Effect of dried Persimmon fruit (*Diospyros kaki*) on acute carbon tetrachloride induced hepatotoxicity in laboratory rats

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Abstract:

Persimmon (*Diospyros kaki*) is a popular and a widespread fruit that is rich in many bioactive compounds. The present study was carried out to investigate the effect of the dried Persimmon fruit on acute carbon tetrachloride induced hepatotoxicity. Thirty male albino rats (*Sprague Dawley Strain*), weighing between 180-200g, have been used and were divided into two main groups for 6 weeks. The first group: normal control group (negative group, 5 rats). The second group: twenty five rats treated with single dose of CCl_4 in paraffin oil (50% v/v 4 ml/kg) injected to induce acute damage in liver. Chemical, biochemical and histological tests were carried out. The results of this study showed that persimmon powder contains a high amount of carbohydrates, a moderate amount of protein, fat and crude fiber which can decrease risks of heart disease and cancers. They also recorded a high amount of antioxidant activity, total Phenols, total flavonoids and carotene. T.B, D.B, ID.B, AST, ALT and ALP decreased significantly in all groups that were supported by different percentages of persimmon powder compared with the positive control group. Additionally, they showed a significant decrease in Ceatinine, Urea and U.A, whereas the results of T.P, ALB and G showed a significant increase in all groups that were supported by different percentages of persimmon powder compared with the positive control group. There was also a noticeable improvement in the prothrombin time parameters. Examination of Liver and kidney histopathologically showed improvement in all groups that were supported by different percentages of persimmon powder compared with the positive control group. As a result of its bioactive qualities, this study suggests that persimmon powder be used to improve liver damage in rats with hepatotoxicity.

Key words: Persimmon fruit (*Diospyros kaki*) - Hepatotoxicity- Liver Functions- Kidney Functions- Prothrombin Time test.

Introduction

Persimmon (*Diospyros kak*i) is a popular and a widespread fruit that belongs to Diospyros genus. The Diospyros genus belongs to the Ebenaceae family and has more than 350 known species **Zhao *et al*., (2011)**. The persimmon fruit looks like an orange red tomato with a pointed end. The whole fruit is edible. Its color ranges from glossy light yellow-orange to dark red-orange **Yonemori *et al*., (2000)** and this is relying upon the concentration of carotenoid contents **(photo 1) Philip & CHEN, (1988)**. It is rich in many nutritional and bioactive components such as vitamin A, vitamin B12, vitamin B6, vitamin c, vitamin D, vitamin E, proteins, sugar, calcium and potassium **Pachisia, (2020)**. In addition, it has polyphenols like tannins, flavonoids**, Pachisia, (2020)** dietary carotenoids (a-carotene, ˆ a-cryptoxanthin, zeaxanthin, lutein, and lycopene) **de Ancos *et al*., (2000)**, steroids, terpenoids, minerals, and dietary fiber **Zhao *et al*., (2011)**. In the pulp of the persimmon, the major phenolic acids are ferulic acid, gallic acid and p-coumaric acid **Yaqub *et al*., (2016)**. These compounds have direct beneficial effects to human health and the reduction of risk **Marques *et al*., (2019)**.

Persimmons are delicious fruits that can be used for more than just a sweet and savoury snack. They have a long list of health advantages, including the capacity to minimise signs of ageing, improve digestion, stimulate the immune system, prevent cancer, lower cholesterol and blood pressure, raise metabolism, strengthen bones, and improve cognitive function and skincare. They also assist the body in healing faster, reducing inflammation and improving blood circulation throughout the body **Arslan & Bayrakci, (2016) & Kashif *et al*., (2017)** and protect eye vision **An *et al*., (2005)**.

The liver is responsible for metabolism and detoxification of most of the components that enter the body **Nunez, (2006)**. Carbon tetrachloride (CCl_4) is one of the strongest poisons used to induce chemical hepatic injuries in laboratory animals. The CCl_4-induced hepatic lesion is a common experimental model for the screening of the hepatoprotective activity of certain drugs and it is a strong hepatotoxic agent and a single exposure to it rapidly leads to severe hepatic necrosis

and steatosis **Manibusan *et al*., (2007)**. The aim of this study was to investigate the effects of dried Persimmon fruit on hepatotoxicity caused by carbon tetrachloride injection in laboratory rats.

Materials and Methods

Materials

- Persimmon fruits were purchased from local market. The fruits were washed well, cut into small slices and dried at (0-60 °C) by oven in Central Laboratory of Soil, Food and Feed, Faculty of Technology and Development, Zagazig University, pulverized to powder using a blender and kept in air-tight containers until further usage.

- Casein, vitamins, minerals, cellulose, choline chloride, carbon tetrachloride and silymarin powder were purchased from El-Gomhoreya Company, Cairo, Egypt.

- Oil and starch were purchased from local market, Cairo, Egypt.

- Thirty male albino rats (*Sprague Dawley Strain*) weighing between 180-200g were obtained from Food Technology Research Institute, Giza.

Methods:

Chemical analysis

Chemical analysis of the dried Persimmon fruit powder including protein, lipids, moisture and ash were conducted in Food Technology Research Institute according to the method described by the **A.O.A.C., (2005)**. Carbohydrate value was calculated according to **FAO (1982)** by as follows:

Soluble carbohydrates (%) = 100 – (protein % + ash % + fat % + fiber %+ moisture%).

Total phenolic and Antioxidant activity content in Persimmon fruit powder was determined according to **Su & Chien (2007)**, Total flavonoid content according to **John *et al*., (2014) and** Carotene in accordance with **Kim et al., (2005)**

Biological Experiment

Diet was given in a non-scattering feed cups to minimize food loss. Water was provided to the rats by means of glass tube projecting through the cage wire. Basal diet was prepared from fine ingredients (100 g) according to **Reeves *et al.*, (1993)** in the animal house of Agricultural Research Center in Ministry of Agriculture, Giza.

The basal diet consisted of casein 12%, cellulose 5%, corn oil 10%, mineral mixture 4%, vitamin mixture 1%, choline chloride 0.20% and the remained amount is starch according to **ALN, (1993)** with (2.5, 5, 10%) Persimmon fruit powder daily during the experimental period (6 weeks).

After the adaptation period, the experimental animals were divided into two main groups. The first group: Normal control group (negative group, 5 rats) in which, rats were fed on basal diet for 6 weeks. The second group: Twenty five rats were treated with single dose of CCl_4 in paraffin oil (50% v/v 4 ml/kg) injected to induce acute damage in liver according to **Jayasekhar *et al.*, (1997)**. After that, the injected group was divided into 5 groups (5 rats per each) as following :

Group 2: Control positive group (non-treated group) fed on basal diet.

Group 3: Rats which were orally given 50 ml/kg body weight of silymarin solution, a potent hepatoprotective drug, was used as standard control, add to fed on basal diet according to **Pradeep *et al.*,** (2007).

Group 4: Rats fed on experimental diet containing 2.5% Persimmon fruit powder

Group 5: Rats fed on experimental diet containing 5% Persimmon fruit powder

Group 6: Rats fed on experimental diet containing 10% Persimmon fruit powder

During the experimental period (6 weeks), each rat was weighed every week and food consumption was recorded. The body weight gain and food efficiency ratio (FER) were determined according to **Chapman *et al.*, (1959)** using the following formula:

$$(\text{BWG\%}) = \frac{\text{Final Weight\_ Initial Weight}}{\text{Initial Weight}}$$

$$(\text{FER}) \quad = \frac{\text{Daily body Weight gain(g)}}{\text{Food intake (g/d)}} * 100$$

At the end of the experimental period rats were fasted over night before slaughtering. After that the blood was collected then centrifuged. Serum was separated and stored at -20°c for biochemical analysis i.e. aspartate amino transferase (AST) and alanine amino transferase (ALT) according to **Reitman & Frankel, (1957)**, serum alkaline phosphates (ALP) according to **Belfield & Goldberg, (1971)**,serum total protein(T.P) according to **Gornall *et al.*, (1949)**, serum albumin(ALB) according to **Doumas *et al.*, (1971)**, serum globulin(G) were calculated by subtracting serum albumin from serum total protein, serum total bilirubin(T.B) according to **Young , (1996)**, serum uric acid according to **Fossati *et al.*, (1980),** urea according to **Marsch *et al.*, (1965)**, Creatinine according to **Bartels & Bohmer, (1971),** Prothrombin Tim (PT) & (INR) according to **Neofotistos *et al.*, (1998).**

Histopathological Examination

Kidneys and Livers were separated from each rat and examined histopathologicaly according to **Bancroft *et al.*, (2012).**

Statistical analysis

Results are expressed as mean ± SD. Data were statistically analyzed using one – way analysis of variance ″ANOVA″ according to **McClave & Benson, (1991).**

Results and Discussion

Chemical composition of Persimmon fruit powder

Persimmon fruit powder was analyzed for knowing its chemical composition (moisture, protein, carbohydrates, fat, crude fiber and ash).The obtained results (Table1) showed that, the crude protein, total carbohydrates, fat content, crude fiber , ash and moisture were 4.32, 80.86, 3.23, 3.42, 2.78 and 5.38 % on dry weight, respectively. Similar results were obtained by **Jung *et al.*, (2005)** demonstrated that, dry persimmon includes 5.61g/100 g fiber and **Cho *et al.*, (2003)** revealed that, sweet persimmon powder contains protein 2.2%, carbohydrate 56.6% and ash 2.5%.

Active ingredients of Persimmon fruit powder

The amounts of antioxidant activity, total phenols, total flavonoids and carotene of Persimmon fruit powder are shown in Table 2. Antioxidant activity, total phenols, total flavonoids and carotene recorded high levels in persimmon fruit powder and they were 90%, 16.70 mg/g, 3.84mg/g and 1.89 mg/g, respectively. Consequently, the persimmon fruit proved to be a good source of antioxidant activity, total phenols, total flavonoids and carotene. These results are in agreement with that of **Pachisia, (2020)** that evidence, persimmon fruit contains significant quantities of phenolic compounds and in addition, it has a high antioxidant capacity. Similar results were obtained by **Chen *et al.*, (2016)** who deducted that persimmon fruit contains total phenolic 19.16 mg/g and **Jung *et al.*, (2005)** who estimated that it contains 88% antioxidant activity at 50 ml**.**

Feed intake (FI), feed efficiency ratio (FER) and body weight gain (BWG) of rats fed on different experimental diets

Feeding and growth performance indicated by food intake (FI), body weight gain (BWG) and feed efficiency ratio (FER) of all tested diets are presented in Table 3. After feeding, the BWG of the rats fed on different tested diets for 6 weeks was calculated and it ranged from 0.28 to 0.47 g whereas there are no significant differences in values of food intake and feed efficiency ratio in all tested groups compared to the positive control. However, there is an increase in the feed efficiency ratio (FER) and body weight gain (BWG) in all groups compared to the positive control although the increase was insignificant. These results did not agree with **Gorinstein *et al.*, (2011**) who revealed that food supplemented with persimmon fruits increased feed intake in treatment groups. But they are in agreement with that of **Ayşe & Ertuğrul, (2020)** who showed that there was no significant difference in overall food intake or food efficiency ratios across all experimental groups.

Liver functions of rats fed on different experimental diets

The liver function biomarkers T.B, D.B, ID.B, AST, ALT and ALP were estimated in serum samples. These results are shown in Table 4. The CCl_4 treatment remarkably affected the liver specific enzymes. It was found that there was a significant increase in serum T.B, D.B, ID.B, AST,

ALT and ALP activities of CCl_4 treated rats. These results showed that these hepatic biomarkers increased in the serum due to the release of the enzymes from the damaged liver. Nevertheless, there was a significant decrease observed in the respective serum activities of rats given persimmon fruit powder compared with CCl_4 treated group and the best results were of G6. This result is in an agreement with that of **Ma et al., (2007)** who showed that persimmon fruit appeared to prevent hepatic injury and decrease fat accumulation which is proved by decreased hepatotoxic indices in serum.

Kidney functions of rats fed on different experimental diets

The Kidney functions biomarkers T.P, ALB, G, Ceatinine, Urea and U.A were estimated in serum samples. The results are shown in Table 5. They showed that the nephritic biomarkers cratinine, urea and U.A increased while T.P, ALB and G decreased in the serum due to the liver damage. However, a significant decrease was observed in cratinine, urea and U.A in the serum activities of rats given Persimmon fruit powder compared with CCl_4 treated group and the best results were of G6. Whereas the results of T.P, ALB and G showed a significant increase in the serum activities of rats given Persimmon fruit powder compared with CCl_4 treated group and the best results of T.P and G were of G6. But the best results of ALB were of G4.

Prothrombin Time Test and INR of rats fed on different experimental diets

The results of the analysis of serum Prothrombin Time Test and INR in rats are shown in table 6. Prothrombin time (PT) showed a significant decrease in the serum activities of rats given persimmon fruit powder compared with Positive Control group and the best results were of G5 & G6. Regarding to Partial thromboplastin time (PTT) there was a significant decrease in the serum activities of rats given persimmon fruit powder compared with Positive Control group and the best results were of G4 & G6. Whereas International normalized ratio (INR) showed a significant light decrease in the serum activities of rats given persimmon fruit powder compared with Positive Control group and the best results were of G6. The effects could be due to the presence of Polyphenolic that presented strong anticoagulant properties.These findings are supported by

the results of **Butt *et al.*, (2015)** who demonstrated that Anticoagulant fraction separated from persimmon leaves delayed thrombin time (TT) and activated partial thromboplastin time (APTT) and prothrombin time (PT).

Histopathological examination

1- kidney:

Microscopically, kidneys of rats from G1 revealed the normal histological structure of renal parenchyma (normal renal cortex and renal medulla) (Fig.1). On contrary, kidney sections of rats from G2 showed a remarkable vacuolar degeneration of epithelial lining renal tubules and endothelial lining glomerular tuft (Fig. 2). Meanwhile, kidneys of rats from G3 manifested a slight vacuolar degeneration of epithelial lining, some renal tubules and slight vacuolar degeneration of endothelial lining glomerular tuft (Fig. 3). Furthermore, kidneys of rats from G4, 5 & 6 showed no histopathological lesions (Figs. 4, 5 & 6).

2- Liver:

Microscopically, the liver of rats from G1 revealed the normal histological texture of hepatic lobules with normal central vein and normal hepatocytes (Fig. 1). On contrary, the liver of rats from G2 showed necrosis of sporadic hepatocytes, proliferation of oval cells and fibroplasia in the portal triad, hyperplasia of biliary epithelium with newly formed bile ductuoles (Fig. 2). However, the liver of rats from G3 showed Kupffer cells activation and oval cells proliferation (Fig. 3). Meanwhile, the sections from G4 revealed vacuolar degeneration of sporadic hepatocytes, few inflammatory cells infiltration and portal infiltration with inflammatory cells (Fig. 4). On the other hand, the liver of rats from G5 revealed no lesions except Kupffer cells activation (Fig. 5). Furthermore, the examined sections from **G6** revealed no histopathological alterations (Fig.6).

Conclusion

Persimmon fruits were proved to have a large number of biologically active components such as phenolic compounds, a high antioxidant capacity and carotene. Also, it has a therapeutic effect on CCl_4-induced

liver damage and improved the biochemical parameters of liver, kidney and prothrombin time test. But fresh persimmon is only available in the autumn and winter months. Therefore, when fresh fruits are not available, the powdered dried persimmon could be successfully used as a substitute or a nutritional additive in functional foods.

Recommendations

Due to the importance of persimmon fruit and its therapeutic effect on CCl4-induced liver damage, the current study recommends studying the effect of it on other diseases such as cancer prevention because it is rich in antioxidants that help the body get rid of free radicals. It also recommends studying the effect of persimmon fruit on hypotention because it has contains a good amount of potassium as previous studies had proved.

Photo 1: persimmon fruit

Table 1: Chemical composition

Samples name	Test results (%)					
	Fiber	Moisture	Ash	Fat	Protein	Carbohydrate
Persimmon fruit powder	3.42	5.38	2.789	3.23	4.320	80.861

Table 2: Active ingredients

Samples name	Test results			
	Antioxidant Activity by DPPH Radical%	**Total Phenols** (mg/g)	**Total Flavonoids** (mg/g)	**Carotene** (mg/g)
Persimmon fruit powder	٩٠	16.70	3.84	1.89

Table 3: Feed intake (FI), feed efficiency ratio (FER) and body weight gain (BWG)

Groups / Parameter	**Negative Control (G1)**) Mean±S.D	**Positive Control (G2)**) Mean±S.D	**silymarin solution(G3)**) Mean±S.D	**Persimmon fruit powder Treatments (Mean±S.D)**			**LSD ٠.٠٥**
				2.5%(G4)	**5% (G5)**	**10% (G6)**	
BWG (g)	$0.35^{a} \pm 0.06$	$0.28^{a} \pm 0.08$	$0.37^{a} \pm 0.13$	$0.45^{a} \pm 0.13$	$0.47^{a} \pm 0.15$	$0.47^{a} \pm 0.16$	0.16
FI (g/day)	$^{ab} \pm$ ٢٢1.54	$20^{b} \pm 1.37$	$22.1^{ab} \pm 0.55$	$22.08^{ab} \pm 1.42$	$23^{a} \pm 0.94$	$22.7^{a} \pm 1.82$	1.75
FER (%)	$7.34^{a} \pm 1.09$	$6.36^{a} \pm 1.53$	$7.62^{a} \pm 2.47$	$8.92^{a} \pm 1.96$	$9.14^{a} \pm 2.32$	$9.17^{a} \pm 2.50$	2.67

Values are expressed as means ± SD.

Values at the same column with different letters are significant at P<0.05.

Table 4: Liver Function

Groups / Parameter	Negative Control (G1) Mean±S.D	Positive Control (G2) Mean±S.D	silymarin solution(G3) Mean±S.D	Persimmon fruit powder Treatments (Mean±S.D)			LSD ٠.٠٥
				2.5%(G4)	5% (G5)	10% (G6)	
T.B (mg/dl)	0.55 ^{d} ± 0.07	1.01 ^{a} ± 0.09	0.90 ^{b} ± 0.04	0.75^{c} ± 0.04	0.79^{c} ± 0.04	0.70^{c} ± 0.04	0.08
D.B (mg/dl)	0.13^{c} ± 0.01	0.20 ^{a} ± 0.01	0.16 ^{b} ± 0.02	0.16^{b} ± 0.02	0.15 ^{bc} ± 0.01	0.13^{bc} ± 0.02	0.02
ID.B (mg/dl)	0.43^{c} ± 0.06	0.82 ^{a} ± 0.08	0.74^{a} ± 0.05	0.60^{b} ± 0.04	0.65^{b} ± 0.05	0.56 ^{b} ± 0.04	0.08
ALT (U/L)	43.35^{e} ± 15.52	157.58^{a} ± 12.10	139.43^{b} ± 10.67	101.76 ^{c} ± 9.66	107.98 ^{c} ± 11.18	74.58 ^{d}± 7.04	16.82
AST (U/L)	101.88 ^{e} ± 9.75	216.68^{a} ± 27.35	189.88^{b}± 10.47	160.55 ^{c} ± 9.36	148.5^{c} ^{d} ± 17.39	131.5^{d}± 11.21	23.23
ALP (U/L)	112.95 ^{d} ± 23.20	354.03^{a} ± 54.59	232.38^{b} ± 27.84	152.58 ^{cd}± 21.54	179.55 ^{c} ± 23.96	138.73 ^{cd} ± 22.02	46.25

Total Bilirubin (T.B), Direct Bilirubin (D.B), Indirect Bilirubin (ID.B), Alanine transaminase (ALT), Aspartate transaminase (AST) & Alkaline phosphatase (ALP)

Values are expressed as means ± SD.

Values at the same column with different letters are significant at P<0.05.

Table 5: Kidney Function

Groups / Parameter	Negative Control (G1) Mean±S.D	Positive Control (G2) Mean±S.D	silymarin solution(G3) Mean±S.D	Persimmon fruit powder Treatments (Mean±S.D)			LSD ٠.٠٥
				2.5%(G4)	5% (G5)	10% (G6)	
T.P (g/dl)	6.95^{a} ± 0.25	5.13^{d}± 0.31	5.71^{c}± 0.26	6.2^{b} ± 0.22	6.19^{b} ± 0.26	6.72^{a} ± 0.32	0.41
ALB (g/dl)	3.27^{a} ± 0.36	2.29^{c} ± 0.19	2.51^{bc} ± 0.11	2.89^{b} ± 0.11	2.67^{bc} ± 0.26	2.65^{bc} ± 0.20	0.34
G (g/dl)	3.68^{b} ± 0.14	2.85^{d} ± 0.13	3.2^{c} ± 0.23	3.31^{c} ± 0.26	3.52^{bc} ± 0.16	4.07^{a} ± 0.16	0.28
A/G (Ratio)	0.89^{a} ± 0.13	0.80^{ab} ± 0.05	0.79^{ab}± 0.06	0.88^{a} ± 0.10	0.76^{ab} ± 0.09	0.65^{b}± 0.04	0.13
Ceatinine (mg/dl)	0.55^{d} ± 0.06	1.19^{a} ± 0.13	0.94^{b}± 0.05	0.81^{c} ± 0.05	0.66^{d} ± 0.04	0.58^{d}± 0.05	0.11
Urea (mg/dl)	26.01^{d} ± 6.84	85.67^{a} ± 5.08	60.99^{b} ± 11.04	55.26^{b}± 5.79	51.16^{b} ± 6.03	40.45^{c} ± 3.68	10.11
U.A (mg/dl)	3.18^{e} ± 0.27	9.32^{a} ± 1.35	7.76^{b} ± 0.44	6.01^{c}± 0.47	4.95^{d} ± 0.33	4.07^{de} ± 0.37	0.97

Total protein (T.P), Albumin (ALB), Globulin (G) & Uric acid (U.A)

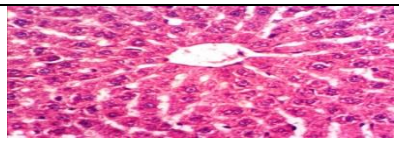
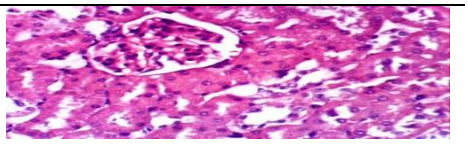
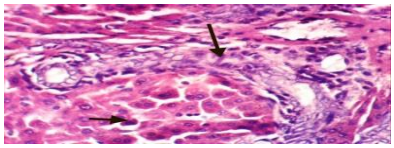
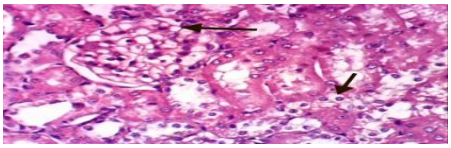
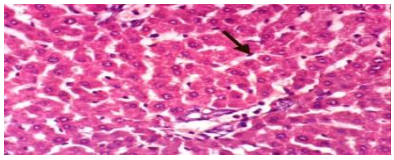
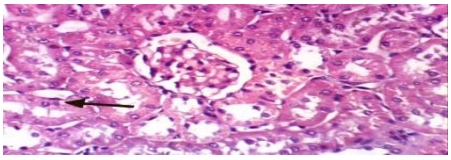
Values are expressed as means ± SD.

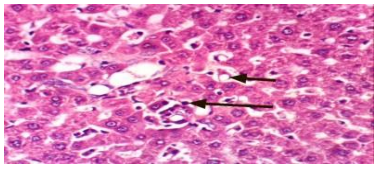
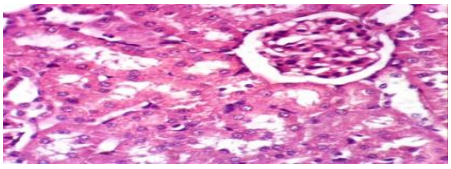
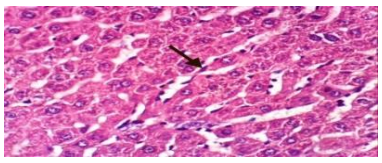
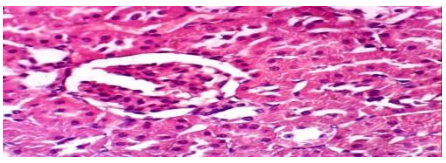
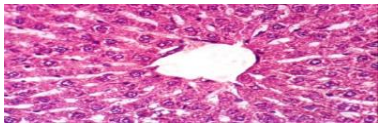
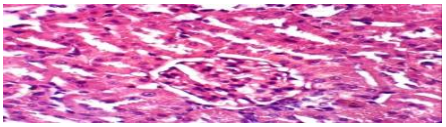
Values at the same column with different letters are significant at P<0.05.

Table 6: Prothrombin Time Test and INR

Groups / Parameter	Negative Control (G1) Mean±S.D	Positive Control (G2) Mean±S.D	silymarin solution (G3) Mean±S.D	Persimmon fruit powder Treatments (Mean±S.D)			LSD ٠.٠٥
				2.5%(G4)	5% (G5)	10% (G6)	
INR (Ratio)	1.14^{d} ± 0.06	1.65^{a} ± 0.07	1.49^{b} ± 0.06	1.29^{c} ± 0.03	1.28^{c} ± 0.07	1.15^{d} ± 0.08	0.09
PT (Sec)	14.13^{d} ± 0.48	18.06^{a} ± 0.51	16.83^{b} ± 0.45	15.40^{c} ± 0.18	15.33^{c} ± 0.58	14.30^{d} ± 0.69	0.75
CONC (%)	86.67^{a} ± 5.14	55^{d} ± 3.54	63.33^{c} ± 3.12	75^{b} ± 2.04	75^{b} ± 5.40	85.83^{a} ± 7.17	7.00
PTT (Sec)	30.75^{e} ± 1.07	52.96^{a} ± 2.36	44.56^{b} ± 2.50	36.27^{d} ± 2.08	41.01^{c} ± 1.74	38.45^{cd} ± 3.05	3.30
International normalized ratio (INR), Prothrombin time (PT) & Partial thromboplastin time (PTT)							

Values are expressed as means ± SD.Values at the same column are significant at P<0.05.

Organs / Groups	Photomicrograph of liver	Photomicrograph of kidney
G1 Control (-ve)	 Fig. (1): shows the normal histological architecture of hepatic lobule (H & E X 400).	 Fig. (1): shows the normal histological structure of renal parenchyma (H & E X 400).
G2 Control (+ve)	 Fig. (2): shows necrosis of sporadic hepatocytes and proliferation of oval cells and fibroplasia in the portal triad, hyperplasia of biliary epithelium with formation of newly formed bile ductuoles (H & E X 400).	 Fig. (2): shows aremarkable vacuolar degeneration of epithelial lining renal tubules and endothelial lining glomerular tuft (H & E X 400).
G3	 Fig. (3): shows the Kupffer cells activation and oval cells proliferation (H & E X 400).	 Fig. (3): shows a slight vacuolar degeneration of epithelial lining some renal tubules (H & E X 400).

G4	 Fig. (4): shows a vacuolar degeneration of sporadic hepatocytes and few inflammatory cells infiltration (H & E X 400).	 Fig. (4): shows no histopathological lesions (H & E X 400).
G5	 Fig. (5): shows the Kupffer cells activation (H & E X 400	 Fig. (5): shows no histopathological lesions (H & E X 400).
G6	 Fig. (6): shows no histopathological alterations (H & E X 400).	 Fig. (6): shows no histopathological lesions (H & E X 400).

G1: Negative control group, **G2** Positive control, **G3:** 50 ml/kg body weight of silymarin solution**, G4:** 2.5% Persimmon fruit powder**, G5:** 5% Persimmon fruit powder& **G6:** 10% Persimmon fruit powder

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تأثير ثمار البرسيمون المجففة (الكاكا) على السمية الكبدية الحادة التي يسببها رابع كلوريد الكربون في فئران التجارب

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الملخص العربى

تعتبر ثمار البرسيمون فاكهة شائعة ومنتشرة وهي غنية بالعديد من المركبات النشطة بيولوجيًا. أجريت الدراسة الحالية لمعرفة تأثير ثمار البرسيمون المجففة على السمية الكبدية الحادة التي يسببها رابع كلوريد الكربون. تم استخدام ثلاثين جرذ ألبينو ذكور وزنها ما بين ١٨٠-٢٠٠ جرام وتم تقسيمها إلى مجموعتين رئيسيتين لمدة ٦ أسابيع. المجموعة الأولى: المجموعة الضابطة (المجموعة السلبية ، ٥ فئران). المجموعة الثانية: خمسة وعشرون جرذاً عولجت بجرعة وحيدة من CCl_4 في زيت برافين (٥٠٪ حجم / حجم ٤ مل / كغ) حقنت لإحداث تلف حاد في الكبد. أجريت الاختبارات الكيميائية والبيوكيميائية والهستوباثولوجية. أظهرت نتائج هذه الدراسة أن مسحوق البرسيمون يحتوي على كمية عالية من الكربوهيدرات وكمية معتدلة من البروتين والدهون والألياف الخام التي يمكن أن تقلل من مخاطر الإصابة بأمراض القلب والسرطان. كما سجلت إحتوائها على قدرًا كبيرًا من النشاط المضاد للأكسدة ، وإجمالي الفينولات ، وإجمالي مركبات الفلافونويد والكاروتين. انخفض كل من T.B و D.B و ID.B و AST و ALT و ALP بشكل ملحوظ في جميع المجموعات التي تم دعمها بنسب مختلفة من مسحوق البرسيمون مقارنة بالمجموعة الضابطة الإيجابية. بالإضافة إلى ذلك ، فقد أظهرت انخفاضًا معنويًا في Ceatinine و Urea و U.A ، بينما أظهرت نتائج T.P و ALB و G زيادة معنوية في جميع المجموعات التي تم دعمها بنسب مختلفة من مسحوق البرسيمون مقارنة بالمجموعة الضابطة الإيجابية. كان هناك أيضًا تحسن ملحوظ في معاملات وقت البروثرومبين. كما أظهر الفحص الهستوباثولوجى للكبد والكلى تحسنا في جميع المجموعات

المدعمة بنسب مختلفة من مسحوق البرسيمون مقارنة بالمجموعة الضابطة الإيجابية. تقترح هذه الدراسة استخدام مسحوق البرسيمون لتحسين تلف الكبد في الفئران المصابة بالسمية الكبدية لما تتمتع به من صفات نشطة بيولوجيا.

الكلمات الدالة: فاكهة البرسيمون (الكاكا) – السمية الكبدية – وظائف الكبد – وظائف الكلى– اختبار زمن البروثرومبين.