African J. Biol. Sci., 15 (1): 1-12 (2019)
ISSN 1687-4870 **e-ISSN 2314-5501 (online)**
www.aasd.byethost13.com **Email: aasdjournal@yahoo.com**

Effect of feeding artichoke and milk thistle on rats treated with CCl_4 and glycerol/saline solution

Asmaa F. Amin, Zenab M. Mosa, Ereny W. Nagib, and Abdelrahman R. Abdelrahman
Nutrition and Food Sciences, Home Economics Dept., Fac. of Specific Education Ain-Shams University

ABSTRACT

The present study was performed to examine the effect of an artichoke and milk thistle consumption on liver function, kidney function, and lipid profiles. The chemical constituents were determined for the tested dried artichoke and milk thistle. This search was carried out using 72 adult male white albino rats randomly classified into two main groups. The first main group (36 rats) fed on a basal diet containing 20% - 40% artichoke and 20% - 40% milk thistle (acute liver failure groups). The second main group (36 rats) fed on a basal diet containing 20% - 40% artichoke and 20% - 40% milk thistle (acute renal failure groups).Then, the main groups were divided into six subgroups for each (n = 6). Results revealed that all groups treated with CCl4 or glycerol/ saline solution and administrated with different levels of dried artichoke and milk thistle (20% -40%) had a significant decrease in their liver function, kidney function, total cholesterol, triglycerides, LDL-c and VLDL-c cholesterol compared with the positive control group. On the other hand, a significant increase in HDL-c was recorded in all groups administrated with dried artichoke and milk thistle (20% -40%) compared with the control positive group. The results indicated that the consumption of artichokes and milk thistle could help in reducing the symptoms of acute liver and renal failure.

Key words: Artichoke, milk thistle, acute liver failure, acute renal failure, rats.

INTRODUCTION

Nutrition is a way that meets the needs of organism for growth to compensate the damaged cells and tissues and to supply body with energy (Ebrahim, 2002). Food is one of the important environmental factors affecting human health and proper balanced diet protects against human diseases, treat physical and psychological sound health that increases its ability to work and production (Al Bendari, 2002).

Liver disease is an expression for any damage that reduces the functioning of the liver. This general term covers all the potential problems that cause the liver to fail to perform its specified operations (Guan and He, 2013). Liver disease, ranging from early steatosis to severe hepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma (HCC), has high prevalence worldwide (Li *et al.,* 2016).

Asia and Africa have previously been classified as areas of high injury for hepatitis B virus (HBV), but in some countries, highly effective vaccination programmers have shifted this pattern towards intermediate or low injury (André, 2000).

Kidney disease diagnosed with objective measures of kidney damage and function has been recognized as a major public health burden. The population prevalence of chronic kidney disease exceeds 10%, and is more than 50% in high-risk subpopulations. Risk of kidney disease has a notable genetic component (Eckardt *et al*., 2013)

Artichoke has been widely used in traditional medicine as a herbal medicament for therapeutic purposes (Jacociunas *et al.*, 2013). Cardoon *(Cynara cardunculus L)* is a native plant to the Iberian Peninsula and the European Atlantic coast and invasive in American

environments (Rial *et al*., 2014). It is cultivated in Europe and other parts of the world as a food crop (Radulović and Dordevic, 2014). Artichoke is a good source of health-promoting compounds, including polyphenols. The main phenolic compounds of artichoke is (chlorogenic acid) and its beneficial effects are linked to their antioxidant activity that can be affected by their stability under gastro-intestinal conditions, during digestion (Garbetta *et al*., 2014).

Milk thistle *(Silybum marianum)* has been used for centuries as a medicinal plant. The Greek physician and botanist Discords was the first to describe milk thistle healing properties. Later, in 1597, John Gerard noted that milk thistle was "the best remedy against melancholy diseases". More recently, a small randomized study from Iran showed similar improvements in patients with obsessive-compulsive disorder who received either fluoxetine or extract derived from leaves of the milk-thistle plant (Siegel and Stebbing, 2013).

Milk thistle (MT) or *Silybum marianum* is the well-researched plant in the treatment of liver disease. *Silymarin* acts as an antioxidant by reducing free radical production and lipid peroxidation. *Silymarin* reduces liver injury caused by acetaminophen, carbon tetrachloride, radiation, iron overload, phenylhydrazine, alcohol, cold ischaemia and Amanita phalloides. *Silymarin* has been used to treat alcoholic liver disease, acute and chronic viral hepatitis and toxin-induced liver diseases (Abenavoli *et al.*, 2010).

The present work aims to study the effect of feeding artichokes and milk thistle for treatment of rats injected with (CCl_4) or glycerol / saline solution**.**

MATERIALS AND METHODS

Materials:

- Casein, all vitamins, minerals, cellulose, L -Cystine and choline chloride were obtained from El–Gomhoriya company, Cairo, Egypt.
- Artichoke and milk thistle (artichoke land) were obtained from local market, Cairo, Egypt.
- Normal male albino rats (72) of Sprague Dawley Strain were obtained from the National Research Centre, Cairo, Egypt.
- Carbon tetrachloride and glycerol were obtained from El- Gomhoriya Company, Cairo, Egypt.
- Kits: kits used to determine serum cholesterol, triglycerides, HDL-c, LDL-c, AST, ALT, ALP, uric acid, urea nitrogen, creatinine were obtained from Gama trade Company, Cairo, Egypt.

Preparation of artichoke and milk thistle:

Artichoke and milk thistle were dried at 50°C in a hot air oven for 12 hrs and ground to obtain the particle size of less than 1.0 mm (Adejuyitan *et al*., 2008).

Biological Investigation:

The basal diet consists of 14 % protein from casein (≥ 80 %), 5% soya oil , 0. 25 % choline chloride, 1 % vitamin mixture, 3.5% salt mixture, 5 % cellulose, 0.18 % L – cystine and the remainder (71.07 %) was corn starch (Reeves *et al* ., 1993).

The salt mixture was prepared according (Hegested *et al*., 1941) and the vitamin mixture was prepared according to (A.O.A.C 2005).

Male albino rats Sprague Dawley Strain (72 rats) weighing (150-200g) were housed in well aerated cages under hygienic conditions and fed a basal diet for one week for adaptation. After adaptation period, the rats were divided into two main groups :

First group (36 rats): It divided into:

Subgroup (1): containing 6 rats that were fed a basal diet as a "negative control"

The other 30 rats that were injected by carbon tetrachloride (CCL_4)as 2 ml/kg body weight and divided into 5 sub-

groups, each group containing 6 rats and fed as follows:

Subgroup (2): treated rats were Fed a basal diet "positive control".

Subgroup (3): treated rats were Fed a basal diet containing 20% dried artichoke.

Subgroup (4): treated rats were Fed a basal diet containing 40% dried artichoke.

Subgroup (5): treated rats were Fed a basal diet containing 20% dried milk thistle.

Subgroup (6): treated rats were Fed a basal diet containing 40% dried milk thistle.

Second main group (36 rats): according to the following scheme:

Subgroup (1): containing 6 rats that were fed on basal diet as a "negative control". The other 30 rats were injected by 10 ml (v/v) glycerol/ saline solution/kg and were divided into 5 sub-groups each group containing 6 rats fed as follows:

Subgroup (2): treated rats were Fed a basal diet rats "positive control"

Subgroup (3): treated rats were Fed a basal diet containing 20% dried artichoke.

Subgroup (4): treated rats were Fed a basal diet containing 40% dried artichoke.

Subgroup (5): treated rats were Fed a basal diet containing 20% dried milk thistle.

Subgroup (6): treated rats were Fed a basal diet containing 40% dried milk thistle.

At the end of the experimental period (8 weeks), rats were fasted over night before sacrificing. Blood samples were collected from rats and centrifuged at 3000 rpm, to separate the serum. Serum was carefully separated and transferred into dry clean Man-Wasser tubes and kept frozen at – 20° C till analysis.

Methods:

Chemical Analysis:

An artichoke and milk thistle dried samples were chemical analyzed for protein, fat, moisture and ash contents using the methods described by (A.O.A.C., 2005). Crude fiber contents were determined by enzymatic and gravimetric method according to (A.A.C.C., 2000). While, total carbohydrates were calculated by difference according to (Pellet and Sossy, 1970).

Biological evaluation:

Biological evaluation of the different tested diets, dried artichoke and dried milk thistle was carried out. Feed intake (FI), weight of rats in the initial and at the end of the experiment, body weight gain% (BWG%) and organs weight/ body weight% were determined according to Chapman *et al.* (1959).

Biochemical analysis of serum:

Serum cholesterol was determined according to the method described by Allain *et al*.(1974).

Serum triglycerides (TG) was determined according to the method described by Fossati and Principe (1982).

High density lipoprotein cholesterol (HDL-c) was colorimetrically determined according to the method described by Burstein (1970).

Low density lipoprotein cholesterol (LDL-c) was colorimetrically determined according to the method described by Friedwald *et al*. (1972).

Very low density lipoprotein cholesterol (VLDL-c) was color metrically determined according to the method described by Friedwald *et al*. (1972).

Serum uric acid was determined according to the method described by Fossati et al. (1980).

Serum urea nitrogen was determined according to the method described by Patton and Crouch (1977).

Serum creatinine concentration of the sample was determined by colorimetric method using Jaffe reaction as described by Bohmer (1971).

Serum aspartate and alanine amine transferase (AST and ALT) activities were measured according to the method described by Reitman and Frankel (1957).

Serum alkaline phosphatase (ALP) was measured according to the method described by Bergmeyer and Brent (1974).

Statistical analysis:

The statistical analysis was carried out by using SPSS, PC statistical software (version 10.0; SPSS Inc, Chieago, USA). The results were expressed as mean ± SD. Data were analyzed by one way analysis of variance (ANOVA). The differences between means were tested for significance using least significant difference (LSD) test at ($P<0.05$) (Steel and Torri, 1980).

Table (1): Chemical composition of dried artichoke and dried milk thistle.

Chemical composition %	Samples	
	Artichoke dried	Milk Thistle dried
Protein	13.8±0.25	11.4±1.24
Fat	2.19±1.64	1.61±1.69
Carbohydrates	43.05±1.41	6.8±0.89
Moistures	7±0.96	19±1.24
Ash	8.8±0.78	33.87±1.38
Crude Fiber	25.16±1.56	27.32±1.69

RESULTS AND DISCUSSION

Chemical Analysis:

It was obvious from data in Table (1) that the protein, fat and carbohydrates were higher in dried artichoke than dried milk thistle, while moistures, ash and crude fiber contents of the dried milk thistle were higher than those of dried artichoke. Fissore *et al*. (2014) reported that artichoke contained high-dietary fiber (53.6-67.0%) and low fat (2.5-3.7%) lanolin (13-55%), proteins (2-25%), carbohydrates (12-25%), sugars (4-55%), and contained phenol (2.1-8.2 g/100 g). While, El Sohaimy (2013) found that artichoke contained has moisture (75.805%), protein (13.48%), carbohydrates (76.34%), ash (7.21%) and fiber (63.76). On the other hand, Apostol *et al*. (2017) found that Milk thistle seeds are a good source of protein (20.35%), lipids (11.69%), total carbohydrates (38.16%) and crude fiber (27.24%).

Biological Evaluation:

First main group: Acute Liver Failure

The results in Table (2) showed that the positive control group was significantly higher in feed intake than that of group (5) (358g/day and 118g/day, respectively**).** Also, the initial weight of positive control group was significantly higher than that of group (5) (330g and 301.33g, respectively). On the other hand, the body weight gain in the group (5) (44.29%) was lower than that of positive control group (58.4%).

Table (2): Effect of dried artichoke and dried milk thistle on feed intake and weight gains of rats treated with CCl_4.

Groups	Parameters			
	Feed intake (g/day)	Final weight (g)	Initial weight (g)	body weight gain %
Group (1): negative control	98^{c}±1.02	262^{c}±0.25	208^{a}±1.59	25.96^{c}±0.48
Group (2) :positive control	358^{a}±0.25	330^{a}±0.87	208.33^{a}±1.84	58.4^{a}±0.29
Group (3) :20% artichoke dried	182.25^{b}±0.58	305.67^{b}±1.24	208^{a}±1.45	46.96^{b}±0.24
Group(4) :40% artichoke dried	188.43^{b}±2.65	307^{b}±2.97	208.83^{a}±0.54	47.01^{b}±1.54
Group (5) :20% milk thistle dried	118^{b}±2.14	301.33^{b}±3.47	208.83^{a}±2.87	44.29^{b}±1.57
Group (6) :40% milk thistle dried	244^{a}±1.58	319^{a}±0.18	208^{a}±2.16	53.37^{a}±1.58
ANOVA (F)	0.301	0.008	0.121	0.701
Sig.	*	**	*	*

- Values are expressed as mean ± SD, Significant at $p<0.05$ using one way ANOVA test.
- Means in each column which have different letters are differ significantly.

Effect of feeding artichoke and milk thistle on rats treated with CCl_4 and glycerol/saline solution

The data of relatively organs weight were present in Table (3). Rats feed on dried artichoke and dried milk thistle were significantly higher in positive control than those in group (6) (10.44g and 9.32g). While the relative weight of kidney in groups (3) and (4) were lower than those of positive control group (1.48g and 1.78g). The relative weight of heart in group (5) was lower than that of positive control group (0.76g and 0.91g).

Table (3): Effect of dried artichoke and dried milk thistle on relative organs weights of rats injected with CCl_4.

Groups	Parameters		
	Relative weights of liver (g)	**Relative weights of kidney (g)**	**Relative weights of heart (g)**
Group (1): negative control	$8.18^{c}\pm0.74$	$1.62^{b}\pm0.05$	$0.98^{a}\pm0.13$
Group (2): positive control	$9.35^{b}\pm1.01$	$1.78^{a}\pm0.14$	$0.91^{b}\pm0.03$
Group (3): 20% artichoke dried	$10.44^{a}\pm0.74$	$1.48^{c}\pm0.22$	$0.94^{a}\pm0.04$
Group(4): 40% artichoke dried	$10.44^{a}\pm0.74$	$1.48^{c}\pm0.22$	$0.94^{a}\pm0.04$
Group (5): 20% milk thistle dried	$9.42^{b}\pm0.31$	$1.52^{b}\pm0.14$	$0.76^{c}\pm0.03$
Group (6): 40% milk thistle dried	$9.32^{b}\pm0.17$	$1.67^{a}\pm0.06$	$0.88^{c}\pm0.14$
ANOVA (F)	0.105	0.0005	0.341
Sig.	*	**	*

- Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test.
- means in each column which have different letters are differ significantly.

Data in Table (4) showed that the positive control group was significantly increased in total lipids and total cholesterol compared with group (5) (313.25 mg/dL and 231.98mg/dL) and (76 mg/dL and 66 mg/dL), respectively. While the triglycerides in group (6) was significantly higher compared with the other experimental groups.

The current results suggested that silybin is beneficial for hypertriglyceridemia and hyperglycemia supportive therapy and significantly increased the protective high density lipoprotein content. However, its administration did not influence the total cholesterol level. Porupa *et al*. (2015) found that the micronized form of silybin caused a higher increase of protective HDL level.

Table (4): Effect of dried artichoke and dried milk thistle on plasma total lipids of rats injected with CCl_4.

Groups	Parameters		
	Total lipids mg/dL	**Total cholesterol** mg/dL	**Triglycerides** mg/dL
Group (1) negative control	$264.58^{b}\pm7.62$	$67.33^{c}\pm11.85$	$109.33^{b}\pm16.04$
Group (2) positive control	$313.25^{a}\pm6.22$	$76^{a}\pm18.19$	$141^{a}\pm12.66$
Group (3) 20% artichoke dried	$305.11^{a}\pm0.71$	$70^{b}\pm9.54$	$118.67^{b}\pm9.61$
Group(4) 40% artichoke dried	$278.5^{b}\pm5.46$	$68.33^{b}\pm2.31$	$97.33^{c}\pm9.02$
Group (5) 20% milk thistle dried	$231.98^{c}\pm3.15$	$66^{c}\pm11.53$	$79.67^{c}\pm9.29$
Group (6) 40% milk thistle dried	$312.98^{a}\pm5.85$	$73.67^{a}\pm3.06$	$134.67^{a}\pm13.83$
ANOVA (F)	0.601	0.005	0.011
Sig.	*	**	**

- Values are expressed as mean ± SD.- Significant at $p<0.05$ using one way ANOVA test.
- means in each column which have different letters are differ significantly.

Data for different lipodensity protein in the Table (5) indicated that there were significant decrease in the HDL-cholesterol in positive group as compared with group (3) (25 mg/dL and 27.33 mg/dL, respectively). On the other hand, the LDL-cholesterol was significantly higher in positive group than that in group (5) (22.67 mg/dL and 16.98 mg/dL, respectively). The HDL/LDL-cholesterol and VLDL-cholesterol were significantly decreased in groups (4) and (5) than those in positive control group (0.77 mg/dL and 3.16 mg/dL) (15.93 mg/dL and 28.2 mg/dL), respectively.

Rats fed standard laboratory diet did not respond to oral administration of silymarin due to decrease of serum cholesterol, but mild increase in HDL cholesterol was found. Parenterally injected silymarin failed to reduce serum cholesterol in rats fed high cholesterol diet and standard laboratory diet. This agrees with the results of Lkottová *et al*. (1998) who suggested that silymarin role could be attributed to the fat-mediated improved bioavailability and/or by inhibiting of resorption of dietary cholesterol.

Table (5): Effect of dried artichoke and milk thistle on cholesterol fractions of rats injected with CCl_4.

Groups	Parameters			
	HDL-cholesterol mg/dL	**LDL-cholesterol** mg/dL	**(HDL / LDL)-cholesterol** mg/dL	**VLDL-cholesterol** mg/dL
Group (1): negative control	$30^{a}\pm1.05$	$15.67^{c}\pm12.22$	$1.54^{b}\pm2.71$	$21.87^{b}\pm3.21$
Group (2) : positive control	$25^{c}\pm2.13$	$22.67^{a}\pm12.71$	$3.16^{a}\pm1.16$	$28.2^{a}\pm4.13$
Group (3): 20% artichoke dried	$27.33^{b}\pm1.53$	$19.12^{a}\pm8.72$	$0.88^{c}\pm0.17$	$23.73^{b}\pm1.92$
Group(4): 40% artichoke dried	$26^{b}\pm2.65$	$17.63^{b}\pm6.02$	$0.77^{c}\pm0.21$	$19.47^{b}\pm1.81$
Group (5) :20% milk thistle dried	$25.33^{c}\pm2.08$	$16.98^{b}\pm10.69$	$1.23^{b}\pm0.73$	$15.93^{c}\pm1.86$
Group (6): 40% milk thistle dried	$26^{b}\pm2.65$	$20.33^{a}\pm7.09$	$2.77^{b}\pm1.87$	$27.32^{a}\pm7.97$
ANOVA (F)	0.975	0.004	0.0002	0.002
Sig.	*	**	**	**

- Values are expressed as mean ± SD.- Significant at $p<0.05$ using one way ANOVA test.
- means in each column which have different letters are differ significantly.

Data for liver functions' showed in Table (6) indicated that rats in the positive control group tended to have ALT level higher than the other experimental groups except, group (4). While, AST and ALP were higher in positive group than in the experimental groups. Silymarin has been used to treat alcoholic liver disease, acute and chronic viral hepatitis and toxin-induced liver diseases (Kumar and Khanna 2018). Ni and Wang (2016) found silymarin did not lead to liver injury in mice.

Table (6): Effect of dried artichoke and dried milk thistle on liver function of rats injected with CCl_4.

Groups	Parameters		
	ALT (U/L)	**AST (**U/L)	**ALP (**U/L)
Group (1) negative control	$12.67^{c}\pm4.62$	$60^{c}\pm13.86$	$125.3^{b}\pm0.16$
Group (2) positive control	$22.33^{a}\pm7.51$	$76.67^{a}\pm12.36$	$158.2^{a}\pm0.08$
Group (3) 20% artichoke dried	$19.67^{a}\pm4.62$	$74^{a}\pm13.86$	$109.2^{c}\pm0.08$
Group(4) 40% artichoke dried	$22.33^{a}\pm2.31$	$75^{a}\pm7.81$	$114.2^{b}\pm0.04$
Group (5) 20% milk thistle dried	$15.33^{b}\pm2.89$	$67.33^{b}\pm8.51$	$110.3^{c}\pm0.04$
Group (6) 40% milk thistle dried	$18^{b}\pm6.56$	$69.67^{b}\pm0.58$	$119.1^{b}\pm0.08$
ANOVA (F)	0.136	0.033	0.323
Sig.	*	**	*

- Values are expressed as mean ± SD.- Significant at $p<0.05$ using one way ANOVA test.
- means in each column which have different letters are differ significantly.

Effect of feeding artichoke and milk thistle on rats treated with CCl_4 and glycerol/saline solution

Second main group: Acute Renal Failure:

Results in Table (7) showed that the feed intake was the highest in the positive control (327g/day) and the lowest was in the group (6) (110 g/day). Significant differences were observed in the body weight gain % between positive control group and those feed on either diet supplemented with 40% dried artichoke and dried milk thistle (groups 4 and 6).

Table (7): Effect of dried artichoke and dried milk thistle on feed intake and weight gains of rats treated with glycerol and saline solution.

Groups	Parameters			
	Feed intake (g/day)	Final weight (g)	Initial weight (g)	body weight gain %
Group (1) negative control	87c±1.65	262b±2.54	208a±0.47	25.96b±0.28
Group (2) positive control	327a±2.47	272a±2.87	207b±0.19	30.87a±0.28
Group (3) 20% artichoke dried	223a±0.21	269.25a±3.59	208a±0.43	29.24a±0.19
Group(4) 40% artichoke dried	185.43b±0.87	249b±0.45	208a±1.57	19.71b±0.14
Group (5) 20% milk thistle dried	175.25b±0.65	267.25a±0.24	208.33a±2.47	28.28a±0.25
Group (6) 40% milk thistle dried	110b±0.14	222.2c±0.24	208.17a±2.15	6.74c±0.25
ANOVA (F)	0.561	0.003	0.561	0.001
Sig.	*	**	*	**

- Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test.
- Means in each column which have different letters differ significantly.

Table (8) indicated that the relative weights of liver and kidney were lower in group (5) and group (3) than the positive control group (8.14g- 8.18g and 1.59g-1.62g) respectively. On the other hand, the relative weight of heart was higher in positive control group than that of the other investigated groups (0.98g and 0.82g, 0.71g-0.76g-0.68g), respectively.

The relative weights of liver and kidney in group (6) were significant lower than those of the positive group. On contrary, the relative weight of heart was significantly higher in the positive group than that of group (6).

Table (8): Effect of dried artichoke and dried milk thistle on relative organs weight of rats treated with glycerol and saline solution.

Groups	Parameters		
	Relative weights of liver (g)	Relative weights of kidney (g)	Relative weights of heart (g)
Group (1) negative control	7.87^{b}±0.74	1.39^{b}±0.05	0.86^{a}±0.13
Group (2) positive control	8.18^{a}±0.33	1.62^{a}±0.04	0.98^{a}±0.05
Group (3) 20% artichoke dried	8.08^{a}±0.35	1.59^{a}±0.14	0.82^{b}±0.04
Group(4) 40% artichoke dried	7.96^{b}±0.43	1.37^{b}±0.04	0.71^{b}±0.02
Group (5) 20% milk thistle dried	8.14^{a}±0.71	1.44^{b}±0.12	0.76^{b}±0.08
Group (6) 40% milk thistle dried	7.74^{b}±0.39	1.36^{b}±0.14	0.68^{c}±0.02
ANOVA (F)	0.542	0.454	0.922
Sig.	*	*	*

- Values are expressed as mean ± SD.- Significant at $p<0.05$ using one way ANOVA test.
- Means in each column which have different letters are differ significantly.

Data in Table (9) showed that, serum total lipids of rats was higher in positive control group (303.06 mg/dL) than that of the other experimental groups (294.92 mg/dL, 268.31 mg/dL, 221.79 mg/dL and 203.79 mg/dL), although total cholesterol was significantly higher in positive control

group than the group (6) (57.14 mg/dL, 53.43 mg/dL). On the other hand, the level of triglycerides was higher in the positive control group (130.81 mg/dL) than that of groups (6) (69.48 mg/dL).

Table (9): Effect of dried artichoke and dried milk thistle on Plasma total lipids of rats treated with glycerol and saline solution.

Groups	Parameters		
	Total lipids mg/dL	**Total cholesterol** mg/dL	**Triglycerides** mg/dL
Group (1) negative control	$254.39^{b}\pm2.67$	$57.14^{a}\pm7.82$	$99.14^{b}\pm7.14$
Group (2) positive control	$303.06^{a}\pm6.65$	$56.81^{a}\pm9.17$	$130.81^{a}\pm9.67$
Group (3): 20% artichoke dried	$294.92^{a}\pm1.72$	$56.71^{a}\pm8.53$	$121.33^{a}\pm7.62$
Group(4) 40% artichoke dried	$268.31^{b}\pm6.56$	$56.62^{b}\pm4.35$	$108.48^{a}\pm8.12$
Group (5) 20% milk thistle dried	$221.79^{c}\pm1.53$	$55.81^{b}\pm7.53$	$87.14^{b}\pm8.29$
Group (6) 40% milk thistle dried	$203.79^{c}\pm6.45$	$58.48^{a}\pm5.06$	$69.48^{c}\pm3.85$
ANOVA (F)	0.262	0.003	0.013
Sig.	*	**	**

- Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test. - means in each column which have different letters are differ significantly.

Results in Table (10) revealed the cholesterol fraction of rats in the studied group. The serum of HDL-cholesterol was higher in all experimental groups than the positive control group. The LDL-cholesterol and (HDL/LDL)-cholesterol were higher in positive group than the all other groups.

The VLDL-cholesterol was lower in group (5) (10.74 mg/dL) than the positive control group (23.01 mg/dL). On the other hand, rats in all acute renal failure groups that administrated different levels of dried artichoke and dried milk thistle (20% and 40%) had significant increase in their serum high density lipoprotein cholesterol (HDL- C) as compared to positive control. While the serum low density lipoprotein cholesterol (LDL- C) and very low density lipoprotein cholesterol (VLDL-C) levels decreased significantly compared with those of control positive group.

Silymarin could preserve plasmatic high-density lipoprotein cholesterol (HDL-C) to a higher level and low-density lipoprotein cholesterol (LDL-C) to a lower level, which benefited more to the circulation system. Through real-time PCR analysis, a vital protective role of silymarin in mRNA regulation of genes involved in lipid metabolism and oxidative stress was clarified (Ni and Wang, 2016).

Table (10): Effect of dried artichoke and dried milk thistle on cholesterol fractions of rats treated with glycerol and saline solution.

Groups	Parameters			
	HDL-cholesterol mg/dL	**LDL-cholesterol** mg/dL	**(HDL / LDL)-cholesterol** mg/dL	**VLDL-cholesterol** mg/dL
Group (1) negative control	$24.81^{a}\pm1.25$	$10.48^{b}\pm10.21$	$1.02^{b}\pm2.51$	$16.68^{b}\pm2.41$
Group (2) positive control	$19.81^{c}\pm1.23$	$17.48^{a}\pm11.21$	$2.64^{a}\pm1.26$	$23.01^{a}\pm3.15$
Group (3) 20% artichoke dried	$22.14^{a}\pm2.43$	$16.81^{a}\pm6.42$	$0.36^{b}\pm0.23$	$18.54^{a}\pm0.98$
Group(4) 40% artichoke dried	$20.81^{b}\pm4.35$	$13.41^{a}\pm4.01$	$0.25^{c}\pm0.45$	$14.28^{a}\pm2.61$
Group (5) 20% milk thistle dried	$20.14^{b}\pm1.06$	$9.48^{b}\pm9.05$	$0.62^{b}\pm0.85$	$10.74^{c}\pm0.84$
Group (6) 40% milk thistle dried	$20.81^{b}\pm1.61$	$13.14^{a}\pm4.14$	$0.25^{c}\pm1.24$	$14.74^{a}\pm6.07$
ANOVA (F)	0.975	0.004	0.0002	0.002
Sig.	*	**	**	**

- Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test.

- means in each column which have different letters are differ significantly.

Effect of feeding artichoke and milk thistle on rats treated with CCl_4 and glycerol/saline solution

Data in Table (11) revealed that serum of creatinine level was significantly lower in groups (4, 5 and 6) than the positive control group (1.63 mg/dL). On the other hand, serum of uric acid level was lower in all groups. It was noticed that, serum of urea level was the lowest in group (3) (21±7.00 mg/dL). From the data shown in Table (11) it could be observed that all acute renal failure groups administrated with different levels of dried artichoke and milk thistle (20% and 40%) had significant decrease in creatinine, serum urea and uric acid compared with the control positive groups.

In vitro experiments with kidney cells damaged by paracetamol, cisplatin, and vincristin demonstrated that administration of silibinin before or after the chemical-induced injury can lessen or avoid the nephrotoxic effects. The results warrant in vivo evaluations of the flavonolignan derivatives (Sonnenbichler *et al.*, 1999).

Table (11): Effect of artichoke dried and milk thistle dried on kidney function of rats treated with glycerol and saline solution.

Groups	Parameters		
	Creatinine mg/dL	**Urea** mg/dL	**Uric Acid** mg/dL
Group (1) negative control	0.53^{c}±0.06	29.33^{b}±1.00	1.2^{c}±0.78
Group (2) positive control	1.63^{a}±0.14	32^{a}±0.58	1.93^{a}±0.00
Group (3) 20% artichoke dried	1.00^{a}±0.1	21^{c}±7.00	1.2^{c}±0.21
Group(4) 40% artichoke dried	0.9^{b}±0.1	31^{a}±9.07	1.37^{b}±0.55
Group (5) 20% milk thistle dried	0.9^{b}±0.1	31^{a}±1.73	1.4^{b}±0.00
Group (6) 40% milk thistle dried	0.83^{b}±0.14	31^{a}±3.46	1.27^{b}±0.25
ANOVA (F)	0.003	1.475	0.369
Sig.	**	*	*

- Values are expressed as mean ± SD. - Significant at $p<0.05$ using one way ANOVA test.
- means in each column which have different letters are differ significantly.

Conclusion

From the previous results it could be concluded that supplementation of diet with dried artichoke and milk thistle may be useful to improve the deleterious effect of CCl_4 or glycerol on liver , kidney function and lipid profile of them, especially with milk thistle.

REFERENCES

A.A.C.C. (2000). Approved Methods of the American Association of Cereal Chemists. Published by American Association of Cereal Chemists.10th ed., St. Paul, Minnesota, U.S.A.

Abenavoli, L.; Capasso, R.; Milic, N. and Capasso, F. (2010). Milk thistle in liver diseases: past, present, future. Phytotherapy Res., 24(10): 1423-1432.

Adejuyitan, J. A.; Adelakun, O. E.; Olaniyan, S. A. and Popoola, F. I. (2008).Evaluating the quality characteristics of kunun produced from dry-milled sorghum. Afr. J. Biotechnol., 7(13): 2244-2247.

Allain, C.Z.; Poon, L.S. and Chan, C.S. (1974). Enzymatic determination of total serum cholesterol.Clin. Chem., 20: 470-475.

André, F. (2000). Hepatitis B epidemiology in Asia, the Middle East and Africa. Vaccine., 18: S20-S22.

A.O.A.C. (2005). Official Methods of Analysis of the Assoc. of Official Agricultural Chemists, 12th ed. Washington, D.C.

Apostol, L. ; Iorga, C.S.; Moșoiu, C.; Mustățea, G. and Cucu, Ș. (2017). Nutrient composition of partially defatted milk thistle seeds. Scientific Bull. Series F. Biotechnologies, 21 : 165-169.

Al Bendari Sana (2002). Scientific Reference in Human Nutrition, Second Edition, Nile Arabic Publishing and Distribution (book).

Bergmeyer, H.U. and Brent, E. (1974). Methods of Enzymatic Analysis vol.2. Bergmeyer, H.U. (Ed.) Verlag Chemise Weunheun, Acdemic Press, New York, 735,760.

Bohmer, H.B.U.M. (1971). Micro-determination of creatinine. Clin. Chem. Acta., 32: 81-85.

Burstein, M. (1970). HDL cholesterol determination after separation high density lipoprotein. Lipid Res., 11: 583.

Chapman, D.G.; Gastilla, R. and Campbell, J.A. (1959). Evaluation of protein in food. I.A. Method for the determination of protein efficiency ratio. Can. J. Biochem. Physiol., 37: 679−686.

Ebrahim, A.M.(2002).The Importance of Food and Medicinal Vegetables, First Edition, Publisher, Knowledge Center, Alexandria (book).

Eckardt, K.U.; Coresh, J.; Devuyst, O.; Johnson, R.J.; Köttgen, A.; Levey, A.S. and Levin, A. (2013). Evolving importance of kidney disease: from subspecialty to global health burden. The Lancet., 382(9887) : 158-169.

El Sohaimy, S.A. (2013).The effect of cooking on the chemical Composition of Artichoke (*Cynara scolymus* L.). Afr. J. Food Sci. and Technol., 4(8) : 182-187.

Fissore, E.N.; Domingo, S.C.; Pujol, C.A.; Damonte, E.B.; Rojas, A.M. and Gerschenson, L. N. (2014). Upgrading of residues of bracts, stems and hearts of *Cynara cardunculus* L. var. *scolymus* to functional fractions enriched in soluble fiber. Food and function, 5(3): 463-470.

Fossati, P. and Principe, L. (1982). Enzymatic colorimetric method to determination triglycerides., Clin. Chem., 28: 2077.

Fossati, P.; Prencipe, L. and Berti, G. (1980). Enzymatic colorimetric method of determination of uric acid in serum. Clin. Chem., 26 (2): 227-273.

Friedewald, W. T.; Levey, R. I. and Fredrickson, D. S. (1972).Estimation of concentration of low-density lipoprotein separated by three different methods. Clin. Chem., 18: 499-502.

Garbetta, A.; Capotorto, I.; Cardinali, A.; D'Antuono, I.; Linsalata, V.; Pizzi, F. and Minervini, F. (2014). Antioxidant activity induced by main polyphenols present in edible artichoke heads: influence of in vitro gastro-intestinal digestion. J. Functional Foods., 10: 456-464.

Guan, Y. S. and He, Q. (2013). A current update on the rule of alternative and complementary medicine in the treatment of liver diseases. Evidence-Based Complementary and Alternative Medicine, 2013, Article ID 321234:1-10.s

Hegested, D. M.; Mills, C.; Elvehjem, C. A. and Hart, E. B. (1941). Choline in the nutrition of chicks. J. Biol. Chem., 138: 459-470.

Jacociunas, L.V.; de Andrade, H.H.R.; Lehmann, M.; Pedersini, L.W.; Ferraz, A.D.B.F.; da Silva, J. and Dihl, R.R. (2013). Protective activity of *Cynara scolymus* L. leaf extract against chemically induced complex genomic alterations in CHO cells. Phytomedicine, 20 (12): 1131-1134.

Kumar, S. and Khanna, R.K. (2018). Beneficial effects of *Silybum marianum* seed extract against hepatic fibrosis induced by carbon tetrachloride in rats . BMJ journal Volume 67, Issue Suppl 2. IDDF-ABS-0265

Li, S.; Hong, M.; Tan, H.Y.; Wang, N. and Feng, Y. (2016). Insights into the role and interdependence of oxidative stress and inflammation in liver diseases. Oxidative medicine and cellular longevity, doi: 10.1155/4234061

Łkottová, N.; Krečman, V.; Walterová, D.; Ulrichová, J.; Kosina, P. and Łimánek, V. (1998). Effect of silymarin on serum cholesterol levels in rats. Biomedical Papers., 141:87-89.

Ni, X. and Wang, H. (2016). Silymarin attenuated hepatic steatosis through regulation of lipid metabolism and oxidative stress in a mouse model of nonalcoholic fatty liver disease (NAFLD). American journal of translational research., 8(2): 1073.

Patton, C.J. and Crouch, S.R. (1977). Enzymatic colorimetric method to determination urea in serum. Anal. Chem.,49: 464.

Pellet, P.L. and Sossy, S. (1970). Food composition. Tables for use in the Middle East. American Univ. of Beirut. Beirut. Lebanon., 2:126.

Porupa, M.; Matusková, Z.; Kazdová, L.; Oliyarnyk, O.; Malínská, H.; di Angelo, I.T. and Vecera, R. (2015). Positive effects of different drug forms of silybin in the treatment of metabolic syndrome. Physiological Res., 64: 507.

Radulović, N.S. and Đorđević, M.R. (2014). Chemical composition of the tuber essential oil from *Helianthus tuberosus* L. (Asteraceae). Chemistry and biodiversity, 11(3): 427- 437.

Reeves, P.G.; Nielsen, F.H. and Fahmy, G.C. (1993). AIN-93 purified diets for laboratory rodents: Final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. J. Nutr., 123(11): 1939-1951.

Reitman, S. and Frankel, S. (1957). A colorimetric method for the determination of serum Reitman glutamic oxaloacetic and glutamic pyruvic transaminase. Am. J. Clin. Path., 28: 56-63.

Rial, C.; Novaes, P.; Varela, R.M.G.; Molinillo, J.M. and Macias, F.A. (2014). Phytotoxicity of cardoon (*Cynara cardunculus*) allele-chemicals on standard target species and weeds. J. Agric. and food chem., 62(28): 6699-6706.

Siegel, A.B. and Stebbing, J. (2013). Milk thistle: early seeds of potential. The Lancet Oncology, 14(10): 929–930.

Sonnenbichler, J.; Scalera, F.; Sonnenbichler, I. and Weyhenmeyer, R. (1999). Stimulatory effects of silibinin and silicristin from the milk thistle *Silybum marianum* on kidney cells. J. Pharmacol. and Experimental Therapeutics, 290(3): 1375-1383.

Steel, R.G. and Torri, J.H. (1980). Principle and Procedures of Statistical Biometrical Approach.2nd ed. Pbi. Mc Grew Hill Book Company; New York; U.S.A.

Zholobenko, A. and Modriansky, M. (2014). Silymarin and its constituents in cardiac preconditioning. Fitoterapia, 97: 22 - 132.

تأثير تناول الخرشوف وشوك الحليب على الفئران المحدث اصابتها برابع كلوريد الكربون والمحلول الملحى مع الجليسرول

أسماء فريد امين محمد، زينب مصطفى موسى، ايرينى ولسن نجيب، عبد الرحمن رجب عبد الرحمن

* تغذية وعلوم أطعمة - قسم الاقتصاد المنزلي - كلية التربية النوعية - جامعة عين شمس

المستخلص

أجريت الدراسة الحالية لدراسة تأثير استهلاك الخرشوف وشوك الحليب المجفف على وظائف الكبد، وظائف الكلى، ومستوى الدهون فى الدم. وقد تم قياس المكونات الكيميائية والفيتامينات والمعادن والألياف فى الخرشوف وشوك الحليب المجفف. تم اجراء هذه الدراسة على 72 من ذكور الفئران الالبينو البيضاء بشكل عشوائي التي قسمت إلى مجموعتين رئيسيتين. المجموعة الرئيسية الأولى (36 فأر) تغذت على الوجبة الاساسية التي تحتوي على 20٪ - 40٪ الخرشوف و 20٪ - 40٪ شوك الحليب (مجموعات الفشل الكبدي الحاد) .تغذت المجموعة الرئيسية الثانية (36 فأر) على الوجبة الاساسية التى تحتوي على 20٪ - 40٪ الخرشوف و20٪ - 40٪ شوك الحليب (مجموعات الفشل الكلوي الحاد). تم تقسيم كل مجموعة رئيسية إلى 6 مجموعات فرعية لكل (ن = 6).

اظهرت النتائج أن جميع مجموعات الفشل الكبدى الحاد والفشل الكلوي الحاد التى تمت تغذيتها على مستويات مختلفة من الخرشوف وشوك الحليب المجفف (20٪ - 40٪) شهدت انخفاض كبير في وظائف الكبد، وظائف الكلى، والكوليسترول الكلي، والدهون الثلاثية VLDL-C ، LDL-C والكوليسترول مقارنة مع المجموعة الضابطة الموجبة. من ناحية أخرى، اظهرت النتائج زيادة كبيرة في-C HDL في كل مجموعة من مجموعات الفشل الكبدى الحاد والفشل الكلوي الحاد التى تمت تغذيتها على مستويات مختلفة من الخرشوف وشوك الحليب المجفف (20٪ - 40٪) مقارنة مع المجموعة الضابطة الموجبة. ويوصى البحث بإستهلاك الخرشوف وشوك الحليب حيث انه قد يخفف من اعراض الفشل الكبدي والكلوي الحاد.

الكلمات الدالة: الخرشوف، شوك الحليب، الفشل الكبدى الحاد، الفشل الكلوى الحاد.