Artichoke and Green Coffee Seeds to Overcome Hepatopathy induced by Carbon Tetrachloride in Rats

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Abstract

This study aimed to investigate the effect of diets enriched with artichoke and green coffee seeds powders on hepatopathy rats. Twenty five adult male albino rats (Sprague Dawley strain), weighting (160±10g) used in this study and assigned to two main groups. The first is a negative control group (5 rats) was received a basal diet throughout the experiment .The second group (20 rats) was injected s/c by (0.2ml/kg) carbon tetrachloride for two weeks, twice a week. The percent of plants seeds which were used 7% artichoke seeds, 7%green coffee seeds and 7%mix of them from the basal diet. Serum liver function (AST, ALT and ALP), (SOD, GPx and CAT), (total protein, albumin and globulin), (total bilirubin, direct bilirubin and indirect bilirubin), total cholesterol and triglycerides, lipoproteins (VLDL-c, HDL-c, LDL-c) were determined, kidney function was also assessed (urea, creatinine, uric acid).The results revealed that, the control (+ve) group showed a significant increase in (ALT, AST, ALP)c ompared with the control (-ve) 7% green

coffee seeds powder was the best results, the results of (total protein, albumin and globulin) showed a significant increase in negative control compared with the control (+ve) (7% mix of artichoke and green coffee seeds powder) was the best results, but the results of lipid profile, kidney function and (total bilirubin, direct bilirubin, indirect bilirubin) revealed that, the control (+ve) group showed a significant increase in its compared with the control (-ve) (7% mix of artichoke and green coffee seeds powder) was the best results of lipid profile and kidney function but (7% artichoke seeds powder) was the best results of (total bilirubin, direct bilirubin, indirect bilirubin), on the other hand the control (+ve) group showed a significant decrease in (SOD, GPx, CAT) compared with the control (-ve) (7% mix of artichoke seeds powder) was the best results.The obtained results concluded that feeding with artichoke and green coffee seeds powder improved, liver function, kidney function and lipid profile.

Recommendations

According to the results of this study, which showed the importance of both artichoke and green coffee seeds powder in improving liver and kidney functions and blood lipids because they contain antioxidants and phenolic compounds so we have recommended the use of them as a drinks to improve hepatopathy, the current study recommended to more interested in the effect of artichoke and green coffee seeds powder on other diseases such as heart disease, obesity, diabetes and cancer.

Key words: Artichoke, Green coffee, Hepatopathy rats, carbon tetrachloride

Introduction

The liver is a functional multi-organ, the largest solid organ, the largest gland, involved in carbohydrate, protein, and fat metabolism, food absorption and detoxification **(Kunutsor *et al*., 2014)**.The concentration of liver enzymes, such as (AST) aspartate transaminase and (ALT) alanine transaminase are generally assessed for liver function, therefore any increase in these enzymes must be detected **(Sajjad *et al*., 2021)**. Obesity, diabetes, virus and chemicals are the most important causes of liver disease **(Talal *et al*., 2013)**. The use of herbs, their seeds and various parts of plants was common in ancient times as a form of alternative medicine **(Tang and Halliwell, 2010).**

Artichoke (*Cynara scolymus* L.) seeds are a good source of natural antioxidants such as vitamin C and hydroxycinnamic acids, used in traditional medicine for centuries as a specific liver and gallbladder remedy, the active ingredient in artichoke is cynarin which is found in highest concentrations in the leaves and seeds like silymarin. Cynarin has demonstrated significant liver protecting and regenerating effects, furthermore cynarin is a phenolic acid compound that experts believe is responsible for its cholagogue and choleretic properties **(Ramazan *et al*., 2020)**. However studies on rats which were administrated of seeds, root and leaf liquid extracts

of artichoke exhibited good hepatoprotective results and helped hepatocytes regenerate**(Salem *et al*., 2015).** Also seeds of artichoke have an effective effect in the treatment of non-alcoholic fatty liver disease and non-alcoholic steatohepatitis management **(Rangboo *et al* .,2016).** Seeds also may have a hypocholesterolemic effect and thus may help protect against heart disease, artichoke seeds reduced postprandial glycemic insulinemic responses **(Pérez *et al*., 2000)**

Sajjad *et al*., (2021) showed that artichoke leaves and seeds extract elicited a significant decrease in ALT levels in obese, cardiac damaged, Wistar rats with a high- fat diet. On the other hands wild Egyptian artichoke seeds were able to normalize ALT and AST levels in hepatitis C virus patients **(Elsebai *et al* ., 2016)**

Green coffee is a natural product with powerful antioxidant activity, caffeine is the main component of coffee, and moreover its antioxidant activities of it had a positive protective effect against the risk of metabolic syndrome **(Wolska *et al*., 2017)**. For this reason, most studies on coffee were focused on the beneficial protective activity of caffeine **(Sarria *et al*., 2018)** ,because of its antioxidant properties and diminishing mortality chances against different degenerative diseases such as malignant growth, diabetes, liver diseases and Parkinson's disease **(Skowron *et al*., 2016)**. Also, green coffee which contains chlorogenic acids (caffeic and ferulic acid, are therefore of particular interest. In vitro trials showed that green coffee exhibited antidiabetic activities including inhibition of adipogenesis

and the hepatoprotective effect of silymarin and green coffee extract against thioacetamide-induced hepatotoxicity on the histologica and immunohistochemical levels in rats **(Haddad *et al*., 2021).**

The aim of the study

This study aims to use a natural product that fights hepatopathy and reduces liver enzymes, as well as not affecting the normal functions of the body, so we used seeds powder of the plants such as, artichoke seeds powder because of its a good source of cynarin which is a phenolic acid compound, its reduces liver enzymes. Also, green coffee seeds powder are contain caffeine and chlorogenic acids because of its antioxidant properties its reducd inhibition of the hepatoprotective effect, so we can use seeds powder of artichoke and green coffee to improve liver function, kidney function and lipid profile.

Materials and methods

Materials

Plants seeds

Artichoke (*Cynara scolymus* L.) and green coffee (*Coffea*) seeds were purchased from Agricultural Seed, Spices and Medicinal Plants Co. (Harraz), Cairo, Egypt

Carbon tetrachloride (CCl4)

Carbon tetrachloride was obtained from El Gomhouria Company for Chemical Industries, Cairo, Egypt, as a toxic chemical for liver poisoning according to **Passmore and Eastwood, (1986)** in the same time, it is mixed with olive oil in equal volumes and used for induction of hepatopathy .

Animals

Twenty five (25) adult male albino rats (Sprague Dawley strain), weighting (160±10g) from Medical Insects Research Institute, Doki, Cairo. Rats were fed on a basal diet for one week to acclimatize at the animal research laboratory, Faculty of Home Economics, Menoufia University, Egypt.

Methods

Plants seeds Preparation

Artichoke and green coffee seeds were prearation powdered by an electric grinder and kept stored at 4°C until used.

Induction of liver intoxication in rats

Twenty adult male albino rats were injured of subcutaneous injection by Carbon tetra Chloride (CCL_4) in olive oil 50% V/V 0.2ml/kg.b.wt twice a week for two weeks to induce chronic damage of the liver according to the method described by **Jayasekhar *et al*., (1997).**

Basal diet

The basal diet prepared according to **AIN (1993)** the following : corn oil (10%), vitamins mixture (1%), Protein (10%), mineral mixture (4%), methionine (0.3%), choline chloride (0.2%), cellulose (5%) and the remained is corn starch(69.5%). The component of vitamin mixture were used that recommended by **Campbell (1963)** but, the salts mixture were recommended by **Hegsted *et al*., (1941).**

Biological experimental design

Experimental Design:

The experiment was done in the Faculty of Home Economics, Menoufia University, Shebin El-kom. Rats were housed in wire cages at room temperature and kept under normal healthy conditions. The study protocol and procedures were approved by the Animals Health Research Institute of Egypt's Guidelines for the Care and Use of Laboratory Animals**.**

Rats were divided into the following groups:

Main group 1: Fed basal diet, as a control negative (5 rats).

The rats in this group fed on a basal diet and tap water.

Main group 2: CCL_4 hepatopathy induced group (20 rats). In this group, rats were injected with Carbon Tetrachloride (0.2 mg\kg body

weight) to induce liver impaiment for two weeks. The group was divided into 4 groups (each 5 rats) for 4 weeks to feed on the diets according to the following:

Group (2): Control positive (untreated group fed on a basal diet)

Group (3): Treated with 7% of artichoke seeds powder replacing equivalent amount from the basal diet.

Group (4): Treated with 7% of green coffee seeds powder replacing equivalent amount from the basal diet.

Group (5): Treated with 7% a mix of artichoke and green coffee seeds powder replacing equivalent amount from the basal diet.

Blood Samples

At the end of the experiment period (4 weeks), the rats were fasted for 12 h, They were anesthetized andblood samples were collected from the portal vein heparinized centrifuge tubes. The plasma was separated by centrifugation at 3000 rpm for 10 min at the room temperature and kept in plastic vials stored at -20°C until they were analyzed. The samples were divided at 5 µm in thickness and stained with hematoxylin and eosin for microscopic examination according to **Bancroft & Stevens, (1990)**

Determination of Liver enzymes:

Serum Alkaline Phosphates (Alp): Determination of according to **Belfield and Goldberg (1971).**

Serum glutamic oxaloacetic transaminases (AST) and glutamic pyruvic transaminase (ALT) were measured according to methods described by **Yound (1975) and Tietz (1976).**

Determination of antioxidant enzymes levels:

Superoxide dismutase (SOD):

Superoxide dismutase (SOD) activity was determined by the method of **Kakkar *et al*., (1984).**

Catalase (CAT):

Catalase was assessed according to the method of **Aebi (1974).**

Glutathione peroxidase (GPx):

Glutathione peroxidase (GPx) was determined by the method of **Ellman (1959).**

Determination of serum Bilirubin:

Serum total bilirubin:

Serum total bilirubin was determined in the serum according to the method described by **Doumas *et al*., (1973).**

Serum direct bilirubin:

Direct bilirubin was determined in the serum according to the method described by **Chary and Sharma (2004).**

Serum indirect bilirubin:

Indirect bilirubin was calculated according to **Chary and Sharma (2004)** equation:

Serum indirect bilirubin (g/dL) = **Total bilirubin** (g/dL) **- direct bilirubin** (g/dL).

Determination of serum total proteins:

Serum total protein:

Total protein was estimated by Biuret reaction in which peptide bonds of protein react with an alkaline copper solution to give a violet coloration as described by **Sonnenwirth and Jaret (1980).**

Serum albumin (Alb):

Albumin was determined according to the method described by **Drupt, (1974)** as modified by, **Spencer and Price (1977)** using Diamond Company Kits.

Serum globulin (Glob):

Globulin was calculated according to **Chary and Sharma (2004)** equation:

Serum globulin (g/dL) = total protein (g/dL) – albumin (g/dL).

Estimation of serum lipid:

Triglycerides was carried out according to **Fossati and Prencipe (1982).** Total cholesterol was determined according to **Allen (1974).**

HDL-cholesterol: Determined by the same method used for total cholesterol, according to **Lopez (1977)**.

VLDL –c and LDL-c were calculated according to the method of **Lee and Nieman (1996)** as follows:

VLDL (mg/dl) = Triglycerdes/5

LDL (mg/dl) = (Total cholesterol – HDL-c) – VLDL-c.

Determination of Renal Functions.

Urea was determinate according to the enzymatic method described by **Patton and Crouch (1977)** Creatinine was determinate according to the kinetic method of **Henry (1974)**, and Uric acid determination was carried out according to the method of **Schultz (1984).**

Statistical analysis

The data were statistically analyzed by one-way analysis of variance "ANOVA" and the results are presented as mean ± SD, accoriding to. **Sendcor and Cocharn , (1979).**

Results

Effect of artichoke, green coffee seeds and their combination on ALT, AST and ALP in rats injected with CCL_4.

Table (1) illustrates the mean value of AST, ALT and ALP. It could be noticed that the ALT of the control negative group was lower than the control positive group. All hepatopathy rats fed on different diets revealed significant decreases in mean values in this parameter, as compared to the control (+) group , group 4 (hepatopathy rats fed on green coffee seeds7%) was recorded the best result. Also, it could be observed that the mean value of the AST of the control (+) was higher than the control (-) group. All treated groups showed significant decreases in AST compared to the positive group The best result AST was recorded for group 4 (hepatopathy rats fed on green coffee seeds 7%). In the same table, it could notice an increase in the ALP level of the positive group ,then a significant decrease occurred in the treated groups compared to the positive group. (hepatopathy rats fed on green coffee seeds 7%) was The best results.

Table (1) Effect of artichoke, green coffee seeds and their combination on ALT, AST and ALP in rats injected with CCL_4

Groups	ALT (U/L) Mean±SD	AST (U/L) Mean±SD	ALP (U/L) Mean±SD
Control -ve (G١)	$57.48^{d} \pm 0.98$	$78.05^{d} \pm 1.85$	$170.33^{d} \pm 13.17$
Control +ve (G2)	$176.72^{a} \pm 1.72$	$243.53^{a} \pm 1.54$	$315.64^{a} \pm 41.59$
Artichoke seeds 7% (G3)	$113.10^{b} \pm 2.09$	$168.93^{b} \pm 2.27$	$271.68^{b} \pm 17.41$
Green coffee seeds 7% (G4)	$68.27^{c} \pm 1.68$	$116.84^{c} \pm 1.68$	$201.5^{c} \pm 2.64$
Mix of artichoke and green coffee seeds 7% (G5)	$110.77^{b} \pm 2.43$	$118.29^{c} \pm 1.90$	$248.15^{b} \pm 2.60$
L.S.D (p≤0.05)	**2.39**	**2.56**	**29.33**

Means in the same column with different litters are significantly ($p \leq 0.05$). different.

Effect of artichoke, green coffee seeds and their combination on SOD, GPx and CAT in rats injected with CCL_4.

Table (2) illustrates the mean value of antioxidant enzymes including SOD, GPx and CAT. It could be noticed that the SOD of the control (-) group was higher than the control (+) group . All hepatopathy rats fed on different diets revealed significant increases in mean values as compared to control (+) group ,the group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results. Also, it could be observed that the mean

value of GPx of the control (+) was lower than the control (-) group, all treated groups showed significant increases in GPx compared to the positive group, and the best GPx was recorded for group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%). In the same table, it could notice a decrease in the CAT level of the positive group, then a significant increase occurred with the treated groups compared to the positive group .The group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results.

Table (2) Effect of artichoke, green coffee seeds and their combination on SOD, GPx and CAT in rats injected with CCL_4

Groups	SOD (U/mg) Mean±SD	GPx (ng/mg) Mean±SD	CAT (ng/mg) Mean±SD
Control –ve (G1)	$201^{a} \pm 2.12$	$250.8^{d} \pm 1.30$	$9.80^{a} \pm 0.21$
Control +ve (G2)	$32^{e} \pm 1.58$	$43.2^{e} \pm 1.32$	$0.52^{e} \pm 0.01$
Artichoke seeds 7% (G3)	$67.8^{d} \pm 2.28$	$95^{d} \pm 1.58$	$1.85^{d} \pm 0.87$
Green coffee seeds 7% (G4)	$117.8^{c} \pm 2.20$	$147.2^{c} \pm 1.64$	$4.60^{c} \pm 0.07$
Mix of artichoke and green coffee seeds 7% (G5)	$157.6^{b} \pm 1.67$	$186.8^{b} \pm 1.92$	$5.88^{b} \pm 0.13$
L.S.D ($p \leq 0.05$)	**2.72**	**2.01**	**0.53**

Means in the same column with different litters are significantly ($p \leq 0.05$). different.

Effect of artichoke, green coffee seeds and their combination on total protein, albumin and globulin in rats injected with CCL_4.

Table (3) results show the mean value of total protein, albumin and globulin . It could be noticed that the total protein of the control (-) group was higher than the control (+) group. All hepatopathy rats fed on different diets revealed significant increases in mean values as compared to the control (+) group ,the group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best serum total protein. Also, it could be observed that the mean value of albumin level of control (+) was lower than the control (-) group all treated groups showed significant increases in albumin compared to the positive group (+). The group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best serum albumin. On the other hand, it could noticed the decrease in the globulin level of the positive group compared to negative control, the group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results.

Table (3) Effect of artichoke, green coffee seeds and their combination on total protein, albumin and globulin in rats injected with CCL_4

Groups	Total protein (g/L) Mean±SD	Albumin (g/dl) Mean±SD	Globulin (g/dl) Mean±SD
Control –ve (G1)	$6.82^{b} \pm 0.015$	$3.05^{d} \pm 0.016$	$3.77^{a} \pm 0.021$
Control +ve (G2)	$5.56^{e} \pm 0.019$	$2.2^{e} \pm 0.019$	$3.36^{c} \pm 0.010$
Artichoke seeds 7% (G3)	$5.80^{d} \pm 0.007$	$3.23^{c} \pm 0.023$	$2.57^{e} \pm 0.020$
Green coffee seeds 7% (G4)	$6.52^{c} \pm 0.018$	$3.45^{b} \pm 0.019$	$3.07^{d} \pm 0.016$
Mix of artichoke and green coffee seeds 7% (G5)	$7.00^{a} \pm 0.049$	$3.48^{a} \pm 0.021$	$3.52^{b} \pm 0.02$
L.S.D (p≤0.05)	**0.03**	**0.03**	**0.27**

Means in the same column with different litters are significantly (p ≤ 0.05). different.

Effect of artichoke, green coffee seeds and their combination on total, direct and indirect bilirubinin in rats injected with CCL_4.

Table (4) results indicated the mean value of total bilirubin, direct bilirubin, and indirect bilirubin. It could be noticed that the total bilirubin of the control (-) group was lower than control (+) group. Hepatopathy rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group. The group3 (hepatopathy rats fed on artichoke seeds 7%) was the best results, the mean value of direct bilirubin in the control postive was

higher than the control negative group, all treated groups showed indicated significant decreases in direct bilirubin compared to the positive group (+), Groups 3 , 4 & 5 indicated non-significant differences between them. The best direct bilirubin was recorded for group 3 (hepatopathy rats fed on artichoke seeds 7%). On the other hand, it could notice the increase in the indirect bilirubin level of the positive group, then significant decreases occurred in the treated groups with the positive group (+). Hepatopathy rats fed on artichoke seeds 7% was recorded the best results.

Table (4): Effect of artichoke, green coffee seeds and their combination on total, direct and indirect bilirubinin in rats injected with CCL_4

Groups	Total bilirubin (mg/dl) Mean±SD	Direct bilirubin (mg/dl) Mean±SD	Indirect bilirubin (mg/dl) Mean±SD
Control –ve (G1)	$0.29^{e} \pm 0.008$	$0.12^{b} \pm 0.019$	$0.17^{e} \pm 0.060$
Control +ve (G2)	$1.03^{a} \pm 0.007$	$0.19^{a} \pm 0.023$	$0.84^{a} \pm 0.021$
Artichoke seeds 7% (G3)	$0.45^{d} \pm 0.011$	$0.12^{b} \pm 0.013$	$0.33^{d} \pm 0.015$
Green coffee seeds 7% (G4)	$0.68^{b} \pm 0.122$	$0.15^{b} \pm 0.020$	$0.53^{b} \pm 0.013$
Mix of artichoke and green coffee seeds 7% (G5)	$0.61^{c} \pm 0.212$	$0.14^{b} \pm 0.013$	$0.47^{c} \pm 0.021$
L.S.D (p≤0.05)	0.03	0.02	0.05

Means in the same column with different litters are significantly ($p \leq 0.05$). different.

Effect of artichoke, green coffee seeds and their combination on lipid profile and atherogenic index in rats injected with CCL_4.

Table (5) results indicated the mean values of serum (T.C), (T.G), (HDL-c), (LDL-c), (VLDL-c) and (AI) . It could be noticed that the serum (T.C) of the control negative group was lower than the control positive group. Hepatopathy rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group, the best was recorded for group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%). Also it could be observed that the mean value of serum (T.G) in the control (+) was higher than the control (-) group all treated groups showed significant decreases of serum (T.G) compared to positive group (+). The best serum of (T.G) was recorded for group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%). On the other hand , it could notice the decrease in the serum (HDL-c) of the positive group (+) ,then more significant decreases occurred for the treated groups compared to the positive group (+). Groups 2&4 indicated non-significant differences between them. The group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results. The mean value of the serum (VLDL-c) the control (-) group was lower than the control (+) group. All hepatopathy rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group, the group 5(hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results. Also the mean value of serum (LDL-c) of the control (+) was higher

than the control (-) group all treated groups showed significant decreases of serum (LDL-c) compared to positive group (+). The group 5(hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best serum of (LDL-c). It could be noticed that serum (AI) mean value of the control (-) group was lower than the control (+) group. All hepatopathy rats fed on different diets revealed significant decreases in mean values as compared to the control (+) group, the group 5(hepatopathy rats fed on mix of artichoke and green coffee seeds 7%) was the best results.

Table (4): Effect of artichoke, green coffee seeds and their combination on lipid profile and atherogenic index in rats injected with CCL_4.

Groups	T.C (mg/dl) Mean±SD	T.G (mg/dl) Mean±SD	HDL-c (mg/dl) Mean±SD	LDL-c (mg/dl) Mean±SD	VLDL-c (mg/dl) Mean±SD	AI (mg/dl) Mean±SD
Control –ve (G1)	$111.65^{e} \pm 2.28$	$162.36^{b} \pm 2.04$	$73.53^{a} \pm 2.96$	$5.6^{e} \pm 4.22$	$32.47^{b} \pm 0.41$	$0.52^{e} \pm 0.07$
Control +ve (G2)	$241.56^{a} \pm 2.21$	$185.37^{a} \pm 1.30$	$48.29^{c} \pm 1.90$	$156.20^{a} \pm 2.54$	$37.07^{a} \pm 0.26$	$4.0^{a} \pm 0.19$
Artichoke seeds 7% (G3)	$183.07^{b} \pm 2.50$	$145.86^{c} \pm 2.15$	$41.99^{d} \pm 2.19$	$111.9^{b} \pm 2.88$	$29.17^{c} \pm 0.43$	$3.3^{b} \pm 0.23$
Green coffee seeds 7% (G4)	$164.2^{c} \pm 1.99$	$139.80^{d} \pm 1.77$	$47.06^{c} \pm 2.48$	$89.1^{c} \pm 3.79$	$27.96^{d} \pm 0.35$	$2.4^{c} \pm 0.21$
Mix of artichoke and green coffee seeds 7% (G5)	$147.79^{d} \pm 1.90$	$124.17^{e} \pm 2.37$	$65.57^{b} \pm 2.05$	$57.39^{d} \pm 3.29$	$24.83^{e} \pm 0.48$	$1.2^{d} \pm 0.08$
L.S.D (p≤0.05)	**2.84**	**1.90**	**3.20**	**4.60**	**0.38**	**0.24**

Means in the same column with different litters are significantly (p ≤ 0.05). Different.

Effect of artichoke, green coffee seeds and their combination on kidney functions in rats injected with CCL_4.

Table (6) results indicated the mean value of creatinine, urea, and uric acid. It could be noticed that the creatinine of the control negative group was lower than the control positive group. Hepatopathy rats fed on different diets revealed significant decreases in values as compared to the control positive group, the group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was the best results. Also it could be observed that the value of the urea of the control positive was higher than the control negative group, all treated groups have significant decreases in urea with the positive group (+ve), Groups 4 & 5 indicated non-significant differences between them. The group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) best serum of urea. On the other hand, it could noticed that an increase in the uric acid level of the positive group (+), then significant decreases occurred for the treated groups compared to the positive group (+). The group 5 (hepatopathy rats fed on a mix of artichoke and green coffee seeds 7%) was recorded the best results.

Table (6): Effect of artichoke, green coffee seeds and their combination on kidney functions in rats injected with CCL_4

Groups	Creatinine (mg/dl) Mean±SD	Urea (mg/dl) Mean±SD	Uric acid (mg/dl) Mean±SD
Control –ve (G1)	$0.59^{d} \pm 0.016$	$29.08^{d} \pm 1.360$	$3.31^{e} \pm 0.232$
Control +ve (G2)	$1.18^{a} \pm 0.015$	$52.16^{a} \pm 0.089$	$11.12^{a} \pm 0.773$
Artichoke seeds 7% (G3)	$0.79^{b} \pm 0.008$	$45.42^{b} \pm 0.746$	$7.90^{b} \pm 0.550$
Green coffee seeds 7% (G4)	$0.69^{c} \pm 0.019$	$38.28^{c} \pm 1.646$	$6.11^{c} \pm 0.239$
Mix of artichoke and green coffee seeds 7% (G5)	$0.56^{e} \pm 0.016$	$37.29^{c} \pm 2.016$	$4.25^{d} \pm 0.485$
L.S.D ($p \leq 0.05$)	**0.02**	**1.99**	**1.13**

Means in the same column with different litters are significantly ($p \leq 0.05$). different.

Discussion

The results showed that acute hepatotoxicity induced by CCl_4 in rats was characterized by decreased high serum levels of liver enzymes (AST, ALT and ALP) which is consistent with the previous study by **Sannia (2010)** who observed that there was a reduction in serum levels of liver enzymes (AST, ALT and ALP) in hepatopathy rats treated with artichoke seeds extracts because of it contained antioxidant and phenolic compounds, also the obtained results of liver function using green coffee seeds group are in agreement with earlier findings by **Qiang *et al*., (2012)**. The obtained result of the

lipid profile of artichoke seeds is in agreement with earlier findings by **Bundy *et al*., (2008) and Qiang *et al*., (2012)** who mentioned that the use of artichoke seeds might be effective for improving the lipid profile. **Qinna *et al*., (2012)** reported that the hypocholesterolemic activity of artichoke seeds extracts was attributed to the inhibition of HMG-CoA reductase (3-hydroxy-3-methyl–glutryl CoA reductase), an enzyme that is responsible for the synthesis of cholesterol in the liver. The present results also showed lowered serum total proteins and elevated total bilirubin in CCl_4 in intoxicated rats, these results were in agreement with the findings by **Heidarian and Rafieian, (2013)**.

Magielse *et al*., (2014) mentioned the increase in the activity of tissue antioxidant enzymes (SOD, GPx and CAT) in the liver of CCl_4 -intoxicated rats because of the protective activity of artichoke could be attributed to its constituents of many bioactive polyphenolic, antioxidant compounds, mainly bioactive polyphenolic antioxidant compounds mainly cynarin, luteolin and chlorogenic acids.

Elbakry *et al*., (2019) reported that there was a significant decrease in liver function of hepatopathic rats which treatment with green coffee seeds because of because of antioxidant activity of its, which could ameliorate the biochemical parameters and restored the damaged hepatopathy tissues to their normal aspect. The green coffee in the current study, significantly increased HDL levels and decreased levels of cholesterol, TG and LDL. This result was in

agreement with that of (**Abdelaal *et al*., 2019)** who stated that consumption of 24 g coffee/day, for1week, reduces serum cholesterol and low-density lipoproteins this is due to a bioactive constituent of green coffee (chlorogenic acid) which could on improve of lipid profile **(Sudeep *et al*., 2016)**.

Erhan *et al* ., (2021) found that the serums of ALT, AST and ALP in serum decreases after using green coffee seeds for hepatopathy rats. **Liang and Kitts (2014)** indicated that green coffee contains antioxidant capacities of chlorogenic acid (CGA), hydrophilic components and hydrophobic components, these components cause increasing HDL-C and reducing LDL-C also, improved levels of SOD, GPx and CAT. **Fardos and Soad (2008)** reported that there was significant decrease in liver function and U.A, Urea and Creatinine levels, these results agree with that of current study.

Histopathological examination of liver:

Histopathological examination confirmed our hypothesis that using seeds could protect liver tissues from any pronounced histopathological changes. Microscopically, the liver of rats from group1 revealed the normal histological structure of the central vein (CV) and hepatic cells (HCs) (Photos 1A and 1B). Meanwhile, liver of rats from group 2 showed diffuse vacuolar degeneration of the hepatic cells mostly hydropic degeneration with scattered necrotic cells, necrotic foci replaced by inflammatory cells and expansion of the portal areas with inflammatory cells, proliferated bile ductules

and congested portal vessels (Photo1C and 1D). **Maha (2014)** reported that there was a necrosis with leukocyte cells infiltration, vacuolar degeneration of the hepatic cell sand severe fatty degeneration and these results agree with the current study. Liver of rat from group3 showing mild vacuolar degeneration, few necrotic cells with general good protection of the hepatic parenchymal cells (Photos 1E and 1F). This result was in agreement with that of **(Abu-Reidah *et al*., 2013)** who showed liver section of a rat fed on artichoke seeds showing almost normal histological structure of hepatic lobule and a few necrotic cells. Liver of rat from group4 showing near to normal appearance of the hepatic parenchymal cells with few vacuolated cells having the appearance of signet ring (Photos 1G and 1H).The liver of rats from group5 showed mild dilatation and congestion of the hepatic sinusoids, mild vacuolar degeneration of the hepatopathic cells with very few necrotic cells (Photos 1I and 1J). **Haddad *et al*., (2021)** reported that there was ameliorated hepatic tissues and few vacuolated cells nearly normal hepatocytes without any congestion these results agree with that of current study.

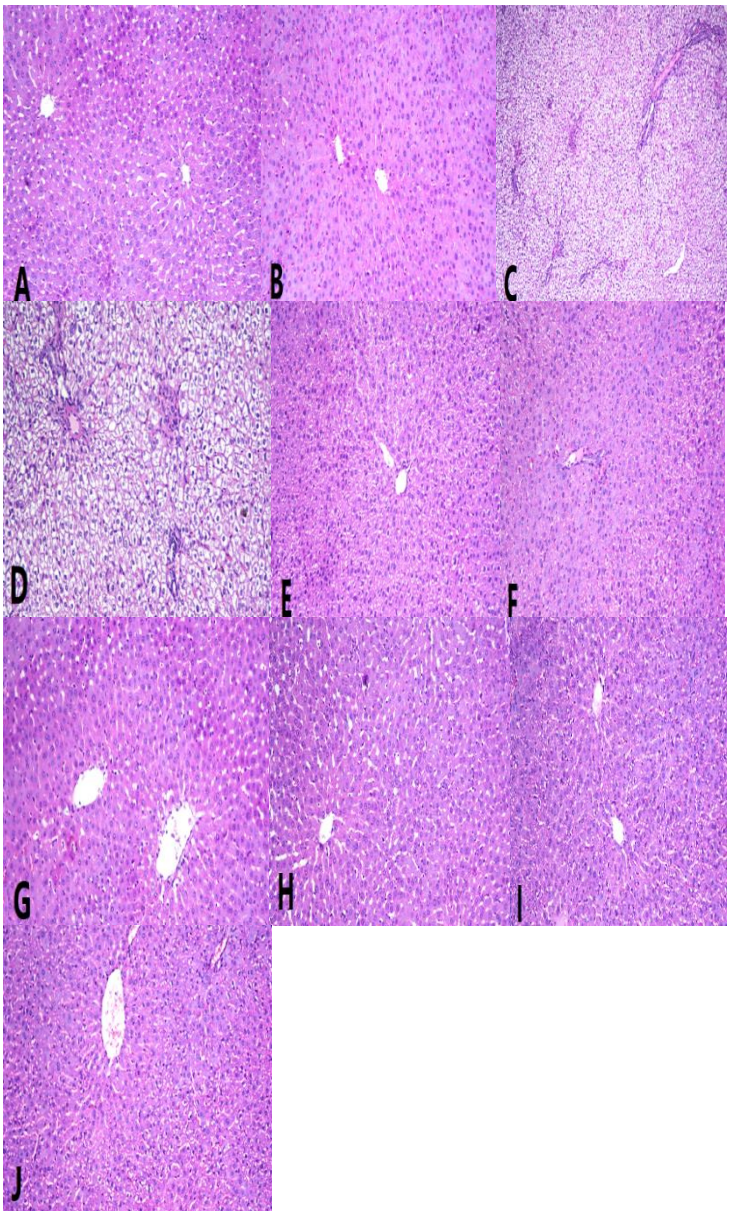

Photo1: The effect of plants seeds which was tested on the changes of histopathological of liver in rats, (a and b) normal (control negative -ve); (c and d) hepatopathy rats group (control positive (+ve); (e

and f) hepatopathy rats fed on diet containing artichoke seeds 7% for 4 weeks; (g and h) hepatopathy rats fed on diet containing green coffee seeds 7% for 4 weeks; (i and j) hepatopathy rats fed on diet containing mix of artichoke and green coffee seeds 7% for 4 weeks (H&E, X200).

Conclusion

In conclusion, it can be said that treatment with the tested plant seeds in the present study didn't cause any changes of histopathological. The results of this study supported that plant seeds which was tested contain many compounds that are able to protect the liver from any pronounced histopathological changes regardless of biochemical changes.

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المجلة العلمية للتربية النوعية والعلوم التطبيقية
The Scientific Journal of Specific Education and Applied Sciences

بذور الخرشوف والقهوة الخضراء للتغلب على أعتلال الكبد الناجم عن رابع كلوريد الكربون فى ذكور الفئران

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الملخص العربي:

هدفت الدراسة الحالية الى التحقق من تأثير الوجبه المدعمة بمسحوق بذور الخرشوف وبذور البن الخضراء على الفئران المصابة بخلل وظائف الكبد بتأثير الحقن برابع كلوريد الكربون وقد أستخدمت خمسه وعشرون من ذكور الفئران البيضاء البالغه التى تزن (160±10) جم (المستخدمة وتم تقسيمها الى مجموعتين رئيسيتن الاولى هى المجموعة الضابطة السالبة (٥ فئران) تغذت على الغذاء الاساسى طوال التجربه والثانية ٢٠ فأر تم حقنهم (0.2) ملل/كجم برابع كلوريد الكربون مرتين أسبوعيا لمدة أسبوعين وأعطيت بذور النباتات المستخدمة بنسبة ٧٪ بذور خرشوف و٧٪ بذور البن الخضراء و٧٪ الخليط بينهم مع الغذاء الاساسى . وتم قياس مستوى انزيمات الكبد (AST, ALT and ALP) وقياس (SOD, GPx and CAT) وقياس مستوى (البروتين الكلى– والالبيومين– الجلوبيولين) و (البيليروبين الكلى– والبيليروبين المباشر – والبيليروبين الغير مباشر) وتم قياس الكوليسترول الكلى والجلسريدات الثلاثية والليبوبروتينات (HDL–c –VLDL–c –LDL– c) وقياس وظائف الكلى (اليوريا– الكرياتينين– حامض اليوريك) وقد أظهرت نتائج كلا من أنزيمات الكبد زيادة معنوية للمجموعة الضابطة الموجبة مقارنة بالمجموعة الضابطة السالبة وكانت ٧٪ من مسحوق بذور البن الاخضر هى أفضل النتائج كما أن نتائج كلا من (البروتين الكلى– الالبيومين– الجلوبيولين) أظهرت ارتفاع معنوى للمجموعة الضابطة السالبة مقارنة بالمجموعة الضابطة الموجبة وكان الخليط من مسحوق بذور الخرشوف والبن الاخضر أفضل النتائج ولكن نتائج وظائف الكلى ومستوى دهون الدم و (البيليروبن الكلى –البيليروبن المباشر– البيليروبن الغير مباشر) سجلت المجموعة الضابطة الموجبة

أرتفاع معنوى مقارنة بالمجموعة الضابطة السالبة وكان ٧٪ خليط من مسحوق بذور الخرشوف والقهوة الخضراء أفضل النتائج لدهون الدم ولوظائف الكلى بينما ٧٪ مسحوق بذور الخرشوف كانت أفضل النتائج (البيليروبن الكلى- البيليروبن المباشر- البيليروبن الغير مباشر) وسجلت المجموعة الضابطة الموجبة أنخفاض معنوى مقارنة بالمجموعة الضابطة السالبة وكانت ٧٪ خليط من مسحوق بذور الخرشوف والقهوه الخضراء أفضل وقد أظهرت هذه الدراسة أن تناول بذور الخرشوف والقهوة الخضراء يحسن من وظائف الكبد ووظائف الكلى ودهون الدم .

التوصية:

وفقا لنتائج هذه الدراسة التي أظهرت أهمية كل من الخرشوف ومسحوق بذور البن الأخضر في تحسين وظائف الكبد والكلى ودهون الدم لاحتوائهما على مضادات الأكسدة والمركبات الفينولية لذلك نوصى بأستخدامهم كمشروبات لتحسين أعتلال الكبد كما أوصت الدراسة الحالية بدراسة تأثير مسحوق بذور الخرشوف والقهوة الخضراء على أمراض أخرى مثل أمراض القلب والسمنة والسكري والسرطان.

الكلمات المفتاحية: (بذورالخرشوف- بذور البن الخضراء- الفئران أعتلال الكبد- رابع كلوريد الكربون).