

## تأثير التغذية بمسحوق اوراق البشملة على الفئران المصابة بمرض السكرى المستحث بالألوكسان

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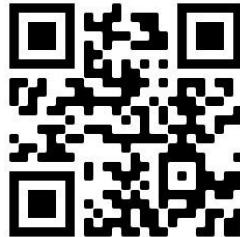
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**Effect of feeding *Eriobotrya japonica* leaves powder on  
diabetic rats induced by Alloxan**

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## Abstract

This study was conducted to investigate the effect of feeding on different levels of *Eriobotrya Japonica* leaves powder on diabetic experimental rats induced by Alloxan. Proximate chemical analysis, moisture, ash, total carbohydrates, fat, total protein and phytochemicals total phenols and flavonoids, tannins, total alkaloids content and antioxidant activity of *Eriobotrya japonica* leaves were determined. The effect of feeding on different levels (5, 10 and 15%) of *Eriobotrya Japonica* leaves on blood glucose, lipid profile, liver enzymes and kidney functions of diabetic rats induced by alloxan was investigated. Results showed that the protein, moisture, crude fiber, fats, ash and carbohydrates was 12.73, 61.98, 4.9, 2.32, 7.62 and 10.45 (g/100g), respectively. Total phenolic of *Eriobotrya Japonica* extracts was 0.160 g/100g, total flavonoids content was 0.064 g/100g, tannins of *Eriobotrya Japonica* was 7.52 g/100g and total alkaloids content was 1.69 g/100g. The antioxidant activity based on the DPPH radical was DPPH (40) 57.15%, DPPH (80) 60.54% DPPH (100) 64.67%. *Eriobotrya Japonica* leaves consumption led to weight improvement in diabetic rats. There were significant reduced at ( $p < 0.05$ ) in blood glucose level, total cholesterol (TC), triglyceride (TG), VLDL-c and LDL-c levels and increased HDL-c of all diabetic rats group fed on diet containing *Eriobotrya Japonica* leaf when compared with positive diabetic rats. Both biomarkers for liver and kidney functions of diabetic rats were improved with consumption *Eriobotrya japonica* leaves. It concluded that *Eriobotrya Japonica* leaves an excellent nutritional quality and it had protection against diabetes.

**Key words:** *Eriobotrya japonica*, chemical composition, diabetes, lipid profile, liver functions, kidney functions.

## INTRODUCTION

Diabetes mellitus is one of the chronic metabolic

diseases, which affects large number of people around the wide world; insulin deficiency often leads to an increase in the level of glucose in the blood (Nandini *et al.*, 2003 and Vadivelan *et al.*, 2019). Diabetes mellitus is socioeconomic problem and occurs in children, adult and elderly population as it is widely hereditary disease. It causes disorders for carbohydrate, fat and protein metabolism, resulting body inability to properly use and store glucose (Kim *et al.*, 2006). WHO defines the disease as the 7th cause of death in 2030 (WHO 2016).

According to World Health Organization projection, the diabetes population is likely to increase to 300 million or more by the year 2025 and therefore the number of diabetics in the next two years will increase to more than half a million because about 463 million people suffer from diabetes in 2019, this increase leads to higher in the cost of treatment (Meenakshi *et al.*, 2010; Guariguata *et al.*, 2014 and Anyanwu *et al.*, 2019). Diabetes mellitus type 2 (T2DM) designated by multiple etiologies is portrayed by chronic hyperglycaemia resulting due to impairment in metabolism of major biomolecules oftenly due to lack of insulin production and action and is frequently symptomized by glycosuria, polydipsia and polyuria (Ngaski, 2018). Loss of balance in the levels of oxidants and antioxidants that known as oxidative stress is a major link in the onset and succession of T2DM (Fiorentino *et al.*, 2013). Most of the antioxidant compounds obtained from plant sources vary widely and have chemical properties. The antioxidant function centered on its ability to trap free radicals. It was reported that all segments of the plant had different biological functions, such as decreasing blood glucose levels (Mbikay, 2012). One such plant is *Eriobotrya japonica* Lindley an evergreen fruit tree grown in many countries such as Iran , Spain ,Turkey ,Tunisia and Egypt. The leaves and flowers of the *Eriobotrya japonica* tree are used in the treatment of many diseases

such as coughs, cancers, skin diseases, colds and diabetes (Liu *et al.*, 2016 and Zhou *et al.*, 2011). Studies indicate the *Eriobotrya japonica* plant has many vital activities Such as improvement of, lung, renal, neuronal cells and liver function (Yoshioka *et al.*, 2010; Nishioka *et al.*, 2002 ; Yang *et al.*, 2012; Hamada *et al.*, 2004 and Kim *et al.*, 2011). and it has an opposite effect to both anti-allergic, anti-thrombotic potential, antiaging, antinociceptive activities ,obesity and hypolipidemic activity (Tanaka *et al.*, 2010; Shih *et al.*, 2010; Shih *et al.*, 2013; Kim *et al.*, 2009; Cha *et al.*, 2011; Lee *et al.*, 2004 and Muramoto *et al.*, 2011). Traditional diabetes mellitus therapy has side effects such as low blood sugar, diarrhea, and myocardial infarction; therefore, search for natural anti-diabetic plant products for controlling diabetes is going on (Andrew *et al.*, 2013). The current research was performed in order to investigate the effect of feeding on different concentrations of *Eriobotrya japonica* leaves powder on diabetic experimental rats induced by Alloxan.

## MATERIALS AND METHODS

### MATERIALS

Leaves of *Eriobotrya Japonica* was collected from the fruit farm, Faculty of Agriculture, Assiut University in October 2019 and dried under shade for ten days.

Alloxan was obtained from El-Gomhoriya Company for Trading Drugs, Chemicals, Assiut, Egypt. 25 male Albino rats (Sprague Dawley strain) initially weighting 220-240g, were obtained from the Egyptian Company for Production of Antisera, Vaccines and Drugs Helwan, Egypt.

### METHODS

#### Induction of diabetes:

Diabetes was induced in the rats by a single under the skin injection of freshly prepared alloxan monohydrate of 150 mg/kg as a 5% solution in normal saline). The animals were allowed to drink 5% glucose solution over night to overcome alloxan induced hypoglycemia (Misra and Aiman 2012 & Ananthan *et al.*, 2004) .

#### **Proximate chemical analysis:**

The *Eriobotrya Japonica* leaves was analyzed for moisture, protein, fat, ash and fiber contents were determined using the methods described in the A.O.A.C (2000). Carbohydrates calculated by differences:

Carbohydrates (%) = 100 - (% moisture + % protein + % fat + % Ash + % fiber)

#### **Determination of tannins:**

Tannins content was determined according to the method which described by (Vasundhara *et al.*, 2013)

#### **Determination of alkaloids**

Alkaloids were determined according to the method described by Adham and Iraq (2015)

#### **Determination of total flavonoids**

The flavonoid content was estimated according to the method of Zhishen *et al.* , (1999)

#### **Determination of total phenolic**

Total phenol has been estimated according to Singleton and Rossi (1965) using the Folin-Ciocalteu reagent

#### **Determination of Antioxidant activity**

The antioxidant activity of *Eriobotrya japonica* leaves extracts against the DPPH radical was determined by the method of **Aromatic et al., (2013)**

**Experimental design:**

twenty five male Albino rats (Sprague Dawley strain ) initially weighing 220- 240 rats were housed in dividually metal cages (5 rats/cage) under the normal laboratory conditions and fed on basal diet for one week for adaptation .The experiment was performed inside Laboratory Animal House, Faculty of Science, South Valley University ,Qena Governorate, Egypt . After this week the rats divided into 2 group as a following.

**The first group (5 rats )** fed on commercial diet and distilled for 4 weeks (as a control negative group).

**The second group (20 rats )** was treated with 150 mg/kg body weight of alloxan to induce diabetes , this group was divided into 4 subgroups as a following:

**Subgroup (1)** diabetic rats fed on commercial diet containing for 4 weeks (as a control positive group).

**Subgroup (2)** diabetic rats fed on commercial diet containing 5% *Eriobotrya japonica* for 4 weeks.

**Subgroup (3)** diabetic rats fed on commercial diet containing 10% *Eriobotrya japonica* and water for 4 weeks

**Subgroup (4)** diabetic rats fed on commercial diet containing 15% *Eriobotrya japonica* for 4 weeks .

At the end the experimental period (4 week) , rats were fasted overnight and blood samples were collected from supraorbital plexus from all animals of each group into clean, dry and labeled tube Blood samples were left to clot at room temperature then serum was separated by cooling centrifugation for 10 minutes .Serum samples were stored at -20 °C until biochemical assays . (liver, , heart, pancreas and kidneys ) of each animal were removed , cleaned , weighed , and kept in formalin solution (10% v/v) according to **Drury and Wallington (1980)** until histological investigations.

### **Commercial Diet composition**

All rats on El Fareed Feeds which consist of (Yellow corn – Soybean 48% - Corn gluten 60% - Soybean oil crude – DDG,S- Mono calcium phosphate – salt – Limestone- lysine – minerals and Vitamin mixture). Crude protein 21% - crude fat 2.83% - energy 2950 Kcal/Kg. crude fiber 2.4% .

### **Biological Evaluation:**

#### **Determination of serum total cholesterol:**

Serum total cholesterol (TC), triglyceride, high density lipoprotein cholesterol, low density lipoprotein cholesterol (LDL-c)and very low density lipoprotein cholesterol (VLDL-c) were determined according to the methods of **Allian et al., (1974), Boutaud and David (1973), Fried wald et al., (1972), Lopes et al., (1977) and Fried Wald et al., (1972)**, respectively.

Serum aspartate amino transferees activity (AST), alanine amino transferees activity (ALT) and alkaline phosphatase (ALP) were determined according to the methods of



**Reitman and Frankel (1957)** and **Kind and king (1954)**, respectively.

Serum urea nitrogen, creatinine and uric acid were determined according to the methods of **Tietz and Saunders (1995)**, **Zender and Jacot (1972)** and **Young (1995)**, respectively.

Glucose was determined in the serum according to the method described by **Trinder (1969)**

### **Statistical analysis**

Statistical analysis using one-way analysis of variance (ANOVA) was done to compare between Negative control group, Positive control group and group treated, followed by post-hoc analysis (Duncan 's test) using Statistical package for Social Science (SPSS , 20) , data were expressed as mean  $\pm$ (SD) standard deviation for five rats in each group (**Coakes, 2012**).

## **RESULTS AND DISCUSSION**

### **Chemical composition of *Eriobotrya Japonica* leaves**

Data in Table (1) illustrated the chemical composition of *Eriobotrya japonica* leaves. The moisture content of *Eriobotrya japonica* leaves was 61.98%. Crude protein, total fat, crude fiber, ash and carbohydrates contents were 12.73, 2.32, 4.9, 7.62 and 10.45%, respectively. These results were convergent with those obtained by **de Almeida Lopes et al., (2018)** found the *Eriobotrya japonica* contain 86.5–90.2%, 0.8–1.7%, 9.6–43.3, 0.4–0.5, 0.43–1.4 and 0.2–0.7 g/100 g) of moisture, crude fiber, total carbohydrates, ash, crude proteins and fat. On the other hand, **Hwang et al., (2010)** found that content of ash **Park**

(2012) reported that proximate compositions of *Eriobotrya japonica* leaves powder was 6.72 % for ash.

**Table (1):** Chemical analysis of *Eriobotrya japonica* leaves (g/100g) basis on wet weight

Sample	Moisture	Protein	Fat	Crude Fibers	Ash	Carbohydrates
<i>Eriobotrya japonica</i>	61.98±2.01	12.73±1.10	2.32±.01	4.9±.17	7.62±.99	10.45±1.50

Values are expressed as mean ±SD

As illustrated in Table (2) *Eriobotrya japonica* leaves showed high content of tannins, such result was agreed with that obtained by (Nawrot-Hadzik *et al.*, 2017) found tannins content of dichloromethane was 6 mg/g. The total content of the phenolic (TPC) and flavonoids (TFC) compounds was 0.160 and 0.064 g/100g of leaves *Eriobotrya japonica* such results were in agreement with Mogole *et al.*, (2020) who reported that the total phenolic and flavonoids contents of the acetone, methanol, ethyl acetate and hexane extract of *Eriobotrya japonica* leaves were acetone 3.680 mg GAE/g and 0.1464 mg QCE/g, methanol 3.810 mg GAE/g and 0.3833 mg QCE/g, ethyl acetate 1. GAE/g and 0.0394 mg QCE/g and hexane 1.2334 GAE/g and 0.0098 mg QCE/g. The differences of values may be due to be the phenolic compounds was affected by many factor as soil nutrients (Borges *et al.*, 2013) and it varied from generation to others (Verma and Shuklla, 2015). The cultivar type and environmental variables will greatly affect these large differences observed Ahumada *et al.*, (2017). Data in the same table showed that the content of total alkaloids recorded 1.69 g/100g.

**Table (2):** Phytochemical content of *Eriobotrya japonica* leaves

Sample	Total phenols	Total Flavonoids	Tannins	Total Alkaloids
<i>Eriobotrya Japonica</i>	0.160±.01	0.064±.00	7.52±1.01	1.69±.01

Values are expressed as mean ±SD

As illustrated in Table (3) *Eriobotrya japonica* leaves showed high content of antioxidant and its value was 57.15, 60.54 and 64.67 %, respectively. This result similar with those obtained by **Ham et al., (2012)** reported that the antioxidants (DPPH) in loquat leaf using extract of ethyl acetate recorded (63.24±2.20, 81.83±2.10, and 93.15±2.31 in sample concentrations of 0.3, 0.7, and 1.0 mg/ml; respectively).

**Table (3):** Antioxidant activity content of *Eriobotrya japonica* leaves

Sample	DPPH(40)	DPPH (80)	DPPH (100)
<i>Eriobotrya japonica</i>	57.15±.87	60.54±94	64.67±1.69

Values are expressed as mean ±SD

## Biological experiment

### Effect of feeding diabetic rats on diet containing *Eriobotrya japonica* leaves on body weight and body weight gain %

Rat's BW was recorded weekly; accordingly the BWG was calculated. As noticed from Table (4). In initial body weight of rats, result revealed that, there were no significant differences among groups. Control (+Ve) rats, which was injected by alloxan a severe loss of body weight, that case may be due to alloxan effect as reported by **Lucchesi et al., (2015)**. The result showed significant increase at (p<0.05) in body weight in all group treated with different level from *Eriobotrya*

*Japonica* when compared with positive control group. It should be noted that, with increasing the level of *Eriobotrya Japonica*, the body weight is also increasing. On the other hand, the body weight significant decreased at ( $p<0.05$ ) in positive control group when, compared negative control group but the body weight still less than control negative group. However, this was increased in body weight gain in all group treated with different levels from *Eriobotrya Japonica* compared with positive control group. These results were similar with obtained by **Shafi and Tabassum (2013)** reported that treatment with the ethanolic extract of *Eriobotrya japonica* seeds led to increase in body weight.

**Table (4):** Effect of feeding diabetic rats on diet containing *Eriobotrya japonica* leaves on body weight and body weight gain %

Body weight			
Groups	Initial body weight(g)	Final weight	BWG%
Control(-Ve)	231 <sup>a</sup> ±6.6	265.6 <sup>e</sup> ±3.4	14.94 <sup>b</sup> ±3.22
Control(+Ve)	228 <sup>a</sup> ±6.3	175.4 <sup>a</sup> ±4.2	-22.6 <sup>a</sup> ±3.04
Eg1	227 <sup>a</sup> ±3.4	239.6 <sup>b</sup> ±2.7	5.56 <sup>c</sup> ±2.11
Eg2	230 <sup>a</sup> ±3.8	246 <sup>c</sup> ±4.2	6.96 <sup>c</sup> ±1.92
Eg3	233.2 <sup>a</sup> ±3.0	251 <sup>d</sup> ±1.6	7.15 <sup>c</sup> ±1.44

Values are expressed as mean ±SD

Values at the same column with different letters are significant at( $p<0.05$ )

**Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on blood glucose.**

From the data illustrated in table (6) it could be noticed that the Control (+Ve) group had shown a significant increase at ( $P < 0.05$ ) in blood glucose level compared with control positive group . Blood glucose of Control (-Ve), Eg1, Eg2 and Eg3 rats was 109.4, 256, 226.4 and 175, mg/dl respectively. As it declared in Table (5) the reduction of blood glucose level in rats fed on basal diet containing 5, 10 and 15% of *Eriobotrya japonica*. Treating diabetic groups with 15% doses from *Eriobotrya japonica* achieved the best results. These results were corresponded with those of **Noreen et al. (1988)** said that treatment with the alcoholic extract of *Eriobotrya japonica* leaves in different doses led to reduce the blood sugar level in normal rabbits. On the other hand,

(**Li et al., 2007**) mentioned that intake the ethanolic extract of *Eriobotrya japonica* leaves in different doses led to a decrease in the blood sugar level, and the impact of taking 30 g / kg of *Eriobotrya japonica* leaves was better than taking 100 mg / kg of phenformin in lowering the blood sugar level. However, (**Tamaya et al., 2010**) evaluated that efficacy of new fermented tea from of loquat leaves and green tea leaves on high glucose level in the blood on rats induced disaccharide , the results showed significantly reduce in blood glucose level.

Decreasing of blood sugar level may be due to content of alkaloids, flavonoids and phenolics. **Qi et al., ( 2010)** reported that Saponins, flavonoids, anthraquinones, alkaloids, terpenoids, coumarins, phenolics and some polysaccharides present of *Eriobotrya Japonica* leaves have antidiabetic activity.

**Table (5): Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on blood glucose.**

Glucose(mg/dl)
----------------

Parameters	Glucose
Groups	
Control(-Ve)	109.4 <sup>e</sup> ±7.5
Control(+Ve)	333.2 <sup>a</sup> ±13.3
Eg1	256 <sup>b</sup> ±6.7
Eg2	226.4 <sup>c</sup> ±2.6
Eg3	175 <sup>d</sup> ±2.4

Values are expressed as mean ±SD Values at the same column with different letters are significant at (p<0.05)

### Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on lipid profile

Data in Table (5) revealed that there were significant increase at (P<0.05) in total cholesterol (TC), triglyceride (TG), LDL-cholesterol, VLDL-cholesterol and reduce in HDL-cholesterol levels in positive control group, as compared with negative control group. Feeding the three concentrations from *Eriobotrya japonica* in treated diabetic rats led to significant reduce at (P<0.05) in total cholesterol (TC), triglyceride (TG), LDL-cholesterol, VLDL-cholesterol and increase in HDL-cholesterol levels, as compared with positive control group. The highest impact in decreasing of total cholesterol (TC), triglyceride (TG), LDL-cholesterol, VLDL-cholesterol and increase in HDL-cholesterol levels recorded for the group which treated with higher level of *Eriobotrya Japonica* leaves, followed by groups which were treated with 10% and 5% of *Eriobotrya Japonica* respectively. These results were similar with obtained by Said *et al.*, (2009) found that treatment with tablet Cholevel (Loquat and olive leaf) reduced significant serum total cholesterol, triglycerides, LDL and increase level HDL-

C in rats hyperlipidemic. On the other hand, **Jian et al., (2017)** found that sesquiterpene glycosides separated from the *eriobotrya japonica* leaves led to a decrease triglycerides, total cholesterol. However, **Xu et al., (2019)** evaluated the efficacy Segregated corosolic acid from *eriobotrya japonica* leaf on human hepatocellular cancer and rat cells. Result showed reduced the levels of fat blood such as triglycerides , total cholesterol , high density lipoprotein-cholesterol, malondialdehyde , blood glucose and increase level HDL-c .The decreasing of TC and TG may be due to *Eriobotrya Japonica* leaves contain high amount of total sesquiterpene glycosides compounds as stated by **Jian et al., (2017)**. However, the decreased of serum LDL-c, VLDL- may be due to alkaloids and flavonoids. **Shafi and Tabassum (2019)** reported that the explanation of reduce in serum low density lipoprotein cholesterol, serum very low density lipoprotein cholesterol level and increase of serum high density lipoproteins cholesterol after administration of *Eriobotrya japonica* extract may be due to presence of glycosides, alkaloids and flavonoids.

**Table (6):** Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on lipid profile

lipid profile					
Parameter s Groups	TC (mg/dl)	TG (mg/dl)	HDL-c (mg/dl)	LDL-c (mg/dl)	VLDL-c (mg/dl)
<b>Control(- Ve)</b>	100 <sup>e</sup> ±2. 91	95 <sup>e</sup> ±5.4 7	54.4 <sup>e</sup> ±1. 67	26.6 <sup>e</sup> ±2.5 4	19 <sup>e</sup> ±1.09
<b>Control(+ Ve)</b>	155 <sup>a</sup> ±2. 52	175 <sup>a</sup> ±8. 09	30 <sup>a</sup> ±1.58	90 <sup>a</sup> ±3.58	35 <sup>a</sup> ±1.61
<b>Eg1</b>	145 <sup>b</sup> ±1. 58	161 <sup>b</sup> ±3. 16	36 <sup>b</sup> ±3.1 6	78.4 <sup>b</sup> ±4.5 1	30.6 <sup>b</sup> ±1. 17
<b>Eg2</b>	140 <sup>c</sup> ±1. 58	147 <sup>c</sup> ±2. 91	42 <sup>c</sup> ±3.39	68.64 <sup>c</sup> ±3. 48	29.4 <sup>bc</sup> ±0. 58
<b>Eg3</b>	130 <sup>d</sup> ±1. 58	140 <sup>d</sup> ±2. 73	49 <sup>d</sup> ±2.7 3	53 <sup>d</sup> ±2.07	28 <sup>d</sup> ±0.54

Values are expressed as mean ±SD Values at the same column with different letters are significant at (p<0.05)

### Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on liver enzymes

The data presented in table (6) showed that aspartate aminotransferases (AST), alanine aminotransferases (ALT) and alkaline phosphatase (ALP) increased significantly at (p<0.05) in the control positive group as compared with control negative group, may be due to alloxan. **Zafar et al., (2009)** reported that alloxan led to increase AST, ALT and ALP. The result indicated that AST, ALT and ALP levels of rats fed on diet containing 5, 10 and 15% *Eriobotrya japonica* leaves were (193.2 ± 2.4, 173.4 ±4.0, 150 ± 3.2) and (110 ±7.2, 102.2 ±11.5, 92.4 ±5.6) and (205 ±7.8, 195 ±4.2, 179 ±2.2) U/L, respectively. Feeding hyperglycemic rats fed on commercial diet containing *Eriobotrya Japonica* leaves reduced AST, ALT and ALP enzymes, as compared to the positive control. This result



was completely agree with Lee *et al.*, (2017) showed that significant decrease total cholesterol, triglycerides, ALT, AST, ALP and LDH, in rats treated with ethanol extract of *Eriobotrya japonica* leaves when, compared with liver rats. Also Shahat *et al.*, (2018) found that the extracts of methanolic, the ethyl acetate, aqueous and butanol of *Eriobotrya japonica* leaves and the different fractions on against hepatotoxicity induced by CCL4 at doses (250 and 500mg/kg), led to significant decrease in serum level enzymes the liver such as ALP, ALT, AST, malondialdehyde, bilirubin and increase in total protein in treated group compared with hepatotoxicity rat group. On the other hand, Banno *et al.*, (2005) & Hong *et al.*, (2008) reported that the leaves of *Eriobotrya japonica* have an antioxidant effect. The natural antioxidants work preventing the excess of lipid peroxidation and inhibition of the enzyme xanthine oxidase of rat liver induced by alloxan.

**Table (7):** : Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on liver enzymes

Liver function tests			
Parameters	AST/GOT (IU/i)	ALT/GPT (IU/i)	ALP (IU/i)
Groups			
Control (-Ve)	135 <sup>e</sup> ± 4.4	80.6 <sup>d</sup> ± 4.7	168 <sup>c</sup> ± 3.2
Control (+Ve)	214.2 <sup>a</sup> ± 12.6	123.6 <sup>a</sup> ± 3.6	216 <sup>a</sup> ± 11.9
Eg1	193.2 <sup>b</sup> ± 2.4	110 <sup>b</sup> ± 7.2	205 <sup>b</sup> ± 7.8
Eg2	173.4 <sup>c</sup> ± 4.0	102.2 <sup>b</sup> ± 11.5	195 <sup>c</sup> ± 4.2
Eg3	150 <sup>d</sup> ± 3.2	92.4 <sup>c</sup> ± 5.6	179 <sup>d</sup> ± 2.2

Values are expressed as mean ±SD Values at the same column with different letters are significant at (p<0.05)

### Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on kidney functions

The data illustrated in Table (8) showed that serum of urea, creatinine and uric acid increased significantly at

( $p < 0.05$ ) in the control positive group as compared with control negative group. Feeding on three concentrations from *Eriobotrya Japonica* in treated diabetic rats contributed to a gradual reduced significant at ( $p < 0.05$ ) in serum of urea, creatinine and uric acid as compared with positive control group. But the Eg2 and Eg3 non-significant between them, but at the same impact in reduce serum of urea. The results showed that, the increasing levels of *Eriobotrya Japonica* led to a major reduce in serum urea, creatinine and uric acid as compared with low and medium of *Eriobotrya japonica* concentrations. This result agrees with the result obtained by **Ismael et al., (2014)** evaluated that efficacy of chloroform extract of *Eriobotrya japonica* leaf on male rats infected nephrotoxicity induced cisplatin. The findings showed that *Eriobotrya japonica* leaf chloroform extract had a major protective impact against nephrotoxicity caused by cisplatin. The reduce of serum urea, creatinine and uric acid may be due to *Eriobotrya japonica* content antioxidant activity. **Nabavi et al., (2015)** showed that treatment with alcoholic aqueous extract of *Eriobotrya japonica* flowers led to improve in kidney functions as serum creatinine, urea and BUN in male rats supplemented compared with gentamicin rat group may be due to antioxidant, anti-hypoxic and nephroprotective agents.

**Table (8):** Effect of feeding diabetic rats on diet containing three levels from *Eriobotrya japonica* leaves on kidney functions

Parameters	Kidneys function tests		
	Urea	Creatinine	Uric acid
Groups			

	(mg/dl)	(mg/dl)	(mg/dl)
<b>Control (-Ve)</b>	<b>42<sup>d</sup> ± 2.7</b>	<b>0.52<sup>d</sup>±0.02</b>	<b>2.25<sup>c</sup>±0.08</b>
<b>Control (+Ve)</b>	<b>65.2<sup>a</sup> ±3.4</b>	<b>1.01<sup>a</sup> ±0.11</b>	<b>5.11<sup>a</sup>±0.21</b>
<b>Eg1</b>	<b>55.8<sup>b</sup> ±2.2</b>	<b>0.70<sup>b</sup> ±0.08</b>	<b>4.6<sup>b</sup>±0.11</b>
<b>Eg2</b>	<b>50<sup>c</sup> ±1.6</b>	<b>0.64<sup>bc</sup> ±0.03</b>	<b>3.7<sup>c</sup>±0.21</b>
<b>Eg3</b>	<b>47<sup>c</sup> ±2.9</b>	<b>0.61<sup>c</sup>±0.03</b>	<b>3<sup>d</sup>±0.44</b>

Values are expressed as mean ±SD Values at the same column with different letters are significant at (p<0.05)

## CONCLUSION

Generally, according to this study the *Eriobotrya Japonica* leaves powder has high content of health and nutritional value, *Eriobotrya japonica* leaves can be used to as anti-diabetes, anti-hyperlipidemia, and an anti-oxidative damage, anti-hepatic and kidney damage.

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تأثير التغذية بمسحوق اوراق البشملة على الفئران المصابة بمرض السكرى  
المستحث بالالوكسان

**الملخص:** أجريت هذه الدراسة لمعرفة تأثير التغذية على تركيزات مختلفة من أوراق البشملة على فئران التجارب المصابة بالسكر بواسطة عقار الالوكسان. تمت دراسة التركيب

الكيميائي ، ومحتوى أوراق البشملة من التانين ، والفوليات ، والأحماض الأمينية ، ومركبات البوليفينول والفلافونويد والنشاط المضاد للأكسدة. تم دراسة تأثير التغذية على مسحوق البشملة بتركيزات مختلفة (5 ، 10 و 15 %) على مستوى السكر ودهون الدم وكذلك وظائف الكبد والكلية للفئران المصابة بالسكر. أظهرت النتائج أن نسبة الرطوبة والبروتين والدهون والألياف الخام والرماد والكربوهيدرات في مسحوق البشملة كان 61,98 و 12,73 و 2,32 و 4,9 و 7,62 و 10,45% على التوالي. كما كان محتوى مستخلص البشملة من المركبات الفينولية والفلافونيد 0,160 و 0,064 جم/100جم. وتميز مستخلص البشملة بقوة نشاطه كمضاد للأكسدة والتي بلغت 64,67 - 60,54 - 57,15 % . وأظهرت النتائج تحسن حالة وزن جسم الفئران التي تغذت على مسحوق أوراق البشملة والعودة إلى صورته الطبيعية بعد أن انخفض بصورة حادة نتيجة الحقن بالألوكسان في الفئران المصابة بداء السكري. كما أظهرت نتائج التحليل الاحصائي أن هناك انخفاض معنوي في مستوى الجلوكوز في الدم والكوليسترول والجليسيريدات الثلاثية والليپوبروتينات منخفضة الكثافة والمنخفضة جدا لجميع مجموعات الفئران المصابة بالسكر والمغذاه على مسحوق أوراق البشملة بنسب (5، 10 و 15 %). كما أوضحت النتائج ان هناك تحسن معنوي في وظائف الكبد والكلية عند جميع الفئران المصابة بداء السكري والمعالجة بمسحوق أوراق البشملة. وخلصت الدراسة إلى أن أوراق البشملة ذات قيمة غذائية ممتازة ولديها حماية ضد مرض السكري.

**الكلمات المفتاحية:** البشملة، التركيب الكيميائي، السكر، دهون الدم، وظائف الكبد، وظائف الكلية