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Performance of Hypolipidemic Activity of Persimmon Extracts on Triton-X Induced Hyperlipidemia in Male Rats

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ABSTRACT

The present study was designed to investigate some chemical composition of persimmon and also determine the effect of persimmon(methanol and water extract) on the nutritional and hyperlipidemic activity. Thirtyadult albino male rats Sprague –Dawley strain weighing 128 ±5 g were classified into five groups,(6 rats each) the first group rats were fed on basal diet only control negative(-ve)group and four rat groups which injected (i.p) triton-X-100 (100mg/kg) to induce hyperlipidemic and reclassified into non-treated control positive (+ve) group (fed on basal diet only), treated with (4.5 mg/kg b.w) of drug (atrovastatin),treated with(5mg/kg b.w) daily of persimmon methanol and water extract by stomach tube, for 60 days.The chemical composition of fresh and dry persimmon showed that the value of moisture content, T.carotoniod, B.carotenoid and Vitamin C of fresh persimmon were more than dry persimmon but the protein, fat, ash, carbohydrate, fiber, mineral, T. phenol, Flavoniods and Tanninin dry persimmon were higher than fresh persimmon .The results revealed that, the control (+ve) group showed a significant decrease in weight gain; feed efficiency ratio(FER), serum high density lipoprotein cholesterol (HDLc), T. protein, globulin, superoxide dismutase(SOD) and glutathione peroxidase (GSH) but a significant increase in serum cholesterol level, triglyceride, low density lipoprotein cholesterol (LDLc), very low density lipoprotein cholesterol (VLDLc), total lipid and phospholipids, amino transferase, (AST, ALT) and A/G compared with control (-ve) group at $p<0.05$. The methanol and water extract of persimmonrat group showed a significant increase in weight gain,(FER) serum, (HDLc), Total. protein, globulin, SOD and GSH. While showing a significant decrease in serum cholesterol, triglyceride, (LDLc), (VLDLc), total lipid and phospholipids, (AST, ALT) A/G and Malondialdehyde (MDA) at $p<0.05$compared with control (- ve) group the histopathological results showed that the methanol and water persimmon extract rat groups had lower changes ofheart. It can beconcluded that, the administration of the methanol and water persimmon extractcan lower the side effects of triton-xinduced hyperlipidemic rats andreducingthe risk factors for cardiovascular disease such as hyperlipidemia

***Key words**:* Persimmon , Tirton , Hyperlipidemic rats

Introduction

Hyperlipidemia refers to elevated levels of lipids and cholesterol in the blood, and is also identified as dyslipidemia, to describe the manifestations of different disorders of lipoprotein metabolism. Although elevated low density lipoprotein cholesterol (LDL) is thought to be the best indicator of atherosclerosis risk, 1 dyslipidemia can also describe elevated total cholesterol (TC) or triglycerides (TG), or low levels of high density lipoprotein cholesterol (HDL) Lucy (1998). The beneficial effects of the oral administration of ethanol extract of *Diospyros kaki* (EEDK) were tested on a mouse dry eye model induced by benzalkonium chloride (BAC).

Kyung-A Kim (2016) who ultimately leads to a decrease in DNA content and Ki-67 protein synthesis in corneal cells. However, flavonoids isolated from the leaves of *D. kaki* have been reported to alleviate oxidative stress-induced DNA damage and apoptosis (Butt *et al*., 2015). The leaves of *D. kaki* have been used for various treatments, without reports of toxic effects, over the past hundred years (Xie *et al*., 2015). the daily oral administration of EEDK in mice did not result in any noticeable toxicity throughout the experiment. The leaves of *D. kaki* have also been approved by the Korea Food and Drug Administration (KFDA) for manufacturing of functional foods and medicines. However, our previous study showed that a high dose may elicit retinotoxicity (Kim *et al*., 2015).

the ethanol extract of *Diospyros kaki* leaves significantly attenuated the upregulation of vascular endothelial growth factor, fibroblast growth factor, interleukin-6, and matrix metalloproteinase-2 (MMP-2)

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protein levels, in alkali burn induced corneal neovascularization in rats (Yang *et al*., 2016 ; Kim *et al*., 2015). Also showed that ethanol extract of *Diospyros kaki* leaves prevented degenerative retinal diseases in N-methyl-Nnitrosourea- (MNU-) induced retinal degeneration in mice. Nasrin *et al*. (2016) showed that the test of antibacterial activity of fruit extracts of two tomato varieties viz., Raton and Persimmon against five Gram positive bacteria viz., Staphylococcus aureus, Bacillus cereus, Streptococcus-β-haemolytica, Bacillus subtilis, Sarcina lutea and five Gram negative bacteria viz., Klebsiella sp., Klebsiella pneumonia, Pseudomonas aeruginosa, Salmonella typhi, Shigella dysenteriae. Between the two varieties, Raton and Persimmon in two different solvents (methanol and ethanol), ethanol fruit extracts of Raton have showed the highest zone of inhibition (19.50±0.28mm) against Gram negative bacteria Pseudomonas aeruginosa. MIC and MBC of the extracts are ranged from 100-300 mg/ml and 150-400 mg/ml respectively.

Persimmon fruit are a good source of fiber, vitamins , carotonied and sugars (Homnava *et al*., 1990) There is high interest to increasing cultivation and production of persimmon for commercial market in Egypt. Since ,the climate and temperature conditions are suitable for it growing and economical production, the kaki or Japanese persimmon is mainly eaten fresh, but can be frozen, canned or dried, and is sometimes used in oriental cooking. They can be stored for up to6months in modified or controlled atmospheres. Persimmons are high in vitamin A,and are a moderate source of ascorbic acid. In addition to the nutritional value, persimmon fruit (D. kaki L.) is a good source of calcium and potassium (Mowat,1990). A medical condition characterized by an elevation of any or all lipid profile and/or lipoproteins in the blood. This medical condition or problem divided into two subtypes which are: primary and secondary hyperlipidemia at primary hyperlipidemia which is usually taken place as a result of genetic problems such as mutation within receptor protein, while secondary hyperlipidemia will arises as a result of other underlining diseases like diabetes. alteration and/ or abnormality in the metabolism of lipid and lipoproteins is a very common condition that taken place within general population, and it consider as one of the main risk factor in the incidence of cardiovascular disease due to their influence on atherosclerosis. Hassan, (2013)

Materials and Methods

A – Materials:

1- Triton x100, Methanol, diethyl salphoxid, physiological saline solution and Distilled water were purchased from El-Gomhoria Company for chemicals, El-Mansoura city, Egypt
2- Atorvastatin was obtained from Egyphar Company, Obour City. Egypt as tablets drug is white yellow, carrier of starch. Each tablets contains 40 mg of atorvastatin. The human therapeutic dose of drug was 40 mg daily which converted to animal dose (4.5 mg/kg) according to previous studies as that recorded by Paget and Barnes., (1964).
3-Persimmon fruits (*Diospyros kaki* L.), were purchased from the local market of Meet Ghamr city, Egypt
4-Experimental animals:

Thirty adult albino male rats Sprague –Dawley strain were purchased from the Agricultural Research Center, Giza, Egypt. The average weight was 128 ±5 g. The animals were kept under observation for five days before experiment and fed on standard diet according to NRC, (1995) and water *ad-libitum*. The standard diet comprised of casein (200g/kg), corn starch (497g/kg), sucrose (100g/kg), cellulose (30 g/kg), corn oil (50g/kg), mineral mixture (100g/kg), vitamins mixture (20g/kg) and DL-methionine (3g/kg).

B- Methods:

1-Preparation of persimmon extract:

-Water extract of persimmon was obtained as follows. In brief, 250 g of persimmon was suspended and extracted with 10 volumes of distilled water with shaking at 80° C for 1 h. The extracts were filtered through a filter paper and the supernatants were pooled. The residue was re-extracted under the same conditions. Pooled supernatants were condensed with a rotary evaporator under reduced pressure at 50°C and then condensed supernatants were lyophilized. The crude extract was obtained, kept in dark bottles and stored in a deep freezer until using.

-Methanol extract of persimmon was obtained by the same procedure as water extract with the exception of the extraction temperature and period. Persimmon was extracted with methanol at room

temperature for 15 h. Pooled extracts were condensed (and methanol removed) with a rotary evaporator at 50 °C (Sakanaka *et al*., 2005).

2- Hyperlipidemia albino rats:

Hyperlipidemia was induced in Wistar albino rats by single intraperitoneal injection of freshly prepared solution of Triton-X-100 (100 mg/kg) in physiological saline solution after overnight fasting for18 h for 7 days (Keshetty *et al*., 2009)

3- Grouping of rats and experimental design:

The rats were randomly classified into five groups (6 rats each) and fed on the standard diet. The rats classified into control negative (–ve) group and four rat groups which injected triton x100 (100 mg/kg) in physiological saline solution and reclassified into untreated control positive (+ve),and treated groups which were atorvastatin tablets (4.5 mg/kg b.w) in 10 ml of normal saline daily, methanol and water persimmon extract (5mg/kg b.w) in 1 ml of diethyl salphoxid. Alltreatments were given in stock solution by stomach tube all over the period of the experiment. The study was assigned for 60 day. The rats were subjected daily to physical examination for observation of healthy condition such as external appearance, color of hair, body condition and activity of rats. The food intake was calculated daily and the body weight gain was recorded weekly Feed efficiency ratio was determined according to the method of Chapman *et al*., (1950)

4- Collection of blood and heart samples:

At the end of the experiment period, the rats were anaesthetized by diethyl ether and sacrificed to obtain blood samples of each rat were withdrawn in test tubes The tubes of blood were left for coagulation then centrifuged at 3000 rpm for 15 minutes to obtain serum for each individual sample and then stored at -20 °C for some laboratory analyses. Heart of male rats was rapidly removed.

5-Determination of the gross chemical composition and minerals of persimmon:

Protein, fat, ash, and moisture and some minerals as zinc, iron calcium, magnesium and sodium of persimmon were determined according to the methods of the A.O.A.C., (2000). The total carbohydrates were calculated as following: Carbohydrates % = 100 - (moisture % + protein % + fat % + ash %).

6-Determination of some of serum biochemical parameters:

Estimation of serum total cholesterol, triglyceride (TG), high density lipoprotein cholesterol (HDLc), total. lipids and Low density lipoprotein cholesterol (LDL) were estimated by using the spin react enzymatic kits according to Young (2001), David and Buccolo (1973), Tietz (1976), Lee and Nieman (1996),Very low density lipoprotein (VLDL)was calculated VLDL-c = TG / 5, according to Friedwald *et al*., (1972), While Phospholipids was calculated according to Lee and Nieman (1996) respectively as following: phospholipids = total lipid – (TG – total cholesterol) Atherogenic indices (TC/HDL-c & LDL-c /HDL-c) were calculated according to Castelli and levitar, (1977). While glutathione peroxidase GSH-PX , superoxide dismutase SOD, Malondialdehyde (MDA) according to Paglia and Valentine *et al*., (1967), Nishikimi *et al*., (1972), Satoh (1978*)*.respectively

alanine and aspartate aminotransferase enzymes activity (ALT & AST) ,Serum total protein , Serum albumin(A) , serum globulin (G) , A/G ratio according to pappas (1989), Henry (1964), Doumas and Waston (1971) ,Coles (1974) , Friedewald *et al*., (1972). Respectively serum creatinine and uric acid was determined by enzymatic colorimetric method according to Yong (2001) and Fossati *et al*., (1980) , Serum globulin (G) was determined by subtracting the albumin from the total proteins according to Coles (1974).

7-Histopathological examination of the heart

The heart sample was fixed in 10% neutral buffered formaldehyde solution at pH 7.5 and cleared in xylol and embedded in paraffin. 4-5 µm thick section were prepared and stained with Hematoxylin and Eosin (H&E) for subsequent histopathological examination according to Bancroft *et al.* (1996).

C-Statistical analysis:

All the obtained data were statistically analyzed by SPSS computer software. The calculated occurred by analysis of variance ANOVA and follow up test LSD by SPSS ver.11 according to Artimage and Berry (1987).

Results and Discussion

The Chemical composition of fresh and dry of persimmon:-

The date in table (1) denoted that the percentage values of moisture, protein, fat, ash, carbohydrate and fiber 82.15, 0.78, 0.12, 0.62, 16.33 and 1.94% in fresh persimmon. while the dry persimmon contain moisture , protein, fat, ash, carbohydrate and fiber 22.98, 2.34, 0.48, 3.37, 38.65 and 7.28% respectively these results agree with Gorinstein *et al*. (2005) found that persimmon contains in 100 g fresh fruit water, 80.3 g, protein, 0.58 g, total lipids, 0.19 g, total carbohydrates, 18.6 g and total dietary fiber up to 1.48 g Piretti (1991) found that the mean composition of dry residue of persimmon fruit includes the soluble and insoluble proteins 0.64, total sugars 14.7, reducing sugars 13.8, tannins 0.20, phenols 0.16. Park *et al*. (2008) found that persimmon possesses a high nutraceutical value was contains soluble fibers, total polyphenols and phenolic acids. The content of dietary fiber was 1.83 ± 0.11, 0.69 ± 0.07 and 1.14 ± 0.12 g/100 g fresh weight for total, soluble and insoluble fibers, respectively.

Table 1: Some major, minor and photo chemical composition in fresh and dry persimmon

Samples / Variables	Persimmon	
	Fresh sample	Dry sample
Carbohydrate %	16.33	38.65
Protein %	0.78	2.34
Fat %	0.12	0.48
Moisture %	82.15	22.98
Ash %	0.62	3.37
Fiber%	1.94	7.28
Namg/100g	5.03	26.12
K mg/100g	204.6	987.2
Ca mg/100g	39.7	159.3
Mg mg/100g	43.4	175.6
Fe mcg/100	115.3	477.9
Mn mcg/100	88.2	460.2
Zn mcg/100	15.1	72.8
Cu mcg/100	8.7	46.2
T-.phenol mg/g	68.09	97.12
Flavonids mg/g	33.15	70.09
T-.carotonid mg/g	164.30	80.43
B-carotene mg/g	97.62	46.86
Tannins mg/100g	4.37	9.51
vitamin.C mg/100g	17.85	3.45

The values of sodium Na, potassium K, calcium Ca, magnesium Mg, iron Fe manganese, Mn, zinc Zn and copper Cu were recorded in fresh persimmon sample Na 5.03, K 204.6 Ca, 39.7 and Mg 43.4 mg/100g. While contain Fe, Mn, Zn and Cu 115.3 , 88.2 , 15.1 and 8.7 mcg/100gBut the dry persimmon sample was contain Na 26.12, K 987.2, Ca 159.3 and Mg, 175.6 mg/100g. while contain Fe 477.9, Mn 460.2, Zn 72.8 and Cu, 46.2 mcg/100g The content of dry persimmon from mineral was higher than content of fresh persimmon these results agree with those reported by Park *et al*. (2008) reported that some essential microelements in fresh and dry persimmon were determined: Na 4.94 ± 0.4 and 24.3 ± 2.2; K-198.2 ± 9.20 and 989.1 ± 32.2 (mg/100g, respectively); Fe, Mn, Cu, Zn: 98.4 ± 8.4 and 487.4 ± 29.8; 99.5 ± 8.6 and 492.6 ± 31.3; 8.7 ± 0.7 and 40.6 ±4.1; 13.1 ± 0.9 and 65.8 ± 4.9 (µg/100 g, respectively. Celik and Ercisli, (2008) found that phosphorus, potassium, calcium, magnesium, sodium, iron, zinc, manganese and copper values of cv. hachiya were obtained as 27, 203, 16, 11, 10, 0.27, 0.10, 0.25and 0.11 mg/100 g fruit, respectively.The photochemical screening T-.phenol, flavonids, T-.carotonid, B-carotene, tannins and vitamin C of persimmon. It can be noticed that fresh sample contain of T phenol, Flavonids, T -carotonids and B-carotene 68.09, 33.15, 164.30 and 97.62 mg/g. While contain tannins and vitamin C 4.37 and 17.85 mg/100g. But in dry sample contain T.-phenol, Flavonids, T. carotonids and B-carotene 97.12, 70.09,

80.43 and 46.86 mg/g. While contain tannins and vitamin C 9.51 and 3.45 mg/100g respectively.the content of dry persimmon it higher than fresh persimmon in T.phenol, Flavoniods and Tannin ,while it was content of fresh persimmon it higher than dry persimmon in T.carotoniod, B.carotenoid and Vitamin C .these results agree with those reported by Gross., (1987). Uchida *et al*. (1989) reported that high concentration of antioxidants such as ascorbic acid (up to 7.5 mg), carotenoids (particularly b-cryptoxanthin, zeaxanthin and b-carotene),polyphenols and a specific group of polyphenols (tannins) were found in persimmon, Park *et al*. (2008) found that persimmon possesses a high nutraceutical value and contains of total polyphenols such as of ferulic, gallic, protocatechuic, vanillic and p-coumaric acids, Sato *et al*. (1996) showed that the total phenolic contents of persimmon extracts are highly effective free radical scavengers and exhibit strong antioxidant activity. Gu *et al*. (2008) reported that the persimmon tannin was reported to be high molecular weight compound. The separation and structural determination of persimmon tannin are very difficult due to the strong hydrogen bond-forming ability of this molecular, thus aggregating each other and firmly adsorbing to various absorbents and other materials in various chromatography's because of a surprisingly large number of phenolic hydroxyl groups of persimmon tannin.

2- Nutritional Results Feeding and growth performance in terms of food intake, body weight gain and food efficiency ratio of control (-ve), control (+ve) and hyperlipidimic rats treated with drug, methanol and water extract were presented in table (2). In comparing with control (-ve) group, the hyperlipidimic control (+ve) group showed significant decrease in body weight gainand food intake ($P<0.05$) hyperlipidemic treated rat groups with atorvastatin, methanol and water extract of Persimmon showed significant increase in body weight gain and food efficiency ratio at ($P<0.01$)On the other hand, there were non-significant difference in food intake among control (+ve), atorvastatin,, methanol and water extract groups. These results agree with. Gorinstein *et al*. (2000) reported that addition of persimmon to the diets did not affect diet intake, its efficiency or body weight gains of rats. At baseline, all three groups did not differ from one another in the plasma lipid concentration or in the level of lipid peroxide

Table 2: Effect of atorvastatin, methanol and water extract of persimmon on feeding and growth performance at the end of study

Variables / Groups			Initial Weight (g)	Final Weight (g)	Weight Gain (g)	Weight Gain %	Food Intake (g)	Food efficiency ratio (FER)
control (-ve)			a 128.0 ± 4.43	c 162.66 ± 13.21	c 36.66 ± 2.78	d 27.50 ± 3.42	a 17.26 ± 2.35	d 0.030 ± 0.001
Hyperlipidimic groups	control (+ve)		a 128.16 ± 4.27	dc 155.66 ± 15.05	d*** 27.50 ± 1.68	d 21.83 ± 7.83	cb* 13.86 ± 1.52	ed 0.028 ± .002
	Treated with	atorvastatin	a 128.3 ± 4.06	bc 174.83 ± 10.72	b** 46.50 ± 3.98	c** 37.16 ± 2.62	b* 14.28 ± 1.63	a*** 0.55 ± 0.001
		methanol extract	a 128.1 ± 3.68	bc 176.83 ± 13.69	ab** 48.66 ± 2.37	c** 37.00 ± 2.27	b* 14.15 ± 1.91	cd** 0.052 ± 0.003
		water extract	a 128.8 ± 5.21	a* 199.16 ± 19.32	a*** 53.66 ± 4.03	ab*** 57.16 ± 6.54	b* 14.56 ± 1.46	b*** 0.168 ± 0.007

*Each value is the mean ±SD Significant with control group *p< 0.05 ** P< 0.01 ***P<0.001Mean values in each column having different subscript (a, b, c, d,.)are significantly at P<0.05*

Biochemical Results:

Table (3) presented some serum lipid parameters in serum. In comparing with control (-ve) group, the levels of TC, TG, LDL-c, VLDL-c, total lipid, phospholipids and atherogenic indices (TC/HDLc and LDL-c /HDLc).in control (+ve) group were significantly increased at $P < 0.001$ & 0.01 but HDLc was significant decreased at ($P < 0.001$) On the other hand, there were non-significant difference in TC, TG, LDL-c, VLDL-c, total lipid, phospholipids and atherogenic indices (TC/HDLc and LDL-c /HDLc) among methanol and water extract persimmon group In comparing with control (-ve) group Analysis of variance ANOVA and LSD test proved presence of significant decrease of serum TC, TG, LDLc, VLDLc, total

lipids and phospholipids but significant increase in serum HDLc in the treated rat groups when compared to control (+ve) group. These results agree with. Jung *et al*. (2012) found that plasma triglyceride and total cholesterol concentrations were significantly lower in the PL(persimmon leaf) group than in the control group, whereas the plasma HDL-cholesterol concentration was significantly higher in the persimmon leaf group and the persimmon leaf supplementation Yeon-Jeong *et al*. (2010) reported that the consumption of vinegar and persimmon vinegar may increase body carnitine levels, which, in turn; activates lipid oxidation that decreases the blood lipid profiles induced by high fat diet ingestion. Matsumoto *et al*. (2010) said that the intake of persimmon significantly lowered the concentration of plasma cholesterol. Jung *et al*., (2005) showed that diets supplemented with persimmon fruit in the experiments on laboratory animals have decreased plasma lipid levels and increased plasma antioxidant activity mainly in rats fed cholesterol. Gorinstein *et al*. (2000) reported that influence of whole persimmon versus phenol-free fruit and in particular to study the impact of diets, supplemented with whole or phenol-free persimmon fruit, on lipid levels and antioxidant activity of rats fed cholesterol.

Table 3: Effect of atorvastatin, methanol and water extract of persimmonon lipid pattern in hyperlipidemic rat groups at the end of study.

Variables / Groups			T.C mg/dl	T.G mg/dl	HDLc mg/dl	LDLc mg/dl	VLDLc mg/dl	Total lipids mg/dl	Phospho lipids mg/dl	ID1	ID2
Control(-ve)			d 67.50 ± 5.60	cd 155.66 ± 2.10	a 28.94 ± 2.91	e 8.52 ± 0.09	cd 31.13 ± 0.43	c 408.85 ± 68.96	b 302.9 ± 16.92	bc 2.32 ± 0.34	d 0.29 ± 0.30
Hyperlipidimic groups	Control (+ve)		a*** 182.77 ± 10.37	a*** 194.55 ± 4.36	e*** 15.16 ± 3.27	a*** 128.75 ± 10.34	a*** 38.91 ± 0.88	a*** 771.6 ± 48.04	a* 332.0 ± 13.26	a*** 12.63 ± 2.30	a*** 8.78 ± 1.98
	Treated with	Atorvastatin	b** 95.84 ± 8.40	b** 174.86 ± 2.15	a 27.78 ± 4.46	b** 34.75 ± 3.52	b** 34.93 ± 0.43	bc 517.08 ± 99.67	e*** 178.1 ± 11.33	b 3.45 ± 0.11	b** 1.21 ± 0.19
		Methanol extract	c* 83.64 ± 7.99	b** 174.85 ± 7.86	a 28.96 ± 6.02	c* 19.72 ± 3.39	b** 34.97 ± 1.56	b** 550.39 ± 86.25	cd** 228.1 ± 11.49	bc 2.91 ± 0.51	cd 0.67 ± 0.41
		Water extract	d 62.59 ± 6.36	d 162.23 ± 7.79	c** 21.91 ± 3.71	de 10.41 ± 1.82	c 32.44 ± 1.54	bc 497.06 ± 88.08	e*** 165.1 ± 4.89	bc 2.87 ± 0.52	cd 0.46 ± 0.42

*Each value is the mean ±SD Significant with control group *p< 0.05 ** P< 0.01***P<0.001Mean values in each column having different subscript (a, b, c, d,) are significantly at P< 0.05*

Table (4) showed the effect of drug and persimmon methanol and water extract on hepatic markersand some renal functions in serum. The levels of ALT, AST enzymes, A/G , creatinin and uric acid were significantly increased in control (+ve), In comparing with treated rat groups at P <0.01& 0.05 but the levels of total protein and globulin were significantly decrease in control (+ve) at P <0.001 when compared to control (-ve) group On the other hand, there were non-significant difference in serum levels of ALT, AST, total protein, globulin, creatinin and uric acid among treated rat groups with atorvastatin, methanol and water persimmon extract when compared to control (-ve) group.

Analysis of variance ANOVA and LSD test revealed a significant decrease of ALT, AST, albumin, A/G, creatinin and uric acid and significant increase in total protein and globulin of treated rats groups when compared to control (+ve) group. These results agree with Jia *et al*. (2007) showed that the persimmon leaf methanol extract and persimmon fruit methanol extract treatments decreased the activities of serum alanin aminortasferase (ALT) and aspartate aminotransfase (AST) compared with ethanol control Lee *et al*. (2006) found that supplementation of persimmon leaf significantly lowered the plasma total cholesterol and triglyceride concentrations, whereas elevated the ratio of HDL-C/total-C and improved the atherogenic index. and reported Contents of fecal triglyceride, cholesterol and acidic sterol were supplementation of the powdered whole persimmon leaf and improves plasma hepatic lipid levels profile These beneficial effects may be due to the properties of its phenolic compounds (1.15 g/100 g) and high fiber (63.48 g/100 g) content in the powder persimmon leaf

Data in table (5) illustrated that, the control (+ ve) group showed a significant decrease values of superoxide dismutase(SOD) and glutathione peroxidase(GSH) (p<0.01&0.001) compared to control (- ve) group. The methanol and water persimmon extract showed a significant increase at (p<0.01&0.0O1)

compared to control (+ve) group but showed non significant different in (SOD) and (GSH) compared to control (- ve) group On the other hand, there were a significant increase in serum Malondialdehyde (MDA) in control (+ ve) group compared to treated rats and control (- ve) group at p<0.001

Analysis of variance ANOVA and LSD tests revealed a significant higher values of (SOD) and (GSH) a significant lower valuesin (MDA) compared to control (+ ve) group. These results agree with Gua *et al*. (2008) they demonstrated that antioxidant properties of persimmon tannins were evaluated using the hydroxyl radical scavenging activities by 2-deoxyribose oxidation system and salicylic acid system, superoxide anion scavenging activity, and linoleic acid lipid per oxidation inhibition activity. Yokozawa *et al*. (2007) cleared that investigated the antioxidant effects of low and high molecular weight polyphenols from PP against high glucose-induced oxidative stress (Hong Seok *et al*., 2002 and Abd El-Ghany, 2007) recorded that Furthermore, catalase and (SOD) activities were increased by both PSE and GSE administration. However, fatty acid composition in phosphatidylcholine and phosphatidylethanolamine were not significantly different among control and other group rats. Gao *et al*. (2009) found that: the protection of total flavonoids from persimmon leaf possesses significant hypoglycemic activities.

Table 4: Effect of atorvastatin, methanol and water extract of persimmononamino transferase (AST & ALT) , total protein ,Albumin, Globulin, A/G,creatinin and uric acidin hyperlipidimic rat groups at the end of study

Variables / Groups			AST µ /L	ALT µ /L	T. Protein g/dl	Albumin g/dl	Globulin g/dl	A/G ratio	Creatinin mg/dl	Uric acid mg/dl
Control(-ve)			bc 52.69 ± 9.47	c b 151.68 ± 12.33	a 7.60 ± 1.32	ab 3.48 ± 1.25	a 4.12 ± 0.93	b 0.84 ± 0.10	b 0.50 ± 0.003	b 1.55 ± 0.16
Hyperlipidimic groups	Control (+ve)		a*** 98.73 ± 1.47	a*** 234.10 ± 61.76	b*** 4.32 ± 0.53	ab 3.46 ± 0.46	b*** 0.88 ± 0.39	a*** 3.95 ± 0.85	a*** 1.60 ± 0.48	a*** 3.23 ± 0.30
	Treated with	Atorvastatin	bc 50.58 ± 12.003	ce 140.60 ± 11.76	a 6.32 ± 0.80	b 2.37 ± 0.08	a 3.95 ± 0.76	c* 0.60 ± 0.03	b 0.57 ± 0.006	b 1.53 ± 0.30
		Maethanol extract	bcd 49.74 ± 12.12	cb 163.99 ± 4.28	a 6.67 ± 1.56	bc 2.49 ± 0.24	a 4.18 ± 1.36	c* 0.59 ± 0.02	b 0.52 ± 0.08	b 1.22 ± 0.30
		Water extract	b 55.44 ± 9.95	b 173.91 ± 14.56	a 6.10 ± 1.03	bc 1.46 ± 0.21	a 3.64 ± 1.18	c* 0.67 ± 0.03	bc 0.47 ± 0.20	b 1.19 ± 0.26

*Each value is the mean ±SD Significant with control group *p< 0.05 ** P< 0.01***P< 0.001Mean values in each column having different subscript (a, b, c, d,.) are significantly at P< 0.05*

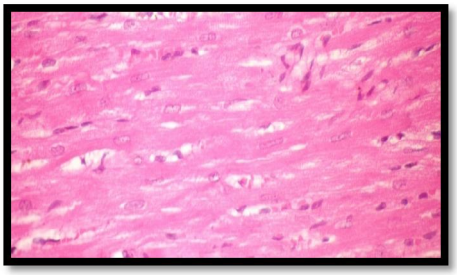
Table 5: Effect of atorvastatin, methanol and water extract of persimmonon some anti oxidant enzymes (SOD&GSH) and MDA in hyperlipidemic rat groups at the end of study

Variable / Groups			Super oxidedismutase SOD(µ / dl l)	Glutathione peroxidase GSH(µ / dl l)	Malondialdehyde MDA(µ / dl l)
Control(-ve)			a 27.25 + 0.52	a 780.03 + 119.22	d 11.75 + 0.48
Hyperlipidimic groups	Control (+ve)		c*** 13.82 ± 2.23	c*** 189.61 ± 67.90	a*** 24.97 ± 0.43
	Treated with	Atorvastatin	c*** 15.73 + 6.54	b* 550.11 + 126.67	b* 17.64 + 0.63
		Methanol extract	a 27.59 + 2.54	a 721.09 + 141.40	cd 13.33 + 0.55
		Water extract	ab 23.31 ± 3.60	ab 620.57 ± 144.77	bc** 14.28 ± 0.99

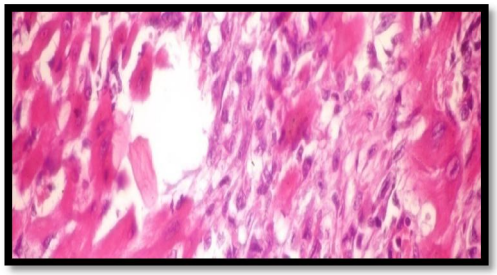
*Each value is the mean ±SD Significant with control group *p< 0.05 ** P< 0.01***P< 0.001Mean values in each column having different subscript (a, b, c, d,)are significantly at P< 0.05*

Histopathological Examination of Heart-:

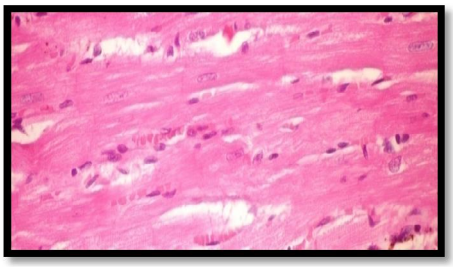
Microscopically heart of control (–ve) group rat revealed the normal myocardial muscle fibers (pict.1). Conversely, heart of rat from hyperlipidimic non treated control (+ve) showed focal necrosis of myocardial muscle fibers associated with leucocytic cells infiltration, inflammatory cells and intermuscular edema (pict. 2). However, heart of rats from treated with atorvastatin, methanol and water extract of persimmon revealed no histopathological changes (pict 3,4,5). The histopathological results denoted some changes but less than that of the control (+ve). The increased plasma cholesterol, particularly LDL-c is one of the most important risk factor for coronary vascular disease. LDL-c particle are taken up with leucocytic cells infiltration by macrophage cells after oxidized or modified and then deposited in the arterial intima leading to formation of atheroma. Low HDL-c levels are considered as a strong risk factor for coronary heart disease as HDL-c act as antioxidant and protect LDL-c from oxidation so that reduce LDL-c from circulation. The results were agree with Gorinstein *et al*. (2011) cleared that the histological investigation of aortas showed that the Cho containing diet led to changes in the aorta. The highest concentration of lesions was in the arch of aorta . The Cholesterol diet group showed the greatest aortic changes compared with the three control diets and the groups.From obtained results It can be recommend that the increase consumption of persimmon of their effective impact in reducing the side effects of hyperlipidimic rats, which proved some chemical analyses of serum, and confirmed by the analysis of histopathological tissue of the heart, and nutritional status, and recommended research also need to enter the persimmon the food plan of hyperlipidemic diet and general beverages in quantities which achieved results on rats, which have been turned into quantities to humans dose.



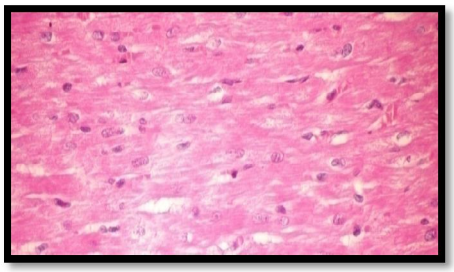
Pic. 1: Heart of control (-ve)rat showing normal cardiac myocyte(H and E ×400) .



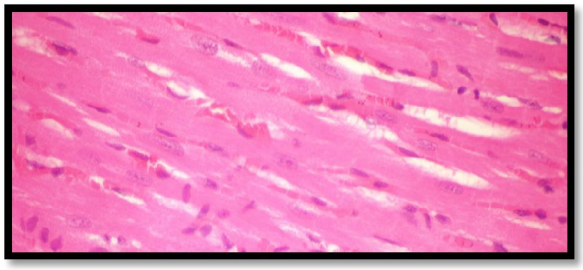
Pic. 2: Heart of non-treated rat showing focal mecrosis of cardiac myocytes associated with linflammatory cells linfictration (H and E ×400).



Pic. 3: Heart of rat treated with atorvastatin showing no histopathological changes.(H and E × 400).



Pic. 4: Heart of rat treated with methanol extract showing no histopathological changes.(H and E × 400)**.**



Pic. 5: Heart of rat treated with water extract showing no histopathological changes (H and E × 400)

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