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Study The Effect of Leaves and Fruits of Figs (*Ficuscarica, L.*) and Olive (*Oleaeuropaea, L.*) on Obesity and Kidney Disorder Rats

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Abstract:

The Effect of leaves and fruitsof figs (*Ficuscarica, L.*) and olive (*Oleaeuropaea, L.*) on obesity and kidney disorder rats were studied.Sixty six adult male albino rats of sprague-dawely weighting (150-160g), All rats fed on a basal diet for 7days to make adjustment and then divided into three main groups as the following: The first main group (6 rats) (Group (1)): fed on basal diet as a control negative group,The second main group (30 rats): fed on the high fat diet with saturated fats to induce obesity and then divided to five subgroups each 6 rats,thesefed on high fat diet as a control positivegroup, other groupratsfed on 5% from olive (*Oleaeurpaea*)leaves, rats fed on 5% from figs (*ficuscarica*) leaves, rats fed on 5% from olive fruits and ratsfed on 5% from fig fruits.

The third main group (30 rats): rats injected with gentamicin (100mg/kg/day) to induce impaired kidney rats and then divided to subgroups each 6 rats, these rats with impaired kidney fed on basal diet as a control positive group, rats with impaired kidney and fed on 5% fromolive leaves, ratsfed on 5% from fig leaves, rats fed on 5% from olive fruits and ratsfed on 5% fromfigfruits. Administration of leaves and fruits of figs (*Ficuscarica L.*) and Olive (*Oleaeuropaea, L.*) on obesity rats at 5% lowered the concentrations of total cholesterol, triglycerides, LDL-c, VLDL-c and decreased of urea, creatinine and uric acid. On the other side, HDL-c was significanlyincreased. Histopathological examination showed amelioration ofhistopathological lesions seen in kidney of kidney disorderrats when received the leaves and fruits of figs (*Ficuscarica L.*) and Olive (*Oleaeuropaea, L.*). So, from this study itcan be concluded that intake of fruit and seeds powder of figs (*Ficuscarica L.*) and Olive (*Oleaeuropaea, L.*) especially at 5% can be useful for treating obesity and kidney disorder rats.

Key words: Obese rats- kidney disorder rats-Olive -Figs- serum lipids– Kidney function- histopathology studies.

Introduction:

Obesity is a serious illness that can lead to many medical complications. It results from an imbalance between food intake and energy expenditure, culminating in excessive accumulation of fat in adipose tissue, liver, muscle, pancreatic islets, and other organs involved in metabolism. Moreover, obese and overweight patients are at higher risk from coronary artery disease, hypertension, hyperlipidemia, diabetes mellitus, cancers, gall bladder disorders, cerebrovascular accidents, osteoarthritis, restrictive pulmonary disease and sleep apnea. Recently, much attention has been focused on some food factors/natural compounds that may be beneficial in preventing high fat diet induced body fat accumulation and possibly reduce the risk of diabetes and heart disease (**Prashant *et al.*, 2013)**.

Kidney is more important organ because of its role in the filtration, metabolism, and excretion of compounds; it is often the site of test-article-induced lesions. In addition, a wide range of spontaneous renal lesions may be observed. Chronic progressive nephropathy (CPN), a spontaneous and age-related disease of rodents, may be exacerbated by chemical administration and is a confounding factor in the interpretation of renal toxicologic and carcinogenic findings **(Seely *et al.*, 2017).**

F. carica improved the lipid profile by decreasing the total cholesterol, triglyceride, low-density lipoprotein cholesterol and increasing high-density lipoprotein cholesterol levels. It also reduced the content of thiobarbituric acid-reactive substances and increased the antioxidant enzymes in liver, heart and kidney in HFD-fed rats. These antihyperlipidemic effects and in vivo antioxidative effects correlated with the in vitro phenolic content scavenging ability **(Belguith-Hadrich*et al.*, 2016)**.

The olive (*Oleaeuropaea*) leaf is considered an important traditional herbal medicine utilized against infectious diseases, and for the treatment of diabetes and hypertension. Moreover, olive leaf constituents have been related to cardio protection, probably due to their association with cellular redox modulating effects. The pathogenesis of certain common diseases, including those of the cardiovascular system, involves oxidative stress and tissue inflammation. Olive polyphenolic compounds, such as oleuropein, hydroxytyrosol, or tyrosol, possess

antioxidant, anti-inflammatory, anti-atherosclerotic, anti-ischemic, and hypolipidemic effects on the myocardium**(Efentakis*et al*., 2015)**.

Materials And Methods

Materials:

The used plants: Figs(*ficuscarica*)and olive(*Oleaeurpaea*) (leaves and fruits) were obtained from theMinistry of Agriculture.

1. Gentamycin: Gentamycin (aminoglycosides antibiotics) was obtained from Technogene, Chemical Company, Dokki, Giza, Egypt.

2.Rats:Sixty six adult male albino rats of sprague-dawely, weighting (150-160g) were obtained frommedical Insects Research Institut, Dokki, Cairo, Egypt.Rats were housed in individual stainless steel cages under controlled environmental conditions, in the animal house of the Faculty of Home Economics, Menoufia University and fed 7 days on basal diet period to start feeding on experimental diets for acclimatization. Diet was given in a non-scattering feeding cup to avoid loss or contamination of feed, water was provided to the eats by means of glass tubes projecting through the wire cage from an inverted bottle supported to one side of the cage. Diet and water checked daily and rats weighed weekly.

Biological experiments:

Basal diet composition of tested rats: The basal diet in the experiment consisted of Protein(10%),Corn Oil(10%),Vitamin Mixture(1%),Mineral Mixture (4%),Choline chloride (0.2%) ,Methionine (0.3%), Cellulose (5%), and the remaind of 100 is Corn Starch (69.5%),according to **AIN (1993)**.

Tallow: Tallow which used in obesity induction, obtained from local market from Shebin El-kom**,**Menoufia, Egypt.

3. METHODS:

Preparation of plants: The tested plants were dried by air oven at 40±2°C for 6 hours for the fruit, but the leaves dried by the sun rays, all parts were ground into fine powder by using electric grinder and kept in dark, stoppered glass bottles in a cool and dry location untill used according to **Russo(2001)**.

Preparation of experimental diets and induction of obesity: Basal diet was prepared **AIN(1993)** according to **Reeves *et al*., (1993)** which provide about 9.5% of its energy from fat (40 g corn oil/kg diet). In order to induce obesity, high fat diet (HFD) was used in which at

least45% of its energy comes from fat as reported by **Negm (2002)**. Basal diet was modified to contain 40 g corn oil + 200 g ghee/kg diet and the amount of add saturated fat was substituted from the amount of corn starch.

Induction of rats with impaired kidney: Impaired kidney was induced in normal healthy meals albino rats by intra-peritoneal injection of gentamicin (aminoglycosides antibiotics) about (100 mg/ kg / day) for 7days in which the nephrotoxicity, one of the adverse reaction of gentamicin takes place according to the methods described by **Farombi and Ekor(2006).**

Experimental procedure: The experimental was done in the Faculty of Home Economics, Menoufia University, Shebin El-kom. Sixty six adult albino rats of an average weight of 150-160g were used in this study. Rats cages kept in a room at temperature 25° C and under normal healthy conditions.All rats fed on a basal diet for 7days to make adjustment and then divided into three main groups as the following:

The first main group (6 rats) (Group (1)): fed on basal diet as a control negative group.

The second main group (30 rats): fed on the high fat diet with saturated fats to induce obese and then divided to the following groups each of 6 rats:

- **Group (2):** Obese rats, fed on high fat diet as a control positive group.
- **Group (3**): Obese rats**,**fed on5% from olive (*Oleaeurpaea*) leaves.
- **Group (4):** Obese rats, fed on 5% from figs (*ficuscarica*)leaves.
- **Group (5):** Obese rats, fed on 5% from olive fruits.
- **Group (6):** Obese rats, fed on 5% from fig fruits.

The third main group (30 rats): rats injected with gentamicin (100mg/kg/day)for 7 days to induce impaired kidney rats and then divided to the following groups each of rats:

- **Group (7):**Rats with impaired kidney, fed on basal diet as a control positive group.

Group (8): Rats with impaired kidney and fed on 5% from olive leaves.

- **Group (9):** Rats with impaired kidney and fed on 5% fromfigs leaves.
- **Group (10):** Rats with impaired kidney and fed on 5% from olive fruits.

- **Group (11):**Rats with impaired kidney and fed on 5%from figfruits.

During the experiment period (28 days), the feed intake and body weight were weighed daily and twice a week, respectively. Body weight gain (BWG) and Feed efficiency ratio (FER) were calculated at the end of the experimental period according to the following equations:

BWG (%)= final weight (g) - initial weight (g) / initial weight (g)×100 .

FER = weight gain (g) / feed intake (g)

Collection of blood samples and organs: At the end of the experimental period, rats were sacrificed following a12 h fast. The rats were lightly anaesthetized by ether and about 7 ml of blood was withdrawn from the hepaticportal vein into dry centrifuge plastic tubes. Blood samples were centrifuged for 20 min at 3000 rpm to separate the serum samples which were kept in tube sat -20° C till biochemical analysis. In addition, kidneys for kidney disorder rats of the sacrificed rats were removed for histopathological study.

Biochemical analysis: Serum total cholesterol was calorimetrically determined according to **Allain (1974)** and triglyceride determined calorimetrically according to **Fossati and Prencipe (1982).**High density lipoprotein cholesterol (HDL-c) was determined colorimetrically according to **Lopez (1977)**.

Low density lipoprotein cholesterol (LDL-c) and very low densitylipoprotein cholesterol (VLDL-c) were calculated mathematically according to **Lee and Nieman (1996)**.

LDL-c = TC-[HDL-c + (TG/5)]

VLDL-c = Triglycerides/5

Urea was determinated according to the enzymatic method of **Patton andCrouch, (1977)**, Creatinine was determinated according to kinetic method of **Henry(1974)** and uric acid concentration determinated in the sample according to **Schultz(1984)**.

Histopathological study: Kidney for kidney disorder rats of the scarified rats were dissected, removed, washed with normal saline and put in 2.5% formalin solution. The fixed specimens were then trimmed, washed and dehydrated in ascending grades of alcohol. The tissue specimens were cleared in xylene, embedded in paraffin, sectioned at 4-6microns thickness, stained with hematoxylen and eosin (H and E) and

then studied under an electronicmicroscope according to **Bancroft *et al*., (1996).**

Statistical analysis: Results are expressed as mean values with their standard deviation of the mean. Statistical differences between groups were evaluated using one-way ANOVA followed by Duncan post hoc test using SPSS version 11.0 for Windows (SPSS, Chicago, IL, USA). Differences were considered significant at ($p \leq 0.05$) according to **S.A.S.(1985)**

Results:

(1)The effect of leaves and fruits of Figs and Olive on body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) in obese rats.

From results of table (1) it is evidence that due to obesity control (+) group revealed more BWG, FI and FER in comparison with that of the control (-)when feeding on leaves and fruits of Figs and Olive BWG all obese rats fed on various groups showed significant decreases in mean values ascompared to control (+) groups.

The mean value of (FI) (g/day/rat) of control (-) group was lower than control (+) group, being 4.64±0.75 and 5.753±0.205 (g/day/rat), respectively, the best FI (g/day/rat) recorded for groups "6" (figs fruits 5%) when compared to control (+) group.

The mean value of FER of obese rats fed on leaves and fruits of Figs and Olive is shown in table (1). It could be noticed that the mean value of FER of control (-) group was lower than control (+) group, being 0.023 ±0.001 and 0.087 ±0.001, respectively, The best FER was recorded for groups "6" (obese rats fed on figsfruits 5%).

The results of table (1) are in agreement with that obtained by**Mopuri*et al*., (2018)** who found that the gas chromatography–mass spectroscopy analysis of the fruit ethanolic extract showed the presence of a number of bioactive compounds such as butyl butyrate, 5-hydroxymethyl furfural, 1-butoxy-1-isobutoxy butane, malic acid, tetradecanoic acid, phytol acetate, trans phytol, n-hexadecanoic acid, 9Z,12Z-octadecadienoic acid, stearic acid, sitosterol, 3,5-dihydroxy-6-methyl-2,3-dihydro-4H-pyran-4-one, and 2,4,5-trimethyl-2,4-dihydro-3H-pyrazol-3-one. The ethanolic extract of the fruit of *F.carica,l.* may have potential antidiabetic and antiobesogenic agents.

Table (1): The effect of leaves and fruits of Figs and Olive on body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) in obese rats

Groups	BWG (%)	FI (g/day)	FER
G(1):Control (-ve)	0.075 ^{b}±0.001	4.64 ^{d}± 0.7	0.023 ^{b}±0.001
G(2):Control (+ve)	0.22 ^{a}±0.005	5.753 ^{a}±0.205	0.087 ^{a}±0.001
G(3):olive leaves 5%	0.175 ^{c} -±0.001	5.717 ^{a}±0.206	-0.072 ^{c}±0.002
G(4): figs leaves 5%	0.256 ^{f}-±0.002	5.333 ^{bc}±0.035	-0.11 ^{e}±0.01
G(5):olive fruits 5%	0.225 ^{d}-±0.003	5.48 ^{b}±0.02	-0.096 ^{d}±0.005
G(6): figs fruits 5%	0.243 ^{e} -±0.001	5.203 ^{c}± 0.021	0.103 ^{de} -±0.003

Values are mean ± SD. Values in the same column sharing the same superscript letters are not statistically significantly different.

(2)The effect of experimental diets on serum lipids:

The effect of of leaves and fruitsof Figs and Olive on TG (mg/dl) of obese rats is shown in table (2). It could be observed that the mean value of TG (mg/dl) of control (-) group was lower than control (+) group, being and 91.667±1.155 and 115.333±2.082 (mg/dl), respectively. The best mean value of TG (mg/dl) recorded for groups "4" (figs leaves 5%) when compared to control (+) group.

It could be noticed that the mean value of total cholesterol (TC) (mg/dl) of control (-) group was lower than control (+) group, being 63.667±1.155 and 113±2 (mg/dl), respectively. The percent of decrease was -43.66 % for control (-) comparing with control (+) group.

It could be observed that the mean value of HDL (mg/dl) of control (-) group was higher than control (+) group, being 42 ±3 and 22±2 (mg/dl), respectively. The percent of increase was 51.81% for control (+) comparing with control (-) group. The best mean value of HDL. (mg/dl) recorded for groups "5" (olive fruits 5 %.) when compared to control (+) group.

It could be observed that the mean value of LDL (mg/dl) of control (-) group was lower than control (+) group, being 3.333±2.248 and 67.933±0.416 (mg/dl), respectively. The percent of decrease was -95.09% for control (-) comparing with control (+) group., the best mean value of LDL. (mg/dl) recorded for groups "3" (olive leaves 5%) when compared to control (+) group.

It could be observed that the mean value of VLDL (mg/dl) of control (-) group was lower than control (+) group, being and 18.333±0.231 and 23.067±0.416 (mg/dl), respectively. The percent of decrease was -20.52% for control (-) comparing with control (+) group., the best mean

value of VLDL (mg/dl) recorded for groups "4" (figs leaves 5%) when compared to control (+) group.

These results were greed with **Jemai*et al.*, (2008)** who suggested that the hypocholesterolemic effect of oleuropein, oleuropeinaglycone and hydroxytyrosol-rich extracts might be due to their abilities to lower serum TC, TG and LDL-C levels as well as slowing the lipid peroxidation process and enhancing antioxidant enzyme activity.

Table(2):The effect of leaves and fruits of Figs and Olive on serum lipids parameters (mg/dl) in obese rats

Groups	TC	TG	HDL	LDL- c	VLDL- c
G(1):Control (-ve)	63.667^{d} ±1.155	91.667 ^{d} ±1.155	42 ^{a}±3	3.333 ^{d} ±2.248	18.333 ^{d} ±0.231
G(2):Control (+ve)	113^{a}±2	115.33 ^{a}±2.082	22 ^{c}±2	67.933 ^{a} ±0.416	23.067 ^{a} ±0.416
G(3):olive leaves 5%	81^{c}±12.288	100.667c ±2.517	27.667 ^{bc} ±2.517	33.2 ^{c} ±9.702	20.133^{c} ±0.503
G(4): figs leaves 5%	93.333^{b}±3.055	98 ^{c}±2	28.333 ^{bc} ±4.726	45.4 ^{b} ±6.416	19.6 ^{c} ±0.4
G(5):olive fruits 5%	102^{b}±2.646	107.667 ^{b} ±2.517	30 ^{b} ±3.464	50.467 ^{b} ±5.500	21.533 ^{b} ±0.503
G(6): figs fruits 5%	84^{c}±3.606	101 ^{c}±1	27.667 ^{bc} ±2.082	36.133 ^{c} ±4.022	20.2 ^{c} ±0.2

Values are mean ± SD. Values in the same column sharing the same superscript letters are not statistically significantly different.

The effect of leaves and fruits of Figs and Olive on kidney function (Urea, creatinine and uric acid) (mg/dl) in obese rats.

A) Serum urea:

Table (3) results show the effect of leaves and fruits of Figs and Olive on urea (mg/dl) of kidney disorder rats.It could be noticed that the mean value of urea (mg/dl) of control (-) group was lower than control (+) group, being 47.667±4.509 and 55.333±1.155 (mg/dl), respectively. Rats fed on groups "1","3" and "4" showed non-significant differences among them. Also, there are non-significant differencesbetween groups "5"and "6". Numerically, the lowet mean value of urea (mg/dl) recorded for groups "3" (olive leaves 5%) when compared to control (+) group.

B) Serum Creatinine:

It could be noticed that the mean value of creatinine (mg/dl) of control (-) group was lower than control (+) group, being 0.88 ±0.095 and 1.277 ±0.065 (mg/dl), respectively. All groups 3-11 revealed preconized decreases of Creatinine, especially groups (4&5) when

compared to control (+) group.Rats fed on groups "3", "4", "5" and "6"showed non-significant differences among them. Numerically, the best mean value of creatinine (mg/dl) recorded for groups "5" (olive fruits 5%) when compared to control (+) group.

c) Serum uric acid:

It could be observed that the mean value of uric acid (mg/dl) of control (-) group was lower than control (+) group, being 1.943 ±0.047 and 2.48 ±0.159 (mg/dl), respectively. The percent of decrease was -21.65 % for control (-) comparing with control (+) group. Rats fed on groups"1", "3","4", "5" and "6"showed non-significant differences among them. Also there are non-significant differences between groups "5" and "6". Numerically, the best mean value of uric acid (mg/dl) recorded for groups "4" (figs leaves 5%) when compared to control (+) group.

The results of table (3) are in agreement with that obtained by **Mohammed *et al.*, (2018)** who reported that there was a significant decrease in serum urea and creatinine ($P \leq 0.05$) of diabetic mother group under treatment with *Oleaeuropaea, L*. as compared to control diabetic mice. Also, histological findings showed improved renal architecture as reflected by reduced glomerular and tubular necrosis in pregnant mice and their fetuses when compared with control group. Also, there was an increase in the anti-angiotensin II (Ang II) immunoreactivity in renal tubules, intra-glomerular, and interstitial cells in the kidney tissue of STZ-induced diabetic group which was markedly improved by treatment with OLE.

Table (3):The effect of leaves and fruits of Figs and Olive on kidney function in kidney disorder rats

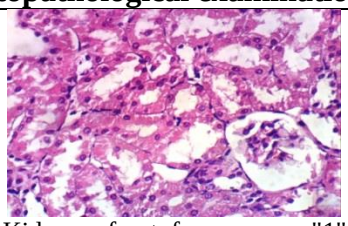
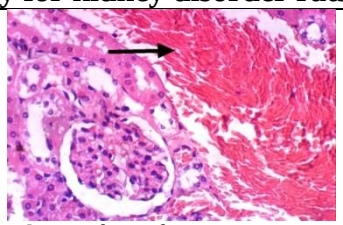
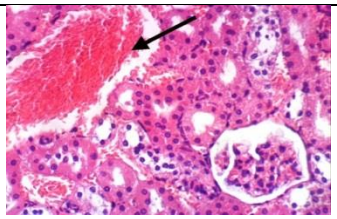
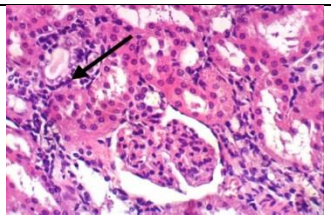
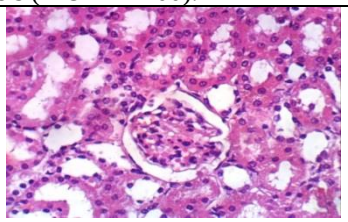
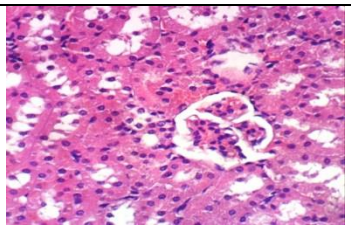
Groups	Urea (mg/dl)	Creatinine (mg/dl)	U. Acid (mg/dl)
G(1):Control (-ve)	47.667 ^{b}±4.509	0.88 ^{c}±0.095	1.943 ^{b} ±0.047
G(2):Control (+ve)	55.333 ^{a}±1.155	1.277 ^{a}±0.065	2.48 ^{a}±0.159
G(3):olive leaves 5%	48 ^{b}±2	1.103 ^{ab}±0.045	1.8 ^{b}±0.075
G(4): figs leaves 5%	48 ^{b}±2.646	1.103 ^{ab}±0.085	1.79 ^{b}±0.095
G(5): olive fruits 5%	51.333 ^{ab}±1.528	0.937 ^{bc}±0.040	1.82 ^{b}±0.137
G(6): figs fruits 5%	52.667 ^{ab}±1.528	1.093 ^{ab}±0.093	1.9 ^{b}±0.03

Values are mean ± SD. Values in the same column sharing the same superscript letters are not statistically significantly different.

Histopathological examination of kidneys:

Microscopically, Kidney of rat from group 1 revealed the normal histological structure of renal parenchyma (Photo 1). Meanwhile, kidneys of rats from group 2 revealed congestion of renal blood vessel (Photo. 2), Kidney of rat from (Photo3) kidney disorder rats from group(3) showing congestion of renal blood vessels. Kidney of rat fromgroup (4) (Photo 4) kidney disorder rats showing interstitial nephritis ,Moreover, kidneys of rats from groups 5 & 6 revealed no histopathological change.

Histopathological examination of kidney for kidney disorder rats:

 **(1):** Kidney of rat from group "1" rats which fed on basal diet as a control (-) group showing the normal histological structure of renal parenchyma (H & E X 400).	 **(2):** Kidney of rat from group "2" obese rats which fed on basal diet as a control (+) group showing congestion of renal blood vessels (H & E X 400).
 **(3):** Kidney of rat from group "3" kidney disorder rats fed on olive leaves 5% showing congestion of renal blood vessels (H & E X 400).	 **(4):** Kidney of rat from group "4" kidney disorder rats fed on figs leaves 5% showing interstitial nephritis (H & E X 400).
 **(5):** Kidney of rat from group "5" kidney disorder rats fed on olive fruits 5% showing no histopathological changes (H & E X 400).	 **(6):** Kidney of rat from group 4" kidney disorder rats fed on figs fruits 5% showing no histopathological changes (H & E X 400).

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دراسة تأثير كلا من أوراق و ثمار التين والزيتون على الفئران المصابة بالسمنة والمصابة بخلل في وظائف الكلى

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الملخص العربي:

تم إجراء الدراسة الحالية لمعرفة تأثير كلا من أوراق و ثمار التين والزيتون على الفئران المصابة بالسمنة والمصابة بخلل في وظائف الكلى. تم استخدام ستة وستون فأراً ألبينو بالغ (ذكور)، تم تغذية جميع الفئران على الوجبة الأساسية لمدة 7 أيام للتكيف علي المعمل و الباحث ثم تم تقسيمهم إلى ثلاث مجموعات رئيسية على النحو التالي:

المجموعة الرئيسية الأولى (6 الفئران): تتغذى على الوجبة الأساسية كمجموعة ضابطة سالبة.

المجموعة الرئيسية الثانية (30 الفئران): تتغذى على وجبة مرتفعة الدهون للإصابةبالسمنة ومن ثم تقسيمها إلى خمس مجموعات فرعية (كل مجموعة بها 6 فئران)وهم: فئران بدينة و تم تغذيتها على الوجبة المرتفعة في الدهون كمجموعة ضابطة موجبة،فئران تم معالجتها بـ 5٪ من أوراق الزيتون،فئران تم معالجتها بـ 5٪ من أوراق التين، فئران تم معالجتها بـ 5٪ من ثمار الزيتون وفئران تم معالجتها بـ5٪ من ثمار التين.

المجموعة الرئيسية الثالثة (30 فأر): تم حقن الفئران بالجنتاميسينلإصابتها بخللفي وظائف الكلى ثم تم تقسيمهم إلى خمس مجموعات فرعية (كل مجموعة بها 6 فئران) وهم:

فئران مصابة بخلل في وظائف الكلى وتم تغذيتها على الوجبة الأساسية كمجموعة ضابطة موجبة، فئران تم معالجتهابـ5٪ من أوراق الزيتون ، وفئران تم معالجتها بـ5٪ من أوراق التين،فئران تم معالجتها بـ5٪ من ثمار الزيتون و فئران تم معالجتها بـ 5٪ من ثمار التين.

تناول أوراق وثمار التين و الزيتون بتركيز 5٪له تأثير علىالسمنة و وظائف الكلى، حيث أدى إلى خفضتركيز الكوليسترول والدهون الثلاثية و LDL-c و VLDL-c ونقص اليوريا ، الكرياتينين وحمض اليوريك. و على الجانب الآخر،أدى إلى زيادة تركيزHDL-c.

وأظهر الفحص الهستوباثولوجي تحسنًا أنسجة الكلى للفئران المصابة بخلل في وظائف الكلى عند تناول أوراق وثمار التين والزيتون. لذلك، خلصت هذه الدراسة إلى أن تناول مسحوق الأوراق والفاكهة من التين والزيتون خاصة بتركيز 5 ٪ من الوجبة يمكن أن تكون مفيدة لعلاج السمنة و الخلل في وظائف الكلى للفئران.

الكلمات المفتاحية: السمنة، خلل في وظائف الكلى ، الزيتون ، التين ، دهون الدم ، وظائف الكلى، دراسات هستوباثولوجية.