levels of Muskmelon powder (2.5%, 5%, 7.5%), correspondingly. After 28 days, by the end of the experiments, blood samples were collected for determination of glucose, TG, HDL-c, LDL-c, VLDL-c, ALT, AST, ALP, urea, uric acid, and creatinine. The weights of rats and the internal organs were also calculated, along with histological analyses of the liver and kidneys. The results in the hyperglycemia untreated group showed a decrease in weight gain, internal organs, and HDL, while an increase in the serum of blood glucose, TG, LDL, VLDL, ALT, AST, ALP, urea, uric acid, and creatinine. The results gradually improved using Cucumis melo L. powder (2.5%, 5%, and 7.5%), respectively; the best group was (7.5%). The histopathological examination of the liver and kidneys also showed despicable pathological histological changes in the group (2) "positive control group (+)." At the same time, significant and noticeable improvement appeared in the tissue of groups (3, 4, 5) hyperglycemic rats treated with Cucumis melo L powder (2.5%, 5%, 7.5), respectively, and the best group was (7.5%).

Keywords: *Chemical Composition, Phenolic Compounds, Hyperglycemia, Lipid Profile, Liver Function, Kidney Function*

1. INTRODUCTION

Diabetes mellitus is a perilous metabolic disorder that gives rise to numerous microvascular and macrovascular complications; the global prevalence of diabetic patients has been rising at an alarming rate. Common risk factors in the twenty-first century include an aging population, sedentary lifestyles, obesity, and an increase in the consumption of high-calorie and fattening diets. Preventing the progression of diseases will be an important objective in this century. The potential for averting disease complications through the management of blood glucose levels and amelioration of hyperglycemia is readily apparent [1]. iabetic kidney disease, blindness, and lower-extremity amputations are just a few of the major health consequences that can arise from diabetes, which ranks seventh in the United States [2].

Muskmelon (Cucumis melo L.), a vegetable crop that is widely consumed on a global scale, possesses significant economic value. Melons are annual plants that are grown in temperate regions of Europe, Asia, and Africa. They are members of the Cucurbitaceous family. Their succulent pulp tastes incredibly good and serves as the ideal dry-weather alternative to natural drinks and meals. Perfectly delicious, ripe melons are enjoyed raw as a refreshing treat. Because of their usefulness in traditional medicine and their appealing sensory qualities, Globally, Cucumis melo L. is cultivated. In addition to its nutritional value, the Cucumis melo L fruit is suggested for the treatment of cardiovascular conditions. The flesh of melons is a good source of [3] The Cucumis melo L. melon, which belongs to the Cucurbitaceae family, is among the most extensively cultivated horticultural crops globally. This family of plants has been the subject of several investigations because of their nutritional, medicinal, veterinary, and ethnomedical qualities. Its fruit is nearly always twisted and bowed, and it is typically thin. A crop of immature fruits is made, and they are eaten raw in salads and as medicine [4].

Melon seeds, according to these authors, include the following nutrients: soluble sugars (3.7–4.2%), proteins (34.4%–39.8%), crude fiber (4.5–8.5%), fat (41.6%–44.5%), carbs (8.2%–12.7%), and minerals (4.6–5.1%). Tocopherols, phospholipids, and sterols are among the lipid fractions. linoleic acid (51.1–58.5%) and Oleic acid (24.8%–25.6%) were the two main fatty acids in lipids. The three main triglycerides were oleoyl dilinolein (OLL) (31.0%–34.0%) ,palmitoyl dilinolein (PLL) (14.9%–22.3%) and trilinolein (LLL) (31.3%–32.2%), [5]. **β**-carotene and phytoene are also present in melon. However, there is a dearth of data from Pakistan regarding the phenolic composition of honeydew melon seeds and their potential as antioxidants. The study utilized high performance liquid chromatography with array detection (HPLC-DAD) to provide novel insights into the substantial phenolic contents and antioxidant properties of diverse seed extracts. [6].

2. Materials and methods

2.1. Materials

2.1.1 Fruits and other materials:

Muskmelon (Cucumis melo L) fruits were obtained from the Ministry of Agriculture at Shibin EL-kom, Menoufia, Egypt.

2.1.2 Chemicals:-

The diabetes mellitus-inducing chemical alloxan (Pure chemical) was procured from Sigma, located at 29 Mawardi Street, Qasr Al-Aini, Cairo, Egypt. The kits were provided by the Cairo, Egypt-based Bio Diagnostics Company.

2.1.3 Rats:-

A total of thirty (30) mature albino rats, each weighing 110±10g, were obtained from the Animal House of the Food Technology Research Institute at the Agricultural Research Center, Giza.

2.2 Methods:

The experimental basal diet for the tested rats consisted of the following components: cellulose (5%), casein (12%), corn oil (10%), mineral mixture (4%), vitamin mixture (1%), chorine chloride (0.2%), methionine (0.3%), and corn starch (67.5%).[7].

2.2.1 Preparation of Muskmelon Seeds:

After the flesh was cut out, the seeds were gathered, cleaned, sun-dried, ground into a fine powder, and refrigerated at 4°C.

2.2.2 Induction of diabetes mellitus

The experiment's basal diet consisted of the following ingredients: chorine chloride (0.2%),cellulose (5%), casein (10%), methionine (0.3%), corn oil (10%), vitamin mixture (1%) and mineral mixture (4%) the tested rats consumed this food.[8].Rats were given fasting blood samples one week following the alloxan injection in order to measure their fasting serum glucose levels. Individuals with serum glucose levels exceeding 200 mg/dL were categorized as diabetic. [9].

2.2.3 Experimental design and animal groups:

Thirty Sprague-Dawley in this investigation, male strain albino rats weighing around 110±10 g were utilized. For the purpose of acclimatization, all rats were given the control food (basal diet) for a week at Menoufia University's Animal House of the Home Economics Faculty. Every rat was kept separately in a controlled environment within a stainless steel wire cage. To prevent food loss and contamination, diets were given to the rats in a unique feeding cup designed to prevent spilling. Rats were given access to tap water through glass tubes that protruded through wire cages from bottles that were flipped and held to one side of the cage:

- *Rats consuming a basal diet exclusively served as the negative control in Group 1.*
- *Rats injected with alloxan while on a basal diet comprised the positive control in Group 2*
- *Group 3 consisted of diabetic rats that were provided with a basal diet supplemented with 2.5% Cucumis melo L. powder.*
- *Group 4 consisted of diabetic rats that were provided with a basal diet supplemented with 5% Cucumis melo L. powder.*
- *Group 5 consisted of diabetic rats that were provided with a basal diet*

supplemented with 7.5% Cucumis melo L. powder.

2.2.4 Biological Evaluation:

Every day of the trial was monitored for diet, and every week, body weight was recorded. The following formulas were used, per [10], to determine the body weight gain (BWG g).

BWG (g) = Final weight - Initial weight

2.2.5 Organs:

The liver and kidney were extracted, cleansed, weighed, and fixed in a 10% formalin solution in preparation for histopathological analysis.

2.2.6 Determination of Biochemical Blood Parameters:

Blood samples were collected via the abdominal aorta at the conclusion of the experiment, subsequent to a 12-hour fast. Scarification of the rats was performed while under ether anesthesia. Blood samples were collected into two distinct tubes: one containing EDTA, which was used to collect whole blood for the complete blood count, and the other containing clean dry centrifuge tubes. These tubes were used to separate the serum from the blood, which was allowed to clot at room temperature before being centrifuged at 3000 r.p.m. for 10 minutes. For biochemical analysis, serum was meticulously aspirated, transferred to sterile cuvette tubes, and frozen at -20 degrees Celsius in accordance with the procedures outlined in [11].

The subsequent parameters were ascertained through the examination of every serum sample: As described in [12], The quantification of creatinine was performed utilizing the kinetic method.

The aspartate aminotransferase (AST) and alanine amino transferase (ALT) standards were determined using the protocol outlined in reference [11]. ALP (alkaline phosphatase) was quantified in accordance with [13].As specified in reference [14], high density lipoprotein cholesterol (HDL-c).The low density lipoprotein cholesterol (LDL-c) calculation was performed in accordance with the methodology described in reference [15].[16] triglyceride as well.Glucose levels in the serum were determined utilizing chemical kits as described in [17].

2.2.7 Histopathological Investigation

Liver and kidney were fixed and stored in 10% formalin solution for histopathological examination according to method mentioned by [11].

2.2.8 Statistical Analysis:

A computerized Costat Program was used to statistically evaluate the data using a one-way ANOVA and a completely randomized factorial design [18].The Duncan's Multiple Range Test was used to separate the means when a substantial mean impact was found. Treatment differences were deemed significant when $P < 0.05$. The data is displayed as mean ± SD.

3. Results and Discussion

The findings of table (1) showed the nutrient composition of seeds has moisture 6.56 percent, protein 10.45 g, fat 36.4g, crude fiber 20.56 g, ash 1.80g and carbohydrates 24.23g respectively. The mineral composition of the muskmelon seeds was found to be 300.24 gm of potassium, 1.68mg of sodium and 6.87 mg of phosphorus respectively. The present trail observed a higher moisture content in the seeds of Cucumis melo L. compared to the findings reported by [19] as 4.5%, the other proximate such as protein, ash and carbohydrates were lower than with values being 11.21 %, 12.61 %, and 73.18 % respectively except fat which was high as 36.4%.

Table (1): Proximate composition of Cucumis melo L seeds (per100g)

Nutrients	Cucumis melo. L seeds
Moisture (%)	6.56±0.34
Protein (g)	10.45±0.65
Fat (g)	36.4±1.04
Ash(g)	1.8±0.02
Crude fiber(g)	20.56±1.15
Carbohydrates (g)	24.23±2.92
Potassium (mg)	300.24±0.04
Sodium (mg)	1.68±0.11
Phosphorous (mg)	6.87±0.25

The phenolic acids were quantified using HPLC with data recorded at 284 nm, as shown in Table 2. The primary bioactive compounds identified in the seeds were gallic acid (37.06 μg/g), chlorogenic acid (14.06 μg/g), coffeic acid (2.00 μg/g), vanillin (4.38 μg/g), and cinnamon (3.45 μg/g).The cytotoxic, antiviral, anti-mutagenic, and antioxidant properties of cinnamic acid, coffeic acid, and gallic acid have been documented. The observed variations may be attributed to factors such as cultivar selection, environmental conditions throughout plant development and fruiting, phenotypic state of the plants, and extraction methods.

Table (2) presents the quantification of phenolic acids using HPLC data collected at 284 nm. The principal bioactive chemicals detected in the seeds were gallic acid (37.06 μg/g), chlorogenic acid (14.06 μg/g), caffeineic acid (2.00μg/g), vanillin (4.38μg/g), and cinnamic acid (3.45μg/g).The anti-mutagenic, antiviral, antioxidant, anticancer and cytotoxic properties of gallic acid, coffeic acid, and cinnamic acid have been shown. Variations in these properties may be related to different cultivars, environmental factors during fruiting, plant growth and plant phenotypic state, and/or extraction conditions [20].

Table (2): Phenolic compounds of Cucumis melo L seeds

Sample	Conc. (μg/g)
Gallic acid	37.06
Chlorogenic acid	14.06
Coffeic acid	2.00
Vanillin	4.38
Cinnamic acid	3.45

The impact of Cucumis melo L powder on body weight gain (BWG/28day) in hyperglycemic rats is illustrated in Table 3. It was observed that the control (+) group had a significantly lower mean value of BWG than the control (-) group, at 20.12±2.76 and 33.17±3.11, respectively, indicating a substantial difference. The mean values of hyperglycemic rats on various diets varied significantly from those of the control group (+). The corresponding values for groups 3, 4, and 5 were 23.58±1.99, 26.41±4.97, and 29.27±4.81, respectively.In comparison to the control group (+), group 5 (Cucumis melo L powder 7.5%) exhibited the highest BWG.

A reduction in the body weight of the rats was observed subsequent to the administration of alloxan solutions. The rats developed hyperglycemia as a consequence of the antibiotic alloxan destroying islet **β**-cells in the pancreas. Additionally, this led to a reduction in the secretion of endogenous insulin, which subsequently impacted the tissues' glucose utilization. This discovery is consistent with prior research that has noted sulfonylurea drugs elevate blood glucose levels through the stimulation of **β** cells to secrete insulin.[21]

Melos the cucumber L seeds are an excellent source of vegan protein. Therefore, it has the potential to promote satiety and facilitate muscle growth. This results in an increase in metabolic rate, which aids in weight management. Diets consisting of various components and concentrations have a substantial impact on body weight over more time. It was observed that seed administration resulted in a slight reduction in body weight for rats on a standard diet; however, experimental groups experienced a significant increase in body weight when compared to their control counterparts.

Normal control rats exhibited a gradual increase in body weight, whereas diabetic control rats demonstrated a comparatively smaller increase. An increase in body weight was observed in the remaining groups of diabetic rats that were fed bitter melon. By including melon seeds in one's diet, it is possible to prevent polyuria syndrome associated with diabetes. Sugar output in the urine is decreased when diabetics incorporate melon seeds into their diet. Diabetes is commonly associated with renal impairment and edema. Primarily, chemical compounds such as glycosides, saponins, phenols, alkaloids, and flavonoids are responsible for this proliferation.[22].

The impact of Cucumis melo. L powder on the feed intake (FI/g/day) of hyperglycemic rats is presented in Table 3. It was observed that the control (+) group had a significantly higher mean value of (FI) than the control (-) group, with respective values of 17.08 ± 0.77 and 12.28 ± 2.05, indicating a notable distinction in comparison to the control (+) group.The mean values of hyperglycemic rats on various diets varied significantly from those of the control group (+). The corresponding values were (13.9±0.89), (15.01±1.02), and (16.53±0.95) for groups 3, 4, and 5, which contained Cucumis melo L powder at 2.5%, 5%, and 7.5%), respectively. For groups 3, 4, and 5, the present changes of the control-positive group were -3.22, -12.11, and -18.61%, respectively; rats fed G3, G4 exhibited a significant difference between them. In comparison to the control group, group 5 (Cucumis melo L 7.5%) exhibited the highest FI (g/day) treatment.

Cucumis melo L provides the body with the necessary nutrients and fuels. Nonetheless, they remain high in calories, and excessive consumption may result in feed intake; therefore, portion control is essential. Our findings corroborate those of studies [23]. A dose-dependent increase in feed intake was observed subsequent to the oral administration of melon seeds. It is nutrient-dense, containing zinc, magnesium, calcium, potassium, iron, and phosphorus, all of which may contribute to gradual weight gain. It has been established that melon seeds contain a wealth of nutrients, including copper ,folate, iron, zinc, potassium, magnesium, amino acids, and B complex [22]. These nutrients play a crucial role in regulating and supporting the natural metabolism of the body.

The mean value of fasting blood glucose (FER) in rats with hyperglycemia was presented in Table 3. It is possible that the control (+) group had a lower mean value of (FER) than the control (-) group, with respective values of 0.097±0.005 and 0.42/0.003. Demonstrating a substantial disparity in comparison to the control group (+). The mean values of all hyperglycemic rats that were fed different diets increased significantly in comparison to the control group (+).The percentage of increase for groups 3, 4, and 5 relative to the control group (+) was 21.42, 50, and 78.67%, respectively. In comparison to the (-) group, group 5 (Cucumis melo L powder 7.5%) received the superior treatment.

Table (3): Effects of Cucumis melo L powder on body weight gain (BWG), feeding take (FI) and efficiency ratio (FER) of hyperglycemic rats.

	BWG (g/28d)		FI(g/day)		FER	
	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv
G1	33.17±3.1a	64.86	12.28±2.05e	-28.10	0.097±0.01a	130.9
G2	20.1±2.76e	-	17.08±0.77a	-	0.042±0.003 d	-
G3	23.58±1.9d	17.19	16.53±0.95b	-3.22	0.051±0.012 d	21.42
G4	26.41±4.97c	31.26	15.01±1.02c	-12.11	0.063±0.002 c	50
G5	29.27±4.81b	45.47	13.9±0.89d	-18.61	0.075±0.001 b	78.67
LSD	2.05	-	0.54	-	0.009	-

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

Persistent hyperglycemia in individuals with diabetes leads to increased production of ROS via glucose oxidation. This, in turn, disrupts cellular processes, inflicts membrane damage via oxidative stress, and renders the body more susceptible to lipid peroxidation. Weight loss decreased FER in diabetic rats and was linked to a number of health benefits. [21].

Muskmelon seeds contain an abundance of vegan protein. Therefore, it has the potential to promote satiety and facilitate muscle growth. This enhances the rate of metabolism, thereby aiding in weight management due to its nourishing attributes and rich content of pro-vitamin A and vitamin C. [3].The impact of Cucumis melo L. powder on the liver weight (g) of hyperglycemic rats was presented in Table 4. It was observed that the control (+) group had a higher mean value of liver (g) than the control (-) group, with respective values of 5.58±0.89 and 4.15±0.77 (g). The difference was statistically significant, as the control (-) group experienced a decrease of -25.62 percent in liver weight compared to the control (+) group. The mean values of all hyperglycemic rats that were fed different diets decreased significantly in comparison to the control group (+).

The present values of decreases for groups 3.4 and 5 were -5.73, -11.82, and -18.45%, respectively. Comparing rats that were fed groups 2, 3, there were no significant differences. In comparison to the control group (+), group 5 (Cucumis melo L. powder 7.5%) exhibited the highest liver weight. This effect is primarily caused by the presence of phenolic chemicals, specifically flavonoids, in melon seeds. An elevation in antioxidant activity was observed; this substance is employed in the management of toxic, acute, and chronic forms of jaundice, cirrhosis, and hepatitis. The introduction of seeds into diabetic rats led to a restoration of liver weight to levels consistent with normalcy [3].

The findings regarding the impact of Cucumis melo L. powder on the heart weight (g) of hyperglycemic rats are displayed in Table 4. It was apparent that the control group (+) had a higher average value of heart (g) than the control group (-), with values of 0.697±0.03 and 0.610±0.01 (g), respectively. This difference was statistically significant, as the control group (-) experienced a decrease of 12.48% in heart weight compared to the control group (+).The values for groups 3, 4, and 5 were 0.676.02, 0.652.04, and 0.6300.05 (g), respectively. In contrast to the control group (+), group 5 (Cucumis melo L. powder 7.5%) exhibited the highest heart weight.

The kidney weight of hyperglycemic rats was examined in relation to Cucumis melo L. powder, as shown in Table 4. A significant difference in the average quantity of kidneys (g) was identified among the control (+) and control (-) groups, with the former experiencing a -15.05 percent reduction and the latter an increase of 1.641±0.09 and 1.394±0.01, respectively .When compared to the (+) control group, there was significant variation in the mean values of hyperglycemic rats that were fed different diets. Group 5, comprising 7.5% cucumber melo L powder, experienced a decline of -8.59%.Group 5 (Cucumis melo L. powder 7.5%) exhibited the highest weight of kidneys in comparison to the control group (+). Hyperplasia and hypertrophy of tubular and mesangial cells within the kidneys may account for a significant increase in the weight of each kidney in diabetic rats. Reducing tubular reabsorption and increasing glomerular filtration rate may constitute the mechanism by which kidney weight increases [24].

A portion but significantly less kidney weight was observed in participants who supplemented with Cucumis melo L. powdered seeds, according to the current study. Hyper-functional kidneys exhibit an elevation in glomerular filtration rate during the initial phases of diabetes. Renal filtration can be reduced in individuals with diabetes by sustaining metabolic control for an extended sequence of time. In our research, those under hyperglycemic control exhibited a substantial increase in glomerular filtration rate. Migraine glomerular filtration rate decreased significantly when fed melon seeds while hyperglycemic. Seeds' hypoglycemic potential has been investigated in numerous scientific studies, which have also proposed diverse modes of application. The results reported in reference [25] align with the expected effects of bitter melon consumption on blood glucose regulation.

A significant difference was identified in the average lung mass (g) between the control (+) and control (-) groups; the control group exhibited a reduction of -21.78% in comparison to the control group, which measured 0.684±0.21 and 0.535±0.03 (g), respectively. When groups 3.4 and 5 were compared to the control positive group, they experienced respective decreases of -11.25%, -7.74%, and -2.48 percent. A comparative analysis between rats administered groups 2 and 3 (5% and 2.5% Cucumis melo L. powder, respectively) was not feasible. In comparison to the control group (+), the Group 5 supplemented with 7.5% cucumber leaf powder exhibited the highest lung weight. Cucumis melo L. seeds are attributed to the phytochemicals with antioxidant activities as flavonoids and phenolics which enhance the body weight, prevented organs damage as lungs and help in reducing the risk of lungs inflammation [26].

The mean value of spleen (g) in the control (+) group was found to be greater than in the control (-) group. The respective weights were 0.394±0.41 and 0325±0.03 (g), which indicates a significant difference of -17.51 percent decrease between the control (-) group and the control (+). The percentages of decline for groups 3.4 and 5 were -2.28, -6.09, and -11.6%, respectively.

Comparing rats that were fed groups 2 and 3, there were no significant differences. In comparison to the control group (+), group 5 (Cucumis melo L.) powder 7.5% exhibited the most favorable spleen weight.

Previous researchs has documented comparable outcomes involving diabetic models and splenic fibrosis, as well as thickened capsule and trabeculae. The introduction of the examined seeds resulted in an augmentation of T-cell production and activity, as well as a stimulation of cytokine production and cellular respiration. These seeds also contained antioxidant factors such as vitamin A and flavonoids, which enhanced insulin sensitivity. [21][3].

Table (4): Effects of Cucumis melo L powder on organs weight of hyperglycemic rats

	Liver (g)		Heart (g)		Kidneys (g)		Lungs (g)		Spleen (g)	
	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv
G1	4.15±0.77d	-25.62	0.61±0.01d	-12.48	1.39±0.01d	-15.05	0.53±0.03d	-21.78	0.32±0.03d	-17.51
G2	5.58±0.89a	-	0.69±0.03a	-	1.64±0.09a	-	0.68±0.21a	-	0.39±0.41a	-
G3	5.26±0.09a	-5.73	0.67±0.02b	-3.01	1.60±0.02a	-2.43	0.66±0.01a	-2.48	0.38±0.21a	-2.28
G4	4.92±0.12b	-11.82	0.65±0.04c	-6.45	1.56±0.25b	-4.93	0.63±0.01b	-7.74	0.37±0.01b	-6.09
G5	4.55±0.19c	-18.45	0.63±0.05d	-9.61	1.50±0.03c	-8.59	0.60±0.11c	-11.25	0.35±0.09c	-11.6
LSD	0.32	-	0.02	4.86	0.04	-	0.02	-	0.01	-

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

The impact of Cucumis melo L. powder on the serum glucose level (mg/dL) of hyperglycemic rats was illustrated in Table 5. It was observed that the control (+) group had a higher mean glucose value than the control (-) group, measuring 290.65 ±5.33 mg/dL compared to 113.7 ±8.34 mg/dl for the control (-) group. This difference indicates a significant difference, as the control (-) group experienced a -55.01% decrease in glucose compared to the control (+) group. The group that exhibited the greatest reduction (32.20%) was group 5, which was fed (Cucumis melo L.)powder at a concentration of 7.5%. Group 4, which did not receive Cucumis melo L. powder, followed suit. A higher level of serum glucose was observed in group 5, in comparison to the control group (+).

Table 5 presents the effects of Cucumis melo L. powder on the blood glucose level (mg/dl) of hyperglycemic rats. The mean glucose levels of the control (+) group were observed to be higher than those of the control (-) group, at 290.65 ±5.33 and 113.7 ±8.34 mg/dL, respectively. This finding demonstrated a statistically significant difference, as the percent decline of the control (-) group was -55.01% less than that of the control (+) group. The largest decline (32.20%)

was observed in Group 5, which was administered Cucumis melo L .powder at a concentration of 7.5%. Group 4 followed suit, with a decrease of 5%. The glucose levels in Group 5 were significantly higher than those in the control (+) group.

Rats subjected to high-dose alloxan treatment have been recognized as an established model for type 2 diabetes due to the severe inhibition of insulin secretion that results in hyperglycemia in rats. Alloxan induces diabetes via ROS, which rapidly degrade pancreatic beta cells, resulting in hyperglycemia [24]. As a result, glucose auto-oxidation generates a greater quantity of free radicals during hyperglycemia. [27].

The well-known hypoglycemic properties of the phytochemicals tannins and saponins, in addition to the soluble fiber and carbohydrates present in citrullus lanatus seed, may be responsible for this hypoglycemic effect.

Table (5): Effect of Cucumis melo L. powder on serum glucose (mg/dl) in hyperglycemic rats

Parameter / Groups	Glucose(mg/dl) Mean ± SD	%Change of +pv
G1	113.76 ±8.34 e	-55.01
G2	290.65 ±5.33a	-
G3	275.84 ±9.21 b	-5.09
G4	237.54±11.99c	-18.27
G5	197.06±9.45 d	-32.20
LSD	13.87	-

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

An alternative hypothesis for this phenomenon might be the antioxidant content of the seeds, as suggested in a prior investigation [28].Antioxidants are protective substances that counteract the cellular damage caused by ROS. It is significant that plants containing glycosides, alkaloids, and flavonoids are believed to possess antioxidant and an anti-hyperglycemic properties.

The antioxidant capacity of seeds may provide protection against ROS associated with chronic hyperglycemia and diabetes-related complications, such as microvascular and macrovascular diseases, according to their findings. Furthermore, regeneration is possible due to the partial destruction of pancreatic beta cells in albino rats caused by the administration of alloxan (150 mg/kg body weight). [24] [29] . Flavonoids found in certain melon seeds are said to regenerate damaged beta cells in the pancreas. Consequently, it is conceivable that the consumption of melon seeds stimulated the production of insulin from surviving **β**-cells and promoted the regeneration of **β**-cells in the pancreas, resulting in an anti-hyperglycemic effect. Furthermore, it was disclosed in reference [28] that this outcome is the result of insulin's action and that the **β**-cells of the islets of Langerhans stimulate its secretion. Additionally, this could be given to the promotion of glucose uptake by peripheral tissues, the suppression of endogenous glucose production, and the induction of gluconeogenesis in the liver and muscles. As a result, it is expected that comparable compounds that enhance pancreatic beta cell regeneration by sequestering ROS could be present in melon seeds.

The effects of Cucumis melo L. powder on total cholesterol (mg/dL) in hyperglycemic rats were presented in Table 6. It was noted that the control (+) group had a higher mean value of total cholesterol than the control (-) group, measuring 233.23±7.85 vs. 128.03±7.04 (mg/dl), respectively. This difference indicated a significant percentage decrease of 45.10% for the control (-) group in comparison to the control (+) group. The mean values of hyperglycemic rats from all diets differed significantly when compared to the (+) group. The corresponding values for three, four, and five were 220.82 ±8.03, 203.17 ±4.99, and 180.27 ±4.77 (mg/dl). The corresponding percentage decreases for groups 3, 4, and 5 were -5.32, -12.88, and -22.70%, respectively. Rats that were fed all groups exhibited significant differences among themselves. In comparison to the control (+) group, group 5 (Cucumis melo L. powder 7.5%) exhibited a superior serum total cholesterol level.

Furthermore, an abundance of research has established a strong correlation [30] between hyperlipidemia and diabetes mellitus. Rats induced with diabetes develop hyperlipidemia due to the over mobilization of fat from adipose tissue, which is caused by the insufficient utilization of glucose, according to one study [31]. It has been observed that certain hormone-sensitive lipases have an enhanced capability to convert stored triglycerides into fatty acids in diabetic animals, resulting in the release of a greater quantity into the bloodstream. As a result, the liver is stimulated to convert surplus fatty acids into phospholipids and cholesterol. Phospholipids, cholesterol, and surplus triglyceride that are produced within the liver have the potential to be expelled into the bloodstream as lipoproteins. The lipoprotein lipase enzyme, which is responsible for the hydrolysis of triglycerides, has been deactivated [32]. It is hypothesized that hypercholesterolemia develops in individuals with diabetes due to the inhibition of **β**-hydroxy-**β**-methylglutaryl-Coenzyme-A (HMG-CoA) reductase, an enzyme that is critical for the metabolism of cholesterol-rich LDL particles, by insulin.

The Cucumis melo L seeds had a significant decrease in some lipid profiles like glyceride, low- density protein, and total cholesterol levels in the rats and at the same time increased the HDL-c level. This could be as a result of increased utilization of glucose which led to the inhibition of lipid peroxidation and control of lipolytic hormones. Melons are a great source of potassium, magnesium, vitamin C, and vitamin A, according to studies. A number of beneficial medical qualities have been demonstrated by it, including analgesic, anti-inflammatory, anti-ulcer ,antioxidant, anti-cancer, diuretic, anti-diabetic, anti-microbial and anti-hyperlipidemic effects [33].

Due to the flavonoids and high fiber content of cucumber seeds (Cucumis melo L), which can reduce inflammation caused by either excessive insulin or blood fat, these seeds have been associated with a decreased risk of heart disease and cholesterol levels [34].

It was observed that the control (+) group had a higher mean value of triglycerides (mg/dL) than the control (-) group, with respective values of 173.91 ±6.34 and 109.30 ±8.63. This difference indicates a significant difference, as the control (-) group experienced a 37.15% decrease in triglyceride levels compared to the control (+) group. The corresponding percent decreases for groups 3.4 and 5 were -22.58%, -19.04, and -9.56, respectively. In comparison to the control group (+), group 5 (Cucumis melo L. powder 7.5%) exhibited the highest serum triglyceride levels (mg/dL).

Gradually, exceeding the target range for glucose can result in increased triglyceride levels due to the additional calories consumed from a diet high in sugar.Groups that were fed Cucumis melo L. demonstrated notably reduced levels of serum triglycerides. In addition to enhancing antioxidant activity and decreasing biomarkers of oxidative stress and inflammation, this plant also contains vitamins, minerals, and fiber. Cucumis melo L is composed of two unsaturated fatty acids, namely 9-hexadecenoic acid and 9-octadecenoic acid. These acids have been found to decrease reactive substances such as triglyceride, LDL cholesterol, and thiobarbituric acid, while also enhancing HDL cholesterol levels and total antioxidant capacity [34].It has been demonstrated that high fiber foods possess hypotriglyceriemic properties [33] by potentially inhibiting the synthesis of triglycerides in living organisms.

The average HDL level in the control (+) group was significantly lower than in the control (-) group, at 37.64 ±3.22 and 58.79 ±3.99, respectively, representing a 56.19 percent increase in the control (-) group relative to the control (+) group. The values for groups 3.4 and 5 were 40.82 ± 5.04, 43.68 ± 2.77, and 46.69 ± 5.76 (mg/dl), respectively. Comparing rats fed groups 3 (Cucumis melo L. powder 2.5%) and 4 (Cucumis melo L. powder 5%) to the control group (+), no significant differences were observed. In comparison to the control group (+), group 5 (Cucumis melo L. powder 7.5%) exhibited the highest HDL levels. These results are consistent with those reported in reference [31], which establishes a link among diabetes and quantitative changes in circulating lipid levels, specifically an elevation in triglycerides, an increase in LDL, and a reduction in HDL. HDL, akin to other lipoproteins, undergoes significant structural and functional modifications in the presence of diabetes.

In addition to insulin resistance, increased synthesis of very low density lipoprotein (VLDL), cholesteryl ester transfer protein (CETP), and endothelial lipase activity may contribute to the specific cause of low HDL-C in type 2 diabetes. The inverse correlation between HDL and coronary heart disease has been established for quite some time. HDL operates via a mechanism referred to as reverse cholesterol transport to facilitate the transportation of cholesterol from non-hepatic peripheral tissues to the liver, where it is metabolized and eliminated [21].

The seeds of Cucumis melo L. contain an abundance of vital fatty acids, zinc, and proteins, among other substances that contribute to their unexpected benefits. It provides numerous cardiovascular health benefits. providing substantial quantities of both polyunsaturated and monounsaturated fatty acids. Studies indicate that these healthy fats may aid in the prevention of heart attacks and strokes. This seed is rich in magnesium, which supports heart health and regulates HDL levels. Seeds' potential ability to promote heart health may be attributed to their antioxidant, anti-inflammatory, and vasodilator characteristics. Its iron content is vital for the transportation of oxygenated blood throughout the entire circulatory system. Additionally, they are rich in zinc, an essential mineral for heart health. It governs

The data revealed that the control (+) group had a higher mean value of low density lipoprotein (mg/dL) than the control (-) group, at 160.81±10.76 and 47.38±2.04, respectively. The difference was statistically significant, as the control (-) group experienced a decrease of -70.5% compared to the control (+) group. The corresponding percentage decreases for groups 3.4 and 5 were -7.63, -18.33, and -32.59%, respectively. In comparison to the control group (+), group 5 Cucumis melo L .powder 7.5% exhibited the highest LDL (mg/dL).

These findings could be linked to the seeds' potential protective (polysaccharide-based) action on pancreatic beta cells. Furthermore, these effects might be brought on by the low activity of the enzymes that produce cholesterol or the negligible amount of lipolysis that is insulin-regulated. Furthermore, unsaturated fatty acids found in seeds, like oleic and linoleic acid, can lower rats' cholesterol levels. These actions most likely entail raising LDL activity while blocking the absorption of cholesterol and bile acids receptors [34].

In the control (+) group, the mean value of very low density lipoprotein was 34.78±4.27 (mg /dL), whereas in the control (-) group, it was 21.86±1.78 (mg /dL). The values for groups 3.4 and 5 were 31.46±2.77, 28.16±1.03, and 25.19±2.95 (mg/dl), respectively. In terms of VLDL, Group 5 (Cucumis melo L.powder 7.5%) was the most effective treatment in comparison to the control group.

This finding is in line with the observation that diabetes significantly raises VLDL-c. The return of more fatty acids as a result of enhanced hormone-sensitive lipase (HSL) activity in adipose tissue and insulin's direct effect on apo B synthesis are the two mechanisms that may cause an increase in VLDL formation in the liver. Additionally, microsomal TG transfer protein (MTP), a crucial enzyme in VLDL formation, is expressed more when there is insulin resistance. Increased FFA entrance into the liver, decreased apoB100 degradation, and increased MTP expression may all contribute to increased hepatic VLDL generation in type 2 diabetes [35][21].

Found that the melon seeds are known to have 30.65% oil, 27.41% protein, 29.96% carbohydrates, 25.32% fiber and 4.83% ash a large number of antioxidants like phenolic compounds. Cucumis melo L is an excellent choice for individuals. VLDL due to its high fiber content, high water content, and absence of fat, cholesterol, and calories [34].

The enhanced excretion of cholesterol and bile acids through fecal sterol excretion may account for the cholesterol-lowering effect of CMFP extracts. The potential mechanism through which various extracts of CMFP function is the mobilization of cholesterol from peripheral cells to the liver, a function attributed to lecithin cholesterol -acyltransferase (LCAT). This may result in a rise in HDL-C levels.

Increased fecal sterol excretion contributes to the cholesterol-lowering effect of Cucumis melo L seeds. This increases the excretion of bile acids and cholesterol. The potential mechanism by which seeds exert their effects is through the mobilization of cholesterol from peripheral cells to the liver via the action of LCAT, which may increase HDL-C and decrease LDL and VLDL [36].

Table (6): Effect of Cucumis melo L. powder diets on total cholesterol (TC), triglycerides (TG), high -density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), very low-density lipoprotein cholesterol (VLDL).

	T.C(mg/dl)		T.G(mg/dl)		HDL(mg/dl)		LDL(mg/dl)		VLDL(mg/dl)	
	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv
G1	128.0±7.04e	-45.10	109.3±8.6e	-37.15	58.8±3.9a	+56.19	47.3±2.0e	-70.5	21.86 ±1.78d	-37.14
G2	233.2±7.8a	-	173.9±6.3a	-	37.6±3.2d	-	160.8±10.7a	-	34.78 ±4.27a	-
G3	220.8±8.0b	-5.32	157.2±9.5b	-9.56	40.8±5.0c	+8.44	148.5±8.6b	-7.63	31.46 ±2.77b	-9.54
G4	203.2±4.99c	12.88	140.7±6.4c	-19.04	43.7±2.7c	+16.04	131.3±6.7c	-18.33	28.16 ±1.03b	-19.03
G5	180.3±4.7d	-22.70	125.9±3.1d	-22.58	46.7±5.7b	+24.04	108.4±7.3d	-32.59	25.19 ±2.95c	-27.57
LSD	10.98	-	13.86	-	2.96	-	7.85	-	3.31	-

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

The effect of Cucumis melo L. powder on urea (mg/dL) in hyperglycemic rats was presented in Table 7. It was observed that the control (+) group had a higher mean value of urea (mg/dL) than the control (-) group, at 30.25±4.05 and 15.46±0.98, respectively. The difference was statistically significant, as the control (-) group experienced a decrease of 48.80% in comparison to the control (+) group. The percentage reductions for groups 3.4 and 5 were -34.23%, -13.04, and -27.11, respectively. In comparison to the control group (+), group 5 (Cucumis melo L. powder 7.5%) demonstrated the most effective treatment. Diabetic complications and alloxan-induced kidney toxicity resulted in elevated urea levels in diabetic rats [38]. The elevated values returned to normal in diabetic rats that were fed Cucumis melo L seeds, confirming the preventative effect of the seeds. Persistent hyperglycemia, alloxan, and free radicals generated by these conditions harm kidney cells and increase oxidative stress while decreasing the antioxidant defense system (CAT, SOD, and GSH). [38].

A melon seed is rich in flavonoids, fat, and vitamin C. Besides, melons contain several compounds that may help lower urea levels and protect against renal damage due to their high-water content and diuretic properties. Staying hydrated is essential for proper kidney function and waste elimination [39].

The mean creatinine level in the control (+) group was 1.49±081 mg/dL higher than in the control (-) group (0.72±0.04), indicating a statistically significant difference of -51.6 percent among the two groups. The mean values of hyperglycemic rats on various diets differed significantly from those of the control group (+). The values of 0.94±0.02, 1.12±0.31, and 0.76±0.03 (mg/dl) were recorded for groups 3.4 and 5, respectively. The differences among rats in groups 5 and 1 (the control group) were not statistically significant. In comparison to the control group (+), group 5 (coated with Cucumis melo L. powder 7.5%) exhibited the most effective treatment.

Serious health issues brought on by diabetes can include renal failure, heart disease, blindness, and lower-extremity amputations [2].

The plant's seeds contain a wide range of chemicals, including tannins, flavonoids, and phenolics, which can be used as powerful medicinal agents to treat a variety of illnesses, including kidney problems that are a side consequence of diabetes. Studies have demonstrated that polyphenols, especially flavonoids, function as antioxidants by lowering oxidative stress. The study evaluated the polyphenolic rich extract from C. melo seeds for its antioxidant and anti-diabetic effects [40].

Melon seeds are rich in a pro-vitamin A carotenoid. It is worth stating that the carotenoid is beneficial to the body because of its antioxidant capabilities. Seeds are rich in flavonoids, fat, and vitamin C. Besides, it is considered to be an important source of ß-carotene and essential source of vitamin B1 and B6 and minerals like magnesium and calcium which may help lower creatinine levels and protect against renal damage due to their high-water content and diuretic properties [39].

The control (+) group exhibited a higher mean value of uric acid (mg/dL) than the control (-) group, measuring 6.87±1.04 versus 4.05±0.97 (mg/dL). The values for groups 3.4 and 5 were 6.07±1.22, 5.25±0.98, and 4.61±1.54 (mg/dl), respectively. In comparison to the control group, group 5 (powder 7.5% Cucumis melo L.) demonstrated the most effective treatment in terms of serum uric acid.

Given that Cucumis melo L. seeds are rich in enzymatic activity and are thought to be a diuretic and helpful agent for both acute and chronic eczema, this noticeable alteration may be partially to blame. Moreover, a variety of bioactive substances found in watermelon seeds, including flavonoids, phenolic compounds, minerals, and vitamins, may help to tangentially lower uric acid levels and shield the kidneys from potential oxidative stress-related damage. These bioactive substances decrease the production of uric acid and ROS by acting as superoxide scavengers Vitamin C is one of the anti-inflammatory elements found in abundance in Cucumis melo L. seeds, which also function as potent antioxidants in the kidneys [39].

Table (7): Effect of Cucumis melo L. powder on kidney function for hyperglycemic rats.

Parameter	Urea(mg/dl)		Creatinine(mg/dl)		Uric acid(mg/dl)	
Groups	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv
G1	15.46±0.98e	-48.80	0.72±0.04d	-51.6	4.05±0.97 e	-41.04
G2	30.2±4.05 a	-	1.49±0.81a	-	6.87±1.04a	-
G3	26.26±2.68 b	-13.04	1.12±0.31b	-24.8	6.07±1.22b	-11.64
G4	22.01±3.09 c	-27.11	0.94±0.02c	-36.91	5.25±0.98 c	-23.58
G5	19.86±3.65 d	-34.23	0.76±0.03d	-48.99	4.61±1.54d	-32.89
LSD	2.14	-	0.17	-	0.23	-

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

The impact of Cucumis melo L. powder on AST (U/L) in hyperglycemic rats was depicted in Table 8. It was observed that the control (+) group had a higher mean value of (GOT) than the control (-) group, at 68.04±3.81 and 40.76±3.78 respectively, indicating a significant difference in percentage of decrease (40.09%) for the control (-) group compared to the control (+) group. The mean values of hyperglycemic rats subjected to different diets varied significantly from those of the control group (+). The values for groups 3.4 and 5 were 64.53±6.41, 59.28±8.56, and 53.78±7.66, respectively. The respective percent of decreases for groups 3 (powder 2.5%), 4 (powder 5%), and

20.95% were as follows: -5.14, -12.87, and -20.95%. With the exception of group 2, rats in all other groups exhibited significant difference in comparison to the control (+) group. The most effective treatment was found in group 5, which contained 7.5% powder, as opposed to the control group (+).

This provided support for the claim that seeds of the Cucumis melo L. posses the capacity to prevent or reverse liver inflammation caused by alloxan ingestion, which resulted in protein leakage and plasma membrane damage; this capability can be attributed to the seeds' potent phytochemical constituents, which have been demonstrated to exhibit antioxidant properties [40].

Lycopene and citrulline are nutraceuticals that have demonstrated efficacy against sickle cell anemia, diabetes, gastrointestinal disorders, ischemic stroke, and renal failure, as well as liver enzymes [41].

The data revealed that the control (+) group had a higher mean value of (GPT) than the control (-) group, at 64.95±4.93 and 39.95±5.21 (U/L), respectively. The difference was statistically significant, with the control (-) group experiencing a decrease of 38.49% in comparison to the control (+) group. The percentages of reduction for groups 3.4 and 5 were -24.03%, -13.87, and -7.23 percent, respectively. With respect to (GPT) activity, group 5 (powder of Cucumis melo L. 7.5%) demonstrated the most effective treatment in comparison to the (+) group.

Compared to the positive control group, the ALT level was found to be lower in animals fed a diet containing the seeds under investigation. The current data is consistent with prior research [21], which demonstrated that individuals with type 2 diabetes have an increased risk of developing cirrhosis and fibrosis, both of which are complications of non-alcoholic fatty liver disease (NAFLD). Notably, identifying individuals with type 2 diabetes who are at risk of developing cirrhosis and hepatocellular cancer is an exceedingly difficult task. ALT, the liver enzyme most strongly associated with adipose tissue accumulation, has been linked to a variety of metabolic syndrome symptoms, according to research [42].

The findings suggest that melon seeds may have the potential to ameliorate the pathological hepatic function associated with diabetes induced by STZ. The seeds with high levels of total phenolic (TP) and total flavonoid (TF) content demonstrated a significant reduction in ALT [25]

The observation revealed that the control group (+) had a higher mean value of alpha-lipoic acid (ALP) than the control group (-). The ALP mean values of hyperglycemic rats, which were influenced by the levels powder of Cucumis melo L., are detailed in Table 8. The relationship between the two groups was statistically significant, with the positive control group exhibiting the highest level of ALP and the negative control group recording the lowest value. There is no significant between groups fed on Cucumis melo L powder at the levels of 2.5% and control (+) group. The mean value of group fed on 7.5% Cucumis melo L powder recorded the lowest mean value when compared with the other treated groups. The percentage reduction of treated groups were 5.98, 9.90 and 17.29 % respectively. By causing glucose auto-oxidation, hyperglycemia increases the production of free radicals, which can harm liver cells. The effects of the diabetogenic drug alloxan may have a secondary role in the rise in oxygen free radicals associated with diabetes, with blood glucose levels rising first [21].

Antioxidant properties of Cucumis melo L seeds flavonoids and alkaloids are obtained from flower, its main alkaloid are listed has antioxidants and anti-inflammatory effects on liver functions as ALP in alloxan-induced diabetic rats [40]. Presence of alkaloids , flavonoids, glycosides, and phenolics, in the phytochemical screening of the melon seeds are likely to be responsible for the antidiabetic effects significantly decreased the serum ALP compared with the control diabetic rats. Phytochemicals found in melon seeds, including polyphenols such as phenolic acid and flavonoids, have been proposed to possess significant therapeutic potential in addressing a range of complications associated with diabetes, as the liver functions by increasing levels of ALP [22].

Table (8): Effect of (Cucumis melo L.) powder on liver function for hyperglycemic rats.

Parameter	AST(U/L)		ALT(U/L)		ALP(U/L)	
Groups	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv	Mean±SD	%Change of +pv
G1	40.76±3.78 d	-40.09	39.95 ±5.21e	-38.49	70.99±8.06d	-25.05
G2	68.04 ±3.81a	-	64.95 ±4.93a	-	94.72 ±9.65a	-
G3	64.54 ±6.41a	-5.14	60.25 ±3.03b	-7.23	89.05 ±5.45b	-5.98
G4	59.28±8.56 b	-12.87	55.94 ±2.82c	-13.87	85.34±7.79 b	-9.90
G5	53.78 ±7.66c	-20.95	49.34 ±6.22d	-24.03	78.34 ±6.79c	-17.29
LSD	3.55	-	3.96	-	4.07	4.86

+PV: Positive control group, G1: Control –ve, G2: control +ve, G3: Cucumis melo L powder (2.5%), G4: Cucumis melo L powder (5%), G5: Cucumis melo L powder (7.5%). Least significant difference at p≤0.05 at means with the same letter in each Column are insignificant difference.

Histopathological examination (liver)

Histopathological examination of the liver Hepatic lobule sections from rats in group 1 (Negative control) exhibited typical histoarchitecture (Photo 1). Rats in group two (the positive control) displayed histopathological damage to their livers, which consisted of edema in the portal triad and hepatocellular vacuolar degeneration (Photo 2). In the interim, there was focal hepatocellular necroptosis accompanied by the infiltration of inflammatory cells (Photo 3). In addition, rats in group 4 (5%) powder of Cucumis melo L. exhibited hepatocellular necrosis that was localized and associated with an influx of mononuclear cells (Photo 4). However, a minor activation of Kupffer cells was observed in the livers of rats in group 5 (7.5 percent powder; Cucumis melo L. Figure 5).

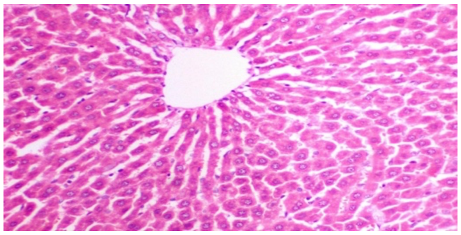

Photo. (1): liver photomicrograph rat from group 1(Negative control) showing normal histoarchitecture of hepatic lobule (H & E X 400).

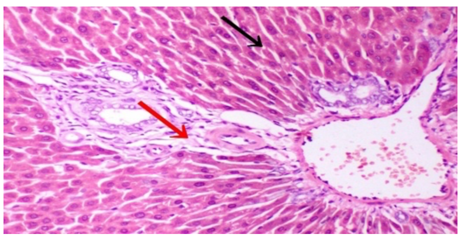

Photo. (2): A Photomicrograph of rats liver from group 2 (positive control) showing hepatocellular vacuolar degeneration (black arrow) and edema in the portal triad (H & E X 400).

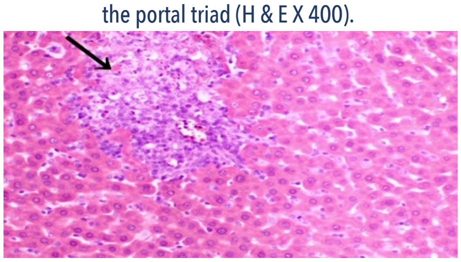

Photo. (3): A Photomicrograph of rats liver from group 3 (Cucumis melo. L powder 2.5%) showing focal hepatocellular necroptosis associated with inflammatory cells infiltration (black arrow) (H & E X 400).

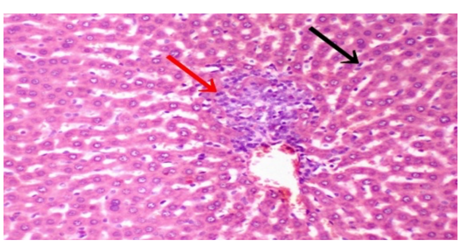

Photo. (4): A Photomicrograph of rats liver from group 4 (Cucumis melo. L powder 5%) showing Kupffer cells activation (black arrow) and focal hepatocellular necrosis associated with mononuclear cells infiltration (red arrow) (H & E X 400).

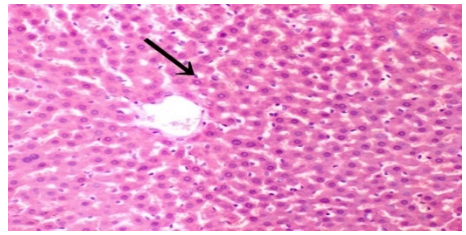

Photo. (5): Photomicrograph of liver of rat from group 5 (Cucumis melo. L powder 7.5%) showing slight Kupffer cells activation (black arrow) (H & E X 400).

Histopathological examination (Kidneys):

A few renal sections obtained from rats in group 1, which served as the negative control, exhibited the characteristic renal histological structure known as parenchyma (Photograph 6). Conversely, renal sections obtained from rats in group 2, which served as the positive control, exhibited interstitial nephritis and vacuolar degeneration of the epithelial lining of the renal tubules (Photo. 7). On the contrary, rats in group 3, which received 2.5% Cucumis melo L.powder, exhibited renal blood vessel congestion (Photo 8.8). In contrast, renal sections obtained from group 4 (5% Cucumis melo. L powder) exhibited vacuolar degeneration of the epithelial lining in certain renal tubules, along with the infiltration of a limited number of mononuclear interstitial cells (photo 9). In addition, histopathological examination of the kidneys of rats in group 5 (7.5 percent of Cucumis melo L. powder) revealed no changes, with the exception of vacuolar degeneration in sparsely lined renal tubules with epithelial lining (Photo.10).

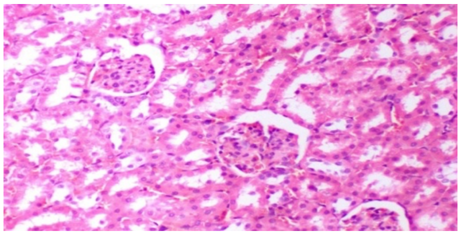

Photo. (6): A Photomicrograph of rats kidney from group 1(Negative control) showing normal histological structure of renal aenchyma (H & E X 400).

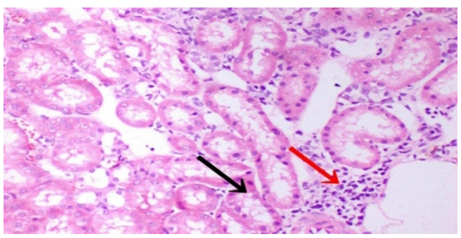

Photo. (7): Photomicrograph of kidney of rat from group 2(Positive control) showing vacuolar degeneration of epithelial lining renal tubules (black arrow) and interstitial nephritis (red arrow) (H & E X 400).

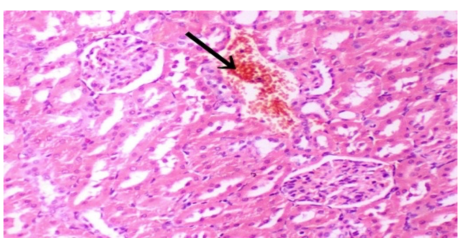

Photo. (8): A Photomicrograph of rats kidney from group 3 (Cucumis melo. L powder 2.5%) showing congestion of renal blood vessel (black arrow) (H & E X 400).

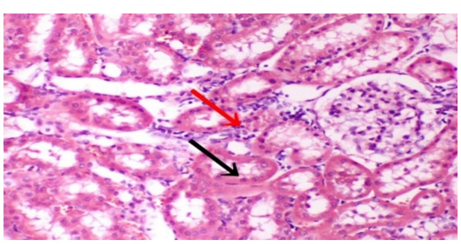

Photo. (9): A Photomicrograph of rats kidney from group 3 (Cucumis melo. L powder 5%) showing vacuolar degeneration of epithelial lining some renal tubules (black arrow) and few mononuclear interstitial cells infiltration (red arrow) (H & E X 400).

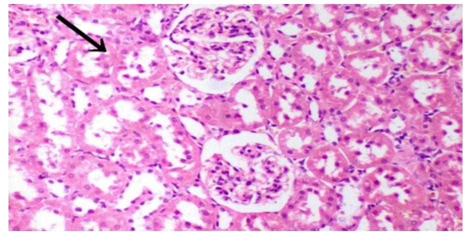

Photo. (10): A Photomicrograph of rats kidney from group 5 (Cucumis melo. L powder 7.5%) showing vacuolar degeneration of epithelial lining sparse renal tubules (black arrow) (H & E X 400).

4. Conclusion

The study's finding validated our hypothesis that Musk melon (Cucumis melo L.) include a variety of bioactive components such as phenolics ,terpenoids ,Flavonoids, carotenoids ,palmitic .gallic, vanillic tocopherols, phospholipids and sterols . These chemicals ,like the others ,have a variety of biological action, Including antioxidant. Group 5 (Muskmelon seeds powder 7.5%) were noticed in liver of rats mild histopathological alterations, Kidneys of rats from group 5 (Musk melon seeds powder 7.5%) exhibited no histopathological alterations .

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الترقيم الدولي اون لاين 2735-590X الترقيم الدولي للطباعة 2735-5934

التغذية وعلوم الاطعمة

تأثير مسحوق بذور الشمام (كوكوميس ميلو ل) الخافض للسكرى على ذكور الفئران البيضاء المستحث بالالوكسان

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الاستشهاد الي:

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الملخص العربي:

يهدف هذا البحث إلى تقدير التركيب الكيميائى و المركبات الفينولية لمسحوق بذور الشمام و تقييم تأثير مسحوق بذور الشمام الخافض لسكر الدم لدى ذكور الفئران البيضاء المحقونة بالالوكسان. تم تقسيم ثلاثون فأرمن الذكور البالغين سبراجو داولي إلى خمس مجموعات وهم :- مجموعة (1) وهي المجموعة الطبيعية السالبة (-) تغذت على الوجبة الأساسية فقط ، المجموعة (2) المجموعة المصابة بالسكر وغير المعالجة الموجبة (+) تغذت على الوجبة الأساسية فقط بينما المجموعات (3، 4 ،5) مصابة بارتفاع سكر الدم و تغذت على الوجبة الأساسية مضاف لها نسب من بذور الشمام (2.5٪ ، 5 ٪ ، 7.5) على التوالي و في نهاية التجربة ، بعد 28 يومًا من التغذية ، تم تقدير الاختبارات البيوكيميائية للدم وهي: سكر الدم، الدهون الثلاثية، الليبوبروتينات، انزيمات الكبد واليوريا والكرياتنين وحمض البوليك. وكذلك تم حساب أوزان الفئران و الأعضاء الداخلية بجانب الفحص الهستوباثولوجى للكبد والكلى. وقد اظهرت النتائج نقص الوزن المكتسب وانخفاض وزن الاعضاء الداخلية و الليبوبروتينات عالية الكثافة وارتفاع نسب كلا من الدهون الثلاثية، الليبوبروتينات، انزيمات الكبد واليوريا والكرياتنين وحمض البوليكفى المجموعة المصابة بارتفاع سكر الدم وتحسنت النتائج باستخدام بذور الشمام تدريجيا وكانت افضلهم مجموعة (7.5 ٪، 5 ٪ ،2.5٪) على التوالى. كما أوضح الفحص الهستوباثولوجي للكبد والكلى تغيرات نسيجية غير مرضية واضحة فى المجموعة (2) المجموعة المصابة بالسكر وغير المعالجة (+) بينما ظهر تحسن كبير وملحوظ يقرب من النسيج الطبيعى فى المجموعات (3، 4 ،5) المصابة بسكر الدم و والمعالجة بنسب من بذور الشمام (2.5٪، 5 ٪، 7.5٪) على التوالي وافضل المجاميع معاجة كانت مسخوق بذور الشمام (7.5٪).

الكلمات الكاشفة: التركيب الكيميائى - المركبات الفينولية - سكر الدم – دهون الدم - وظائف الكبد- وظائف الكلى