The 7th international- 21th Arabic conference
for Home Economics
"Home Economics and sustainable
development2030"
December -15th, 2020
http://homeEcon.menofia.edu.eg

Journal of Home Economics

ISSN 1110-2578

Possible Effects of mango, avocado seeds and their mixture in Alloxan-Induced Diabetic Rats

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Abstract:

The present study was designed to study the effect of mango, avocado seeds and their mixture on diabetic rats. Forty adult male albino rats were used in this study, weighting (150±10g) were divided into eight groups, five rats each. Avocado, mango seedsand their mixture as powder were added at percent 2.5 % and 5% from the main diet. Rats induced alloxan at dose of 150 mg/kg to infect diabetes. Serum lipid profiles (TG, TC, LDL-c, VLDL-c, HDL-c), serum glucose, serum liver enzymes activities (GOT and GPT), kidney function (creatinine, uric acid and urea levels) were also determined. From the obtained results it could be concluded that feeding onmango, avocado seeds and their mixtureas powder caused significant ($P \leq 0.05$) increase in HDL-c, compared with control (-ve) group, and enhanced the kidney and liver functions with the decrease of ALT, AST, ALP, serum glucose, creatinine, uric acid, urea which reflects the powerful nutraceutical therapeutic effect for feeding onmango, avocado seeds and their mixtureas a powder for treatment diabetic in rats.The best result was to concentrate 5% mixture of mango and avocado powder.

Key words: Fruits by-products, Diabetic, Rats and Biochemical analysis.

Introduction:

DM is a group of metabolic diseases characterized by hyperglycemia, hypertriglyceridemia and hypercholesterolemia, resulting from defects in insulin secretion, its action or both **(George*et al*., 2000).**

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood sugar) or alternatively, when the body cannot effectively use the insulin it produces. The overall risk of dying among people with diabetes is at least double the risk of their peers without diabetes **(WHO, 2014)**.

All forms of diabetes increase the risk of long-term complications. These typically develop after many years (10–20), but may be the first symptom in those who have otherwise not received a diagnosis before that time. The major long-term complications relate to damage to blood vessels. Diabetes doubles the risk of cardiovascular disease and about 75% of deaths in diabetics are due to coronary artery disease. Other "macrovascular" diseases are stroke, and peripheral vascular disease **(O'Gara *et al*., 2013)**.

Kodagoda and Marapana, (2017) reported that during industrial processing of fruits; large quantities of wastes are generated. This has become a serious problem as they exert an influence on environment and need to be managed and/or utilized. Further exploitation of the fruit processing by-products as sources of functional ingredients and possible applications has become a promising field and global requirement due to the increase in the concern towards the environment. Natural functional compounds from fruit processing wastes can be used to replace synthetic additives adding multifunctional concepts by combining health benefits to technological use.

Soong *et al.*,(2004) indicated that mango seed kernel has potent antioxidant activity with relatively high phenolic contents. They referred that mango seed kernel was also shown to be a good source of phytosterols as campesterol, bsitosterol,stigmasterol and also contain tocopherols.

Mango kernels are rich sources of gallic acid ،ellagic acid, ferulic acid, cinnamic acids, tanins ،vanillin, coumarin, and mangiferrin, all havingpotential to act as a source of natural antioxidants **(Abdalla*et al.*, 2007a)**.

Abdalla*et al*. (2007b) collected Egyptian mango seeds as wastes from local fruit processing units and checked their antioxidant potential. Dried mango seeds and peel products can improve the nutritional, functional and sensory properties, and oxidative stability of oil/oilrich product.

Ahmad *et al.*, (2018) studied that the leaves extract of *M. indica*, L. used for ant diabetic properties using normo-glycemic, glucose-induced hyperglycemia, and STZ-induced diabetic mice. The aqueous extract of the leaves of *M. indica*,L. possesses hypoglycemic activity.

Basha*et al.*, (2018) reported that single dose study of the extract has no hypoglycemic effect on normal rats. Further studies need to be carried out to define the active principle(s) present in the extracts. They also confirmed that oral administration of *Mangiferaindica*seed kernel extracts lowered total cholesterol and triglycerides level in diabetic rats when compared to diabetic controls.

Samanta *et al.*,(2019) studied about anti-diabetic activity of different parts of *Mangiferaindica*. Various authors mentioned the ethanolic, methanolic and aqueous extracts of seeds, steam-bark and leaf of *Mangiferaindica*. Among all chemical components Mangiferin was found as a major chemical which is responsible for anti-diabetic activity. A part of anti-diabetic property those extracted media also decreased the serum cholesterol level in diabetic rats.

The avocado fruit has a lot of nutrients. This includes its high content of essential minerals, potassium, vitamin B 6, vitamin E and B complex. The avocado seed also contains various classes of natural products such as phytosterols and triterpenes, fatty acids with olefinic, acetylenic bonds, furanoic acid, dimmers of flavonols and oligomericproanthocyanidins, ß-d-glucoside of 8-hydroxyabscisic acid and epi-dihydrophaseic acid ß-d-glucoside. Studies have shown that avocado can be used to reduce visceral fat accumulation and improve hyperlipidemia and hyperglycaemia in rat. In addition, the consumption of avocado based diets showed lower cholesterol levels **(Gouegni and Abubakar, 2013)**.

Avocados contain phytochemicals with antioxidant and anti-inflammatory properties. These include polyphenols and colourful carotenoids such as beta carotene, beta cryptoxanthin, lutein and zeaxanthin that help give avocado its unique colour. These natural antioxidants contribute to cell protection from free radical damage. The

hypoglycemic effect of the avocado was also related to its ability to stimulate the remaining pancreatic β-cells in animal models, making them able to secrete more insulin. Diets rich in MUFA are considered alternatives for the dietary treatment of T2DM and since avocado have a substantial amount of MUFA it could be used as an option for glycemic control in diabetic patients **(Rao and Adinew, 2011)**.

The aqueous extract from the avocad's seeds has hypoglycemic agents, which act protecting against toxicity and oxidative stress. In rats, phenolic extracts of avocado (from leaves and fruits) inhibited the activity of enzymes related to the development of T2DM (α-amilase and α-glucosidase), as well as the malondialdehyde production (MDA), a marker of oxidative stress and responsible for increasing the lipid peroxidation (**Wang *et al*., 2015)**.

This work was conducted to study the effect of different concentrations of mango, avocado seeds and their mixture as powderon biological and biochemical changes of diabetic rats.

Material and Methods

Materials:

Mango, avocado seeds

Commercially dried and ground mango (*Mangiferaindica*, L), avocado (*Perseaamericana*, L) seeds and their mixture were obtained from local market in August 2018 from local market at Menoufia Governorate, Egypt. Chemicals pure white crystalline cholesterol powder and saline solutions were purchased from SIGMA Chemical Co., (USA). Casein, cellulose, choline chloride powder, and DL methionine powder, were obtained from Morgan Co. Cairo, Egypt. Chemical kits used in this study (TC, TG, HDL-c, ALT, AST, ALP, bilirubin, urea, creatinine, albumin) were obtained from Al-Gomhoria Company for Drugs, Chemical and Medical Instruments, Cairo, Egypt.

Experimental animals:

A total of 48 adult normal male albino rats Sprague Dawley strain weighting 140±10 g were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

Methods

Preparations of mango and avocado seeds

To prepare the dried mango and avocado seedsand their mixture powder, were washed thoroughly under running tap water, summarize dried, and ground to a fine powder using an air mill, high speed mixture

(Molunix, Al-Araby company, Benha, Egypt) and then serving as powder seeds .

Experimental design

Forty eight adult male albino rats were debited into two main groups:

The first main group (6 rats) fed on basal diet as control negative group (c-ve).The secand main group (42) fed on basal diet for (15) days. After that group injected with alloxan at dose of 1 som /glkgwere fed on standard diet only without any treatment and used as appositive contron group this seconed main group divided into 7 group each group containel 6 rats as follows

Group (1): Positive control group (untreated group).
Group (2): Diabeticrats with 2.5 mango seeds as powder .
Group (3): Diabetic rats with 5.0 mango seeds as powder .
Group (4): Diabetic rats with 2.5 avocado seeds as powder .
Group (5): Diabetic rats with 5.0 avocado seeds as powder .
Group (6): Diabetic rats with 2.5 mixture (1:1) avocado .
Group (6): Diabetic rats with 5.0 mixture (1:1) avocado .

Blood sampling:

After fasting for 12 hours, blood samples were obtained from hepatic portal vein at the end of each experiment. Two kinds of blood samples were taken. The blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 30 minutes, then centrifuged for 10 minutes at 3000 rpm to separate the serum, which were carefully aspirated and transferred into clean cuvette tube and stored frozen in deep freezer till analysis according to method described by **Schermer (1967)**.

Biochemical analysis:

Determination of blood glucose

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

Liver functions

Determination of alanine amino transferase (ALT)

ALT activities were measured in serum using the modified kinetic method of **Hafkenscheid (1979)** by using kit supplied by Human, Germany.

Determination of aspartate amino transferase (AST)

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

Kidney functions

Determination of urea nitrogen

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

Determination of creatinine

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

Determination of uric acid

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

Lipids profile

Determination of total cholesterol (T.C)

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

Determination of triglycerides (T.G)

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

Determination of high density lipoprotein cholesterol (HDL-c)

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

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

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

VLDL-c Concentration mg/dl = TG/5

Determination of low density lipoprotein cholesterol (LDL-c)

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

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

Statistical analysis

The data were analyzed using a completely randomized factorial design **(SAS, 1988)** when a significant main effect was detected; the means were separated with the Student-Newman-Keuls Test. Differences between treatments of ($P \leq 0.05$) were considered significant using Costat Program. Biological results were analyzed by One Way ANOVA.

Results and discussion :

Effect of mango, avocado seeds and their mixture on glucose level of diabetic rats

Data presented in Table (1) show the effect of mango, avocado seeds and their mixtureon glucose levels of diabetic rats. The obtained results indicated that the higher glucose level recorded for positive control group, while the lowest level recorded for negative control group with a significant difference ($P \leq 0.05$). The mean values were 251 and 102 mg/dl, respectively.

On the other hand, rats fed on 5 % seeds mixture recorded the lowest glucose level with a significant difference ($P \leq 0.05$) when compared with control positive group. The mean value was 110.00 mg/dl. While, the highest glucose level in diabetic rats recorded for 2.5 % mango seeds with a significant difference ($P \leq 0.05$) when compared with control positive group. The value was 129.50 mg/dl. It could be concluded that 5 % seeds mixture recorded the best treatment which showed highest reduction in glucose levels. These results are in agreement with **Gondi and Rao, (2015)**, they reported that the seeds extract may protect both type 1 and type 2 diabetes and its complication by decreasing the glucose release by inhibition of carbohydrate hydrolysing enzymes, its absorption by the small intestine, through increased levels of plasma insulin, improved antioxidative status, protection against LPO. Also**, Irondi*et al.*,(2016)** concluded that *M. indica* kernel flour has antidiabetic effects in T2D rats, and could therefore be a promising nutraceutical therapy for the management of T2D and its associated complications.

Table (1) Effect of mango and avocado seeds and their mixtureson glucose of diabetic rats

Groups	Glucose (mg/dl)
G_1 C (-)	$102.0^{f} \pm 0.10$
G_2 C (+)	$251.0^{a} \pm 1.20$
G_3(2.5% Mango seeds)	$129.30^{b} \pm 0.40$
G_4 (5% Mango seeds)	$118.10^{d} \pm 0.20$
G_5 (2.5%Avocado seeds)	$122.40^{c} \pm 0.40$
G_6 (5% Avocado seeds)	$119.50^{c} \pm 0.30$
G_7 (2.5% Seeds mixture)	$115.30^{d} \pm 0.20$
G_8 (5% Seeds mixture)	$110.10^{e} \pm 0.40$
LSD (P≤0.05)	**3.14**

Eachvalue represents themean ± SD of three replicates.

Effect of mango, avocado seeds and their mixture on liver functions (GOT and GPT) of diabetic rats

Data given in Table (2) show the effect of mango, avocado and their mixtureon (GOT) and (GPT) of diabetic rats. The obtained results indicated that GOT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 56.62 and 11.00 U/L, respectively. While, the highest GOT liver enzyme of treated group recorded for group fed on 2.5 % mango seeds but, the lowest value recorded for group fed on 5% seeds mixture with a significant difference (P≤0.05). The mean values were 40.20 and 19.50 U/L, respectively.

On the other hand, GPT liver enzyme of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 21.25 and 6.05 U/L, respectively. While, the highest GPT liver enzyme of treated group recorded for group fed on 2.5 % mango seeds but, the lowest value recorded for group fed on 5% seeds mixture with a significant difference (P≤0.05). The mean values were 11.90 and 7.65 U/L, respectively. As conclusion, it could be indicated that the 5 % seeds mixture has synergistic effect on reduction of liver functions levels. These results are in agreement with **Al-Dosari, (2011)**, they revealed that feeding on high cholesterol diet with avocado fruit which used in the above fortifications at 15% & 25% resulted in significant decrease

p≤0.05 in serum aspartate aminotransferase and alanine aminotransferase (AST and ALT) as compared to positive control group.

Also, **Prasad*et al.*,(2007)** reported that the chemo-preventive properties of lupeol and mango pulp extract (MPE) was evaluated against 7, 12-dimethylbenz (a) anthracene (DMBA) induced alteration in liver of Swiss albino mice. Lupeol/MPE was found to be effective in combating oxidative stress induced cellular injury of mouse liver by modulating cell-growth regulators.

Table (2) Effect of mango and avocado seeds and their mixture on GOTand GPT of diabetic rats

Groups	(GOT) U/L	(GPT) U/L
G_1 C (-)	$11.00^{g} \pm 1.10$	$6.05^{d} \pm 0.80$
G_2 C (+)	$56.62^{a} \pm 1.35$	$21.25^{a} \pm 0.40$
G_3(2.5%Mango seeds)	$40.20^{b} \pm 2.05$	$11.90^{b} \pm 1.20$
G_4 (5%Mango seeds)	$30.80^{d} \pm 0.60$	$9.75^{c} \pm 0.90$
G_5 (2.5% Avocado seeds)	$34.45^{c} \pm 1.25$	$11.10^{b} \pm 0.50$
G_6 (5% Avocado seeds)	$26.51^{e} \pm 0.90$	$9.50^{c} \pm 0.60$
G_7 (2.5% Seeds mixtures	$25.80^{e} \pm 0.90$	$9.70^{c} \pm 0.60$
G_8 (5% Seeds mixtures)	$19.50^{f} \pm 0.90$	$7.65^{d} \pm 0.60$
LSD (P≤0.05)	**2.24**	**1.38**

Eachvalue represents themean ± SD of three replicates.

Effect of mango, avocado seeds and their mixture on serum total cholesterol and triglycerides of diabetic rats

Theeffect of mango and avocado seeds their mixture on the serum total cholesterol and triglyceridesof diabetic rats are shown in Table (3). The obtained results indicated that the triglyceride of positive control group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 135.15 and 55.81 mg/dl, respectively. While, the lowest triglyceride recorded for group fed on 5 % seeds mixture while, the highest value recorded for 2.5% mango seeds with a significant difference (P≤0.05). The mean values were 57.61 and 81.33 mg/dl, respectively.

On the other hand, the cholesterol levels of positive control group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were

139.0 and 93.0 mg/dl, respectively. While, the lowest cholesterol levels recorded for group fed on 5 % seeds mixture while the highest value recorded for 2.5% mango seeds with significant difference (P≤0.05). The mean values were 98.50 and 130.0 mg/dl, respectively. These results are in agreement with **Wang*et al.*, (2015)** they demonstrated that a high diet enriched with avocado could notably worse cholesterol in a week. The 30 participants with normal cholesterol and 37 participants with placid to high cholesterol (15 of whom had type 2 diabetes) were placed on a diet enriched with 300g avocado to replace all other fats each day. At the end of a week, those with normal cholesterol reported a decline in total cholesterol, while those with mild to high cholesterol reported a reduction in total cholesterol.

Alqayim, (2015) reported that oral uptake of 2.5 mg/kg bwt*Moringaoleifera*seeds caused an increment in total cholesterol, LDL cholesterol, total triacylglycerol and reduction in HDL cholesterol.

Table (3): Effect of mango and avocado seeds and their mixture on serum triglycerides (T.G) and serum total cholesterol (TC) of hyperglycemic rats

Groups	Triglycerides (TG) mg/dl	Total Cholesterol (TC) mg/dl
G_1 C (-)	$55.81^{e} \pm 0.22$	$93.00^{g} \pm 0.20$
G_2 C (+)	$135.15^{a} \pm 3.81$	$139.00^{a} \pm 1.30$
G_3(2.5%Mango seeds)	$81.33^{b} \pm 1.10$	$130.00^{b} \pm 0.50$
G_4 (5%Mango seeds)	$70.42^{c} \pm 0.70$	$127.00^{c} \pm 0.40$
G_5 (2.5% Avocado seeds)	$80.14^{b} \pm 2.15$	$122.00^{d} \pm 0.30$
G_6 (5% Avocado seeds)	$69.87^{c} \pm 2.66$	$110.00^{e} \pm 0.10$
G_7 (2.5% Seeds mixtures	$65.23^{d} \pm 2.10$	$111.00^{e} \pm 0.20$
G_8 (5% Seeds mixtures)	$57.61^{e} \pm 2.30$	$98.50^{f} \pm 0.20$
LSD (P≤0.05)	**2.65**	**2.14**

TG= Triglyceride. TC= Total Cholesterol

Eachvalue represents themean ± SD of three replicates.

Effect of mango and avocado seeds and their mixture on serum lipid profiles of diabetic rats

Data presented in Table (4) showed theeffect of mango, avocado seeds and their mixtureon the serum lipid profiles of diabetic rats. The results indicated that the HDL-c of negative control rats group recorded the higher value when compared with positive control group with significant difference (P≤0.05). The mean values were 45.05 and 29.67 mg/dl, respectively. While, the highest HDL-c of treated group recorded for group fed on 5 % seeds mixture but, the lowest value recorded for group fed on 2.5% mango seeds with a significant difference (P≤0.05). The mean values were 44.11 and 39.94 mg/dl, respectively.

On the other hand, the LDL-c of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 82.30 and 36.84 mg/dl, respectively. While, the highest LDL-c of treated group recorded for group fed on 5 % mango seeds but, the lowest value recorded for group fed on 5% seeds mixture with a significant difference (P≤0.05). The mean values were 71.31 and 42.87 mg/dl, respectively.

On the other hand, the VLDL-c of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 27.03 and 11.16 mg/dl, respectively. While, the highest VLDL-c of treated group recorded for group fed on 2.5 % mango but, the lowest value recorded for group fed on 5% plant mixture with significant difference (P≤0.05). The mean values were 16.51 and 5.0 mg/dl. These results are in agreement with**Pieterse(2007)**, they found that when 45 obese or overweight people with high low density lipid cholesterol eat an avocado a day for five weeks as part of a judicious fat diet, their low density, low cholesterol level, particle size, number and small dense low density lipid as well as LDL: HDL ratio were all drastically reduced. Avocados provide a affluence of benefits as they contain carotenoids and help to boost high density lipid cholesterol and their healthy fats absorb fat soluble carotenoids from other foods. Also, **Olagunju*et al*., (2017)** reported that theavocado pear (*Perseaamericana*) reduces TC/HDL ratio thereby boosting the "good cholesterol" (HDL) which is good for cardiovascular health.

Effect of mango, avocado seeds and their mixture on kidney functions of diabetic rats

Data presented in Table (5) show the effect of mango, avocado seeds and their mixture on kidney functions(urea, uric acid and creatinine) of diabetic rats. The obtained results indicated that the urea level of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 70.05 and 39.00 mg/dl, respectively. While, the highest urea level of treated group recorded for group fed on 2.5 % avocadoseeds. While, the lowest value recorded for group fed on 5% seeds mixture with a difference (P≤0.05). The mean values were 56.81 and 40.80 mg/dl, respectively.

Table (4): Effect of mango, avocado seeds and their mixture on lipid profile of diabetic rats

Groups	High density lipoprotein (HDL-c) (mg/dl)	Low density lipoprotein (LDL-c) (mg/dl)	Very low density lipoprotein (VLDL-c) (mg/dl)
G_1 C (-)	45.05^{ab} ± 2.80	36.84^{f}± 0.13	11.16^{d}± 0.69
G_2 C (+)	29.67^{d} ± 1.71	82.30^{a}± 1.58	27.03^{a}± 1.20
G_3(2.5%Mango seeds)	41.61^{c}±0.50	71.27^{b}± 1.91	16.27^{b} ± 1.72
G_4 (5%Mango seeds)	42.46^{bc} ±1.38	71.31^{b}±0.33	14.08^{c} ± 0.10
G_5 (2.5% Avocado seeds)	39.94^{bc}± 0.90	66.03^{c}±1.40	16.03^{b}± 1.60
G_6 (5% Avocado seeds)	42.51^{a} ±1.40	53.52^{d}±1.15	13.97^{c} ± 0.20
G_7 (2.5% Seeds mixtures	43.50^{ab} ±1.10	54.45^{d}±1.10	13.05^{c}±2.20
G_8 (5% Seeds mixtures)	44.11^{ab} ±1.30	42.87^{e}±1.10	11.52^{d} ±1.40
LSD (P≤0.05)	**3.02**	**3.00**	**2.60**

HDL-c = High density lipoprotein cholesterol. LDL.c = Low density lipoprotein cholesterol. VLDL -c = Very low density lipoprotein cholesterol.
Eachvalue represents themean ± SD of three replicates.

On the other hand, the uric acid level of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 3.47 and 1.61mg/dl, respectively. While, the highest uric acid level of treated group recorded for group fed on 2.5 % mango seeds but, the lowest value recorded for group fed on 5% seeds mixture with significant difference (P≤0.05). The mean values were 2.44 and 1.40 mg/dl, respectively.

In case of creatinine, the level of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05). The mean values were 73.75 and 36.00 mg/dl, respectively. While, the highest creatinine level of treated group recorded for group fed on 5 % mango seeds but, the lowest value recorded for group fed on 5% seeds mixture with a significant difference (P≤0.05). The mean values were 65.63 and 40.70 mg/dl, respectively. These results are in agreement with **Noorul, *et al* (2016),** they reported that the technical evidence recommends avocado consumption has health benefits for weight management, and assisting people with type 2 diabetes, eye health, and it has a potential role in lowering cholesterol and LDL and use for heart health. Avocados also are an important nutritional source of folate, which is essential during pregnancy for healthy foetal development.

Table (5): Effect of mango and avocado seeds and their mixtureon serum urea and serum uric acid of diabetic rats

Groups	Urea mg/dl	Uric acid mg/dl	Creatinine mg/dl
G_1: Negative control	$39.00^{e} \pm 1.10$	$1.61^{b} \pm 0.10$	$36.00^{f} \pm 2.082$
G_2: Postive control	$70.05^{a} \pm 2.20$	$3.47^{a} \pm 0.20$	$73.75^{a} \pm 1.70$
G_3(2.5%Mango seeds)	$54.95^{b} \pm 1.70$	$2.44^{b} \pm 0.10$	$65.63^{b} \pm 3.06$
G_4 (5%Mango seeds)	$47.35^{c} \pm 1.40$	$1.95^{b} \pm 0.40$	$64.07^{b} \pm 1.21$
G_5 (2.5% Avocado seeds)	$56.81^{b} \pm 1.20$	$2.41^{ab} \pm 0.30$	$50.32^{c} \pm 1.34$
G_6 (5% Avocado seeds)	$45.40^{c} \pm 0.80$	$1.50^{c} \pm 1.20$	$47.81^{c} \pm 1.55$
G_7 (2.5% Seeds mixtures	$43.10^{d} \pm 0.70$	$1.45^{c} \pm 1.10$	$46.81^{d} \pm 1.45$
G_8 (5% Seeds mixtures)	$40.80^{d} \pm 0.60$	$1.40^{c} \pm 1.30$	$40.70^{e} \pm 1.35$
LSD (P≤0.05)	**3.20**	**1.20**	**3.10**

Eachvalue represents themean ± SD of three replicates.

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Journal of Home Economics

المؤتمر الدولى السابع- العربى الحادى والعشرون للإقتصاد المنزلى
" الإقتصاد المنزلى والتنمية المستدامة 2030 "
15 ديسمبر2020 م

http://homeEcon.menofia.edu.eg ISSN 1110-2578

التأثيرات المحتملة لبذور المانجو والأفوكادو ومخلوطهم معا على الفئران المصابة بالسكر المستحث بالألوكسان

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الملخص العربى:

اجريت هذه الدراسة لمقارنة تأثير مسحوق بذور المانجو والأفوكادو ومخلوطهم معا. تم استخدام ثمانية وأربعين من ذكور فئران الأبينو في هذه الدراسة ، وكان وزن الفئران (150 ± 10 جم) وتم تقسيمهم إلى ثماني مجموعات كل مجموعه بها ستة فئران منهم مجموعة ضابطة سالبة ومجموعة ضابطة موجبة ، وتم اصابة الفئران بمرض السكر عن طريق الحقن بمادة الألوكسان بتركيز 150مجم/ كجم. تمت إضافة مسحوق بذور المانجو والأفوكادو ومخلوطهم معا بنسبة 2,5 ٪ ، 5 ٪ من النظام الغذائي الرئيسي. تم تقدير (TG، TC، LDL-c، VLDL-c، HDL-c)، الجلوكوز في الدم ، أنزيمات الكبد في مصل الدم (and GOT GPT) ، وظائف الكلى (الكرياتينين وحمض اليوريك ومستويات اليوريا). من النتائج التي تم الحصول عليها تبين أن التغذية على مسحوق بذور المانجو والأفوكادو ومخلوطهم معا أدى إلى حدوث زيادة كبيرة($P \leq 0.05$) معنويةفي مستوى HDL-c، بينما انخفضت مستويات LDL-c,VLDL-cبنسبة عالة مع وجود فرق معنوى. كذلك حدث انخفاض معنوى فى كلا من وظائف الكلى (الكرياتينين ، حمض اليوريك ، اليوريا) ووظائف الكبد (GPT and GOT) وانخفاض معنوى فى مستوى الجلوكوز في الدم ، الذي يعكس تأثير علاجي للتغذية على مسحوق بذور المانجو والأفوكادو ومخلوطهم لعلاج مرض السكر في الفئران. وكانت أفضل نتيجة لتركيز مسحوق مخلوط مسحوق بذور المانجو والأفوكادو بتركيز 5 ٪.

الكلمات المفتاحية: مخلفات الفاكهة ، مرض السكر، الفئران، التحاليل الكيميائية الحيوية.