Journal of Home Economics
Volume 29, Number (4), 2019

http://homeEcon.menofia.edu.eg

Journal of Home Economics

ISSN 1110-2578

Effect of Tamarind and Carob in Treatment of Kidney Functions Induced–Gentamicin in Rats

Seham Aziz Khader, Nagat Mohammed Abdl-Mutaleb Abu KHadrah
Prof. of Nutrition and Food Science , Faculty of Home Economics, Menoufia University Faculty of Home Economics, Al-Azhar University

Abstract:

This study was conducted to investigate the effect of different concentrations 5% and 10% of tamarind and carob powder and their 5% mixture as powder on kidney functions in inducedwith gentamicin in rats. Thirty five white male albino rats, weighing 140-150±10g were used in this study. The rats were divided into 7 groups. Each group contains 5 rats. One was kept as a control negative group while the other groups were injected by gentamicin (10 mg/kg body weight). Glucose level, serum liver functions (ALT, AST and ALP), kidney function markers (urea, creatinine, uric acid), total cholesterol TC, triglycerides TG, and lipoproteins: (HDL-c, LDL-c, VIDL-c) were determined. The obtained results revealed that tamarind and carob powder and their mixture improved Liver functions, kidney functions, serum glucose levels, and lipid profile in rats. The best results recorded for 5% mixture and recommended for use as a beverage drink to improve kidney functions. Also carob diet alone, seems to beof betten action compered to tamarind diet alon.

Key words: Rats, tamarind and carob fruits, Kidney disorder, Biochemical analysis.

Introduction

The kidneys are small bean-shaped organs approximately 6 cm wide and 12 cm long and consist of two main layers – an inner layer called the medulla and an outer layer called the cortex. Most people have two kidneys that are situated at the back of the abdomen on either side of the spine **(Crews *et al*., 2014).**

Kidney disease is a global public health problem that affects more than 750 million persons worldwide. **(GBD, 2015)** The burden of kidney disease varies substantially across the world, as does its detection and treatment. Although the magnitude and impact of kidney disease is better defined in developed countries, emerging evidence suggests that developing countries have a similar or even greater kidney disease burden **(Hill *et al*.,2016).**

Muzaffar and Kumar (2017)reported thattamarind works as one of the finest detoxifying agents. The cleansing properties of tamarind help in detoxifyingthe kidney. The percentage of potassium contains in tamarind is goodenough to flush out the toxic elements that get deposited in the kidneys. Hence, to keep the kidneys in sound condition, one should have tamarind once a daily basis.

Tamarind seeds and pulp are contain a variety of biologically active phytochemical compounds, especially phenolic constituents, flavonoids, anthocyaninins, vitamin C, and carotenoids. These phytochemicals positively influence human health and indicate high antioxidant activity. Hence, it is considered crucial to increase the antioxidant intake in the human diet and one way of achieving this can be through enriching food products with seeds which are rich in phytochemicals. *Tamarind indica*has ameliorative effects on many diseases. It can also be preferred as a nutritious support for malnourished patients **(*Rana and Sharma, 2018).***

Tamarindpulp are contains water, carbohydrates, proteins, organic acids: Tartaric, malic, citric, succinic; vitamins: A, B1, B2, B3, B5, B6, C, K, minerals: Calcium, potassium, phosphorus, magnesium, sodium and selenium; volatile aromas, -sitosterol; a bitter principle From The tamarind pulp, which are the richest source of natural tartaric acid, a refreshing drink is prepared for feverish states and at the same time purifying for its slight laxative action**(Arkhel*et al*.,2011)**.

Tamarind seeds and pulp are biologically active phytochemical compounds, especially phenolic constituents, flavonoids, anthocyaninins, vitamin C, and carotenoids. These are phytochemical

positively influence human health and indicate high antioxidant activity. Hence, it is considered crucial to increase the antioxidant intake in the human diet and one way of achieving this can be through enriching food products with seeds which are rich in phytochemicals. *Tamarind indica* has ameliorative effects on many diseases. It can also be preferred as a nutritious support for malnourished patients**(Natukunda*et al.*,2016)**.

Ekambaram*et al.*, (2010) reported that the hepato and nephroprotective effects of tamarind fruit pulp extract arises due to radical scavenging activity. The extract of tamarind fruit is reported to contain flavonoids like tannins, polyphenols, anthocyanidin, and oligomericproanthocyanidins. These are flavonoids participate in the cellular antioxidant network due to their ability to regenerate ascorbyl radicals and to protect endogenous vitamin E and glutathione from oxidative depletion **(Rohdewald 2002)**.

Carob *(Ceratoniasiliqua)* is typical mediterranean plant, mainly used in food and Egyptian traditional folk medicine. Carob consists of two major parts: The pulp (90%) and the seeds (10%). The chemical composition of carob depends on cultivars and horticultural conditions. Carob contains high levels of carbohydrates (48-56%), fibers (30-40%), tannins (16%-20%), protein (6.34%) and a low level of fat (1.99%). Carob powder is a valuable source of vitamins E, D, C, Niacin, B6, and folic acid; vitamins A, B2, and B12 are provided in lower levels. Carob powder oil is composed of 17 fatty acids, mainly oleic, linoleic, palmitic, and stearic acid at 40.45%, 23.19%, 11.01%, and 3.08%, respectively **(Youssef *et al.*, 2013).**

In addition, carob is a rich source of fatty acids, minerals, cyclitols, amino acids, polyphenols and vitamins. From a pharmacological point of view the most interesting substances of carob are phenolic compound, phenolic acids, flavonoids and tannins. Phenolics, subdivided into benzoic and cinnamic acids, are the most abundant class of polyphenols in carob fruits **(Goulas *et al.*, 2016).**

Carob fruits are characterized by high sugar content (48%–56%) (mainly sucrose, glucose, and fructose), 3%–4% protein, a low-fat content (0.2%–0.6%), low content of alkaloids and high content of dietary fibers, especially in the seeds. Specifically, the pulp is composed of sugars, polyphenols (e.g., tannins, flavonoids, phenolic acids), whereas the seed contains proteins, dietary fibers, polyphenols, and minerals , and is free of gluten **(Ortega *et al.*, 2009)**.

Wilson and Elkatry, (2012) investigated the protective effects of carob and ginger on induced nephrotoxicity in rats. The nephroprotective effects of carob (0.5, 1.0 and 5%).

Shalby*et al.*, (2012) investigated the anti-inflammatory role of fennel, carob of them in improving the renal dysfunction induced in rats by the cyclosporine.

Material and Methods

Materials:

Tamarind *(Tamarindusindica, Linn)* and Carob *(Ceratoniasiliqua)* were obtained in 2019 fromlocal markets at Al Gharbia governorate, Egypt.

Gentamycin:

Gentamycin, obtained fromthe pharmacy, and was used for induction of kidney functions disorder among rats.

Experimental animals

A total of 35 adult normal male albino rats Sprague Dawley strain weighing (140-150 ±10 g) were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

The chemical kits:

Chemical kits used for determination the (TC, TG, HDL-c, ALT, AST, ALP, urea, uric acid and creatinine) were obtained from Al-Gomhoria Company for Drugs, Chemicals and Medical Instroments, Cairo, Egypt.

Methods

Preparation of tamarind and carob

For tamarind and carob the impurities and seeds separatedfrom pulp dried in an oven at low temperature (40 °C) then milled to obtain removed fine powder.

Experimental design, animal groups and blood sampling:

The experimental bart was done in the Faculty of Home Economics, Menoufia University, Shebin El-Kom. Thirty five male albino rats, weighing (140-150±10g) were used in the study. Rats were housed in individual stales steel cages under controlled environmental conditions, in the animal house of the Faculty of Home Economics, Minufiya University and fed 7 days on basal diet (casein diet) prepared according to **AIN (1993),** prior to start feeding on experimental diet for acclimatization. Rats are divided into 7 groups, each group which consists of five rats as follows: Group 1 (-ve): feed on basal diet only, as negative control. Group 2 (+ve): Renopathic rats injected by gentamycin (10 mg/kg body weight)/ rats , and used as positive control.

Group 3:Renopathicrats were injected by gentamycin and were fed on basal diet and tamarind as powder by 5% of the weight /day. Group 4:Renopathicrats were injected by gentamycin fed on basal diet and tamarind as powder by 10% of the weight / day . Group 5:Renopathicrats were injected by gentamycin fed on basal diet and carob as powder by 5% of the weight / day. Group 6:Renopathicrats were injected by gentamycin fed on basal diet and carob as powder by 10 % of the weight / day. Group 7:Renopathicrats were injectedby gentamycin and fed on basal diet and a mixture of tamarind and carob (1:1) as powder by 5% of the weight of the diet. The experiment period continued for 28 days, at the end of the experimental period each rat weight recorded separately then, rats slaughtered and blood samples.Conected blood samples were centrifuged at 4000 rpm for ten minute to separate serum, and then kept in deep freezer till using.

After fasting for 12 hours, blood samples in initial times were obtained from retro orbital vein, while it was obtained from hepatic portal vein at the end of each experiments . 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 Serum carefully aspirated and transferred into clean cuvette tube and stored frozen described by **Schermer (1967)**.

Biochemical analysis:

Determination of blood glucose

Serum glucose was measured using the modified kinetic method according to **Kaplan (1984)**.

Liver functions

Determination of alanine amino transferase (ALT) (GPT)

ALT activities were measured in serum using the modified kinetic method of **Tiez (1976)**.

Determination of aspartate amino transferase (AST) (GOT)

AST activities were measured in serum using the modified kinetic method of **Henary (1974)**.

Determination of serum the activity of serum alkaline phosphatase (ALP):

Alkaline phosphatase (ALP) determined according to the method of **Roy (1970)**.

Kidney functions

Determination of urea nitrogen

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

Determination of creatinine

Serum creatinine was measured using the modified kinetic method according to **Schirmeister, (1964)**.

Determination of uric acid:

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

Lipids profile

Determination of total cholesterol (T.C)

Serum cholesterol was measured using the modified kinetic according to **Richmond, (1973)**.

Determination of triglycerides (T.G)

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

Determination of high density lipoprotein cholesterol (HDL-c)

Scrum high density lipoprotein cholesterol (HDL-c) was measured using the modified kinetic method according to **Allain (1974)**

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 = $\frac{T.G}{5}$

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

Data presented in table (1) show the effect of tamarind and carob powders and their mixture on glucose level of kidney disorder rats.The obtained results indicated that the higher glucose level recorded for positive control group, while the lower level recorded for negative control group with a significant difference ($P \leq 0.05$). were 164.25±1.71 and 98.25±1.71 mg/dl, respectively.

On the other hand, the highest glucose level of kidney disorder treated groups was recorded for 5% tamarind powder group, while the lowest glucose level recorded for group (7), which fed on 5% mixture of tamarind and carob powder with a significant difference (P≤0.05). were 149.75±1.71 and 100.75±1.71mg/dl. The best treatment was recorded for group 7 (5% mixture of tamarind and carob powder) as compared to positive control group.

These results are in agreement with**Bagula*et al*., (2015)**,They reported thattamarind seed lowers blood sugar levels. This protects the pancreas, whith increases the size of insulinproducing cells. Extract of seeds reduces the body weight and adiposity along with an improvement in insulin resistance index.

Also, **Anderson *et al*., (2011),** said that dietarycarob fiber is the main by-product of carob syrup production which mostly consists of insoluble fibers. Its glycemic index is very low, and their digestion occurs slowly. This means, blood sugar increases slowly when consumed .

Data given in table (2) and show the effect oftamarind and carob powder and their mixture on liver functions (GOT, GPTand ALP) of kidney disorder rats.The results indicated that GOT of negative control group recorded the lower value when compared with all groups, specially the control (+) one with significant differences (P≤0.05)(25.88±0.3 and 61.38±0.3 U/L) The rest of the groups range from 61.38±0.3U/L to 28.48±0.17U/L. On the other hand, the highest GOT of kidney disorder treated groups were recorded for 5 % tamarind powder group, while the lowest GOT recorded for 5% mixture of tamarind and carob powder with significant differences (P≤0.05) (53.38 ±0.3and 28.48 ±0.17U/L) respectively. The best treatment was recorded for group 7 (5% mixture of tamarind and carob powder) as compared to negative control group.

Data in the same table illustrated that the mean value of GPT enzyme activity of positive control rats group, was higher than negative control group with a significant difference(P≤0.05) (114.5±1.29 and 84.5±1.29U/L) respectively . On the other hand, the highest GPT liver enzyme of kidney disorder treated groups were recorded for 5 % tamarind powder group, while the lowest GPT recorded for 5% mixture of tamarind and carob powder with significant differences (P≤0.05) (124.5±1.29and 95.8±0.85 U/L)respectively. The best treatment was recorded for group 7 (5% mixture of tamarind and carob powder) as compared to positive control group.

On the other hand, the highest ALP liver enzyme activity of kidney disorder treated groups were recorded for 5% tamarind powder group, while the lowest ALP recorded for group (7), which fed on 5% mixture of tamarind and carob powders with significant differences (P≤0.05) (239.75±0.65 and 179.75±6.35 U/L), respectively. The best treatment was recorded for group 7 (5% mixture of tamarind and carob powder) as compared to positive control group.

These results are in agreement with that of**Maiti*et al*., (2014)**reported thatsupplementation with tamarind produced a significant changes in liver and skeletal muscle glycogen content, activity of liver glucose-6-phosphate dehydrogenase in respect to diabetic group. Activities of liver glucose-6-phosphatase, liver and kidney glutamate oxaloacetate transaminase (GOT) and glutamate pyruvate transaminase (GPT) activities were decreased significantly in the aqueous extract supplemented group in respect to diabetic group.

Data presented in table (3) show the effect oftamarind and carob powder on lipidprofileof kidney disorder rats.The obtained results indicated that HDL-c level of negative control rats group recorded the higher value when compared with positive control group with a significant difference (P≤0.05) (35.38±0.85 and 17.98±0.17 mg/dl)respectively.While, the highest HDL-c was level of treated group recorded for group fed on 5% mixture of tamarind and carob powder but, the lowest value recorded for group fed on 5% tamarind powder with significant differences (P≤0.05) (30.63±0.85 and 18.5±1.29 mg/dl). The best serum HDL-c was observed for group 7 (5% mixture of tamarind and carob powder), when compared with positive control group.

On the other hand, LDL-c level of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05) (51.72±0.1 and 6.48±0.55 mg/dl) respectively. While, the highest LDL-c was level of treated group recorded for group fed on 5% tamarind powder and, the lowest value recorded for group fed on 5% mixture of tamarind and carob powder with significant differences (P≤0.05) (39.30±0.87 and 16.34±0.7 mg/dl) respectively . The best serum LDL-c was observed for group 7(5% mixture of tamarind and carob powders) when compared with positive control group.

In case of VLDL-c, the level of positive control rats group recorded the higher value when compared with negative control group with a significant difference (P≤0.05)(17.75±0.06 and 10.69±0.06 mg/dl) respectively. While, the highest VLDL-c was level of treated

group recorded for group fed on 5 % tamarind powder but, the lowest value recorded for group fed on 5% mixture of tamarind and carob powder with significant differences (P≤0.05)(17.35±0.38 and 12.18 ±0.22mg/dl) respectively. The best serum VLDL-c was observed for group 7 (5% mixture of tamarind and carob powder) when compared with positive control group. These results are in agreement with**Vaneeta*et al.*, (2011),** they reported that the ethanolic extract (50 and 100 mg/ kg) of *T. indica* fruit pulp showed a significant decrease in body weight, serum cholesterol, and triglycerides and a significant increase in HDL-cholesterol in cafeteria diet- and sulpiride-induced obese rats as compared to their respective control groups. This is also supported by earlier study which shows the hypolipidemic activity of ethanolic extract of *T. indica* fruit pulp in hypercholesterolemic hamsters fed with atherogenic diet**.**

Also **Hassanein*et al.*, (2015)**evaluated the effect of carob powder on lipid profile of rats. Results show that, carob powder improved lipid profile parameters such as total cholesterol and LDL cholesterol.

Data given in table (4) show the effect of tamarind and carob powder on (total cholesterol) and (triglycerides) of kidney disorderrats.It was clear to notice that the highest (TG) recorded for positive control rats group, while the lower TG recorded for negative control group with a significant difference (P≤0.05)(88.88±0.26 and 53.38±1.09mg/dl) respectively. On the other hand, the highest (T.G) of Kidney disorder treated groups was recorded for group (3), which fed on 5 % tamarind powder group, while the lowest TG recorded for group 7 which fed on 5% mixture of tamarind and carob powder with significant differences (P≤0.05). (87.48±1.06 and 60.88±1.09 mg/dl) respectively. The best serum TG level was showed for group 7 (5% mixture of tamarind and carob powder) when compared with positive control group.

Data in the same table illustrated that the mean value of total cholesterol (TC) of positive control rats group which was higher than negative control group with a significant difference (P≤0.05). (87.45±0.13 and 52.55±0.13 mg/dl). On the other hand, the highest total cholesterol (T.C) kidney disorder treated groups was recorded for group fed on 5 % carob powder group, while the lowest triglycerides (T.G) recorded for group fed on 5% mixture of tamarind and carob powder with significant differences (P≤0.05)(76.45±0.13 and 59.15±0.13 mg/dl). The best serum TC level was showed for group 7 (5% mixture of tamarind and carob powder) when compared with positive control

group.These results are in agreement with**Uchenna*et al*., (2017)** they concluded that tamarind seeds can lower blood glucose and serum cholesterol and enhance storage of glycogen in rats**.** Further studies are needed to identify the principal phenolic compounds in tamarind seeds which are responsible for lowering cholesterol and blood glucose levels in rats.

Also these results are in agreement with **Bauer(2004**), they reported thathigh levels of lipids or lipoproteins in blood may lead to atherosclerosis and afterwards to heart and vascular diseases. Therefore, supplements that reduce the lipid and cholesterol levels in blood are necessary to balance a high-fat diet. A cholesterol-reducing preparation comprising at least one dietary fiber selected from the group consisting of carob fruit flesh has been patented .

Data presented in Table (5) show the effect of Tamarind and carob powder on urea, uric acid and creatinine of kidney disorder rats.

It was clear to mention that the higher urea recorded for positive control rats group, while the lower urea recorded for negative control group with significant differences (P≤0.05)(32.8±0.84 and 19.88±0.85 mg/dl). On the other hand, the highest urea of Kidney disorder treated groups was recorded for 5 % tamarind powder group, while the lowest urea recorded for 5% mixture of tamarind and carob powder with significant differences (P≤0.05) (28.3±0.84 and 22.45±0.87mg/dl). The best treatment was recorded for group 7 (5% mixture of tamarind and carob powder) as compared to positive control group.

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)(0.85±0.13 and 0.55±0.13 mg/dl). While, the highest creatinine level of treated group recorded for group fed on 5 % tamarind powder and 10% tamarind powder but, the lowest value recorded for group fed on 5% mixture of tamarind and carob powder with a significant difference (P≤0.05)(0.75±0.13 and 0.55±0.13 mg/dl).

Data in the same table illustrated that the mean value of uric acid of positive control rats group which was higher than negative control group with a significant difference (P≤0.05)(2.43±0.17 and 1.53±0.17 mg/dl). On the other hand, the highest uric acid of treated groups kidney disorder was recorded for 5 % carob powder group, while the lowest urea recorded for 5% mixture of tamarind and carob powder with significant differences (P≤0.05)(2.23±0.17 and 1.63±0.17 mg/dl). The best treatment was recorded for group 7 (5% mixture of tamarind and

carob powder) as compared to positive control group. These results were in agreement with **Shalby*et al.*, (2012)**,they showed that cyclosporine induced the nephrotoxicity as appeared by elevation of serum and urinary levels of creatinine, urinary level of beta2 microglobulin, serum levels of ammonia, TGF-beta1 and TNF-alpha and the NAG level while decreased the creatinine clearance. Addition of fennel, carob, doum or mixture of them significantly improved the kidney functions. Moreover, animals injected with cyclosporine and supplemented with fennel, carob, doum and mixture of them, showed a significant amelioration in the kidney functions as compared to animals injected with the cyclosporine only.

Table (1): Effect of tamarind and carob powder and their mixture on glucose level of kidney disorder rats

Parameters / Groups	Glucose (g/dl) Mean± SD	% Change of Positive Control
Negative control(-)	98.25^{g} ± 1.71	-40
Positive control(+)	164.25^{a} ±1.71	_
Tamarind 5%	149.75^{b} ± 1.71	-9
Tamarind 10%	145.25^{c} ± 1.71	-12
Carob 5%	128.25^{d} ± 1.71	-22
Carob 10%	110.75^{e} ± 1.71	-54
Mixture 5%	100.75^{f} ± 1.71	-39
LSD (P≤.0.05)	2.0	_

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

Table (2): Effect of tamarind and carob powder and their mixtures on liver functions (ALP, GPT and GOT) of kidney disorder rats

Parameters / Groups	GOT (U/l)Mean±SD	GPT (U/l)Mean±SD	ALP (U/I)Mean±SD
Negative control(-)	25.88^{g}±0.3	84.5^{g}±1.29	170.25^{f}±0.65
Positive control(+)	61.38^{a}±0.3	114.5^{a}±1.29	259.75^{a}±0.65
Tamarind 5%	53.38^{b}±0.3	124.5^{b}±1.29	239.75^{b}±0.65
Tamarind 10%	33.78^{e}±0.17	117.5^{d}±1.29	230.75^{c}±0.65
Carob 5%	45.03^{c}±0.17	119.5^{c}±1.29	236.75^{d}±0.65
Carob 10%	36.58^{d}±0.17	103.5^{e}±1.29	217.75^{e}±0.65
Mixture 5%	28.48^{f}±0.17	95.8^{f}±0.85	179.75^{f}±6.35
LSD (P≤.05)	**0.311**	**1.909**	**3.514**

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

Table (3): Effect of tamarind and carob powder and their mixtures on (HDL, LDL and VLDL) of kidney disorder rats

Parameters / Groups	HDL (mg/dl) Mea± SD	LDL (mg/dl) Mean± SD	VLDL (mg/dl) Mean± SD
Negative control(-)	$35.38^{a} \pm 0.85$	$27.8^{f} \pm 0.55$	$10.69^{e} \pm 0.2$
Positive control(+)	$17.98^{f} \pm 0.17$	$87.23^{a} \pm 0.1$	$17.75^{a} \pm 0.06$
Tamarind 5%	$18.5^{f} \pm 1.29$	$73.98^{b} \pm 0.87$	$17.35^{a} \pm 0.38$
Tamarind 10%	$20.5^{e} \pm 1.29$	$65.53^{c} \pm 1.46$	$15.88^{b} \pm 0.22$
Carob 5%	$24.5^{d} \pm 1.29$	$66.03^{c} \pm 1.07$	$14.08^{c} \pm 0.22$
Carob 10%	$27.5^{c} \pm 1.29$	$53.03^{d} \pm 2.09$	$14.08^{c} \pm 0.97$
Mixture 5%	$30.63^{b} \pm 0.85$	$40.9^{e} \pm 0.7$	$12.18^{d} \pm 0.22$
LSD (P≤0.05)	1.387	1.509	0.619

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

Table (4): Effect of tamarind and carob powder and their mixtures on (T.G and T.C) mg/dl of kidney disorder rats

Parameters / Groups	TG (mg/dl) Mean ± SD	T.C (mg/dl) Mean ± SD
Negative control(-)	$53.38^{e} \pm 1.09$	$52.55^{g} \pm 0.13$
Positive control(+)	$88.88^{a} \pm 0.26$	$87.45^{a} \pm 0.13$
Tamarind 5%	$87.48^{a} \pm 1.06$	$75.15^{c} \pm 0.13$
Tamarind 10%	$79.38^{b} \pm 1.09$	$70.15^{d} \pm .13$
Carob 5%	$70.38^{c} \pm 1.09$	$76.45^{b} \pm 0.13$
Carob 10%	$70.38^{c} \pm 4.87$	$66.45^{e} \pm 0.13$
Mixture 5%	$60.88^{d} \pm 1.09$	$59.15^{f} \pm 0.13$
LSD:P≤.05	**2.844**	**3.195**

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

Table (5): Effect of tamarind and carob powder and their mixtures on serum urea, creatinine and uric acid (mg/dl) of kidney disorder rats.

Parameters / Groups	Urea (mg/dl) Mean± SD	Creatinin (mg/dl) Mean± SD	Uric Acid (mg/dl) Mean± SD
Negative control(-)	$19.88^{g} \pm 0.85$	$0.55^{b} \pm 0.13$	$1.53^{d} \pm 0.17$
Positive control(+)	$32.8^{a} \pm 0.84$	$0.85^{a} \pm 0.13$	$2.43^{a} \pm 0.17$
Tamarind 5%	$28.3^{b} \pm .84$	$0.75^{a,b} \pm 0.13$	$2.23^{a.b} \pm 0.17$
Tamarind 10%	$25.6^{d} \pm 0.9$	$0.75^{a,b} \pm 0.13$	$1.78^{c} \pm 0.17$
Carob 5%	$26.23^{c} \pm 0.83$	$0.64^{a,b} \pm 0.09$	$2.28^{a,b} \pm 0.17$
Carob 10%	$24.23^{e} \pm 0.83$	$0.65^{a.b} \pm 0.13$	$2.08^{b} \pm 0.17$
Mixture 5%	$22.45^{f} \pm 0.87$	$0.55^{b} \pm 0.13$	$1.83^{c} \pm 0.17$
LSD (P≤0.05)	**0.134**	**0.167**	**0.2**

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

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Journal of Home Economics, Volume 29, Number (4), 2019

تأثير التمرهندي والخروب في علاج الخلل الحادث في وظائف الكلي المستحث في الفئران بالجنتاميسين

سهام عزيز خضر ـ نجاه محمد أبوخضره
قسم التغذية وعلوم الأطعمة ـ كلية الأقتصادالمنزلى ـ جامعة المنوفية

الملخص العربي

تم إجراء الدراسة الحالية لمعرفة التأثيرات المحتملة لمسحوق التمرهندي والخروب أو مخلوطهم معا بتركيزات مختلفة (5% , 10%) على الفئران المصابة بمرض الكلي الناتج عن الأصابهبالجنتاميسين,وكذلك في علاج الخلل الفسيولوجي عنه. تم استخدام 35 فأرأبيض بالغ يترواح أوزانهم مابين (140 ± 10جم) وتم تقسيمهم إلي 7مجموعات. كل مجموعة تحتوي على 5 فئران. احداهما كمجموعة ضابطة سالبة تتغذي على الوجبة القياسية أما المجموعات الأخرى فتم احداث إصابة بالكلي عن طريق الحقن بواسطة الجنتاميسين بتركيز 10ملجم/ كجم / وزن الجسم . وتتغذي أيضا المجموعة الضابطة الموجبة على الوجبة القياسية .وتم قياس مستوى السكر في الدم وإنزيمات الكبد (ALT-AST-ALP) ووظائف الكلى (اليوريا وحمض اليوريك والكرياتين بالسيرم) وتقديرالكوليسترول الكلى والجليسريدات الثلاثية واللليبوبروتينات (HDL-c, LDL-c VLDL-c). وقد أظهرت نتائج هذه الدراسة أن تناول مسحوق التمر هندي والخروب أو مخلوطهم معا نتج عنه تحسن في ظائف الكلى والكبد ودهون الدم.وأظهرت المجموعه المعالجه بمخلوط التمر هندي والخروب بتركيز 5% وعليه ينصح باستخدام مخلوط التمر هندى والخروب كمشروب فى تحسين وظيفة الكلى وبالتالى المحافظة على صحة الانسان. وعلي مايبدو يكون تأثير الخروب علي حده أفضل من تأثير التمرهندي علي حده.

الكلمات الكاشفة:الفئران ـ ثمار التمرهندى والخروب ـ خلل الكلى ـ التقديرات الكيميائية الحيوية.