

Study of the effect of aqueous extract of ginger and milk thistle on kidney function and some biochemical variables in the serum of adult rats treated with acetaminophen

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Abstract

The effect of aqueous extract of ginger and milk thistle on kidney function and some biochemical variables in the serum of adult rats treated with acetaminophen was studied by measuring the levels of kidney function and fats in the blood serum of (18) rats whose ages ranged from (2-4) months. The study was conducted for the period from the beginning of 15 / March until May 22, 2024, at Tikrit University / College of Agriculture. The animals were divided into six groups, the first group was control the second one treated with acetaminophen, the fourth others treated with ginger and milk thistle aqueous extract. The results showed the following:

The results showed a significant increase in the level of liver function (urea and creatinine) in all groups compared to the control group after a month of dosing. It also showed a significant increase in the level of lipid profile in all groups compared to the control group.

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Keywords: ginger, milk thistle, acetaminophen, Lipid profile, kidney function.

1. Introduction

Man relied on plants for his basic and simple requirements, as he used them for food and medicine. Plants were the basis of traditional systems of medicine dating back thousands of years, as the first records written on clay tablets in cuneiform in Mesopotamia date back to 2600 years BC, as The ancient Egyptians used Ammi majus plants and herbs to treat many diseases, which are still in use to this day in treating coughs, colds, parasitic infections and skin diseases [1].

Plants produce many biologically active chemical compounds, and some of these substances enhance their survival. Some plants produce chemicals that act as herbicides to prevent the growth of competing plants, such as salicylic acid, which is produced by the willow plant. Other plants produce substances

that prevent them from being eaten by insects and animals. and other materials [2].

Ginger consists of carbohydrates exceeding 70%, fibre, fat, protein, ash, many minerals, and various vitamins [3]. One of the most important components of ginger root is that it contains a variety of volatile and non-volatile compounds in different concentrations depending on the conditions of cultivation, harvesting, and processing [4]. The health benefits of ginger are mainly attributed to its biologically active phenolic compounds, such as gingerol, paradol, and shogaol. When ginger is dried, gingerol turns into shogaol, which gives the ginger a more pungent flavor and is less palatable, although it is more effective medicinally, compared to ginger being exposed to cooking, as gingerol turns

into zingerone and has a more flavor. It is sweeter and more palatable, but its effectiveness is reduced. One of the reasons for the antioxidant effectiveness of ginger is that it contains several vitamins that have antioxidant effects, especially vitamin C (ascorbic acid), which decomposes when heated or during prolonged storage or exposure to light [5].

Thorns milk is characterized by the container of SIIYMARIN, which represents complex Venetic compounds, which are the most used compounds in traditional medicine. It also contains alkaline, soaps, mucous materials, volatile oils, fats, sugars and different flavonoids and CAK fetamins and contains once materials, resins, tannins [6].

Ginger has a protective effect on the kidneys, as a study by Payami et al [7] .showed that when ginger was given to diabetic mice, it reduced the activation of nuclear factor kappa light chain enhancer of activated B cells (NF-kB), which actually led to improving the histological structure of the kidneys of the affected mice. With sugar, which was treated with the extract. The increase in leptin, creatinine and TNF- α in obese mice was also significantly reduced by ginger extracts. The antioxidant status of the mice was also improved along with the renal tissue. The authors concluded that ginger extract could attenuate kidney damage caused by a high-fat diet Bin-Meferij et al [8] .In another study, cadmium-induced nephrotoxicity studied by Akinyem et al [9] was abolished by ginger essential oil (which prevented changes in levels of cytokines, urease and creatinine) in rats. Therefore, the current research aimed to study the effect of aqueous extract of ginger and milk thistle on kidney function and some biochemical

variables in the serum of adult rats treated with acetaminophen.

2. Materials and Methods

2.1 Animals used in the study

The exact dose was given to 18 adult rats, their weights ranged from (0.5) kg, and their ages were (2-4) months. The study was conducted for the period from the beginning of March 15 to May 22, 2024, at the Tikrit university College of Agriculture. The animals were placed in The animal house was placed in iron cages covered with metal covers, with a floor covered with sawdust, and the cleanliness of the cages was taken into account by replacing the sawdust two to three times a week and sterilizing the cages with disinfectants, and the animals were fed daily and regularly with ready-made feed and water.

2.2.1 Experiment design

The animals were randomly divided into (6) groups with (3) rats for each group, which were dosed orally with (1 cm³) daily, and then dosed with aqueous extract of ginger and milk thistle, according to the following groups:

□ Positive control group C: was dosed orally with plain water.

□ P negative control group: It was dosed orally with acetaminophen at a dose of 200 mg/kg.

Group1 G1: treated with aqueous extract of milk thistle at a concentration of 200 mg/kg body weight.

Group 2 G2: Treatment using aqueous extract of milk thistle at a concentration of 400 mg/kg body weight.

Group 3 G3: Treatment with aqueous extract of ginger at a concentration of 200 mg/kg body weight.

Group 4 G4: Treatment using aqueous extract of ginger at a concentration of 400 mg/kg body weight.

2.2.2 Collect blood samples

After a month of dosing, the animals were starved for (12) hours, and (4) cm³ of blood was drawn. After that, the blood was emptied into clean, dry plastic tubes (one-time use) free of anticoagulants. The blood was separated using a centrifuge at 2500 speed. cycle/minute for 10 minutes, and the blood serum was obtained and stored at -20°C after dividing it into three parts in small Eppendorf tubes until special biochemical tests were performed for liver enzymes, glucose, and total protein.

2.2.2.1 Estimating kidney function levels in blood serum

The Berthelot reaction method was used to measure the concentration of urea and creatinine in the blood using an analysis kit (kits), as stated in [10].

2.2.2.2 Estimation of lipid levels in blood serum

The enzymatic colorimetric test methods described in the kit were used to estimate the levels of cholesterol and triglycerides, as stated in [10].

3. Results and Discussion

The results of the current study showed a significant increase in the urea level and no significant differences in the creatine level in the group treated with paracetamol compared to the untreated group. The results agreed with what was indicated by (Salah) [12] which found an increase in the levels of urea in rats treated with paracetamol, and they do not agree with it in terms of the level of creatinine, as an increase was found in its levels. Another study found that the increase in the levels of urea and creatinine when the rats were exposed to (120 or 240 µL acetaminophen/kg by weight) is caused by the increase in kidney damage caused by acetaminophen through

high urea levels, which explains the association with nephrotoxicity with oxidative stress (Sharoud) [13]. It is also clear from the results that the level of urea decreased significantly in the blood serums of the groups treated with ginger. The results agree with Baiomy et al [14]. in a study of ginger and the extent of its protective effect. The results also agreed with Li et al [15], who indicated the role of flavonoids in lowering the level of urea. Urea when treated with it. The decrease in urea levels may be due to the fact that ginger is rich in antioxidant compounds such as flavonoids, glycosides, and vitamins, as they work to reduce or scavenge free radicals and prevent oxidation of proteins and amino acids.

Thus, it reduces the level of urea in the blood. The reason may be due to the role of ginger in protecting the kidneys through its antioxidant activity and its ability to eliminate free radicals and thus improve the performance of the kidneys [16], as some active compounds such as flavonoids in ginger interfere with toxins. Which works to inhibit the absorption of urea by the nephron [17], and thus the excretion of urea and creatine through the kidney. Ginger also works to maintain the concentration of antioxidants and antioxidant enzymes [18]. It also has a role in reducing cases of oxidative stress by preventing oxidation and damage to proteins and amino acids, or the reason may be due to the ability of phenolic compounds to reduce oxidative damage in renal cells and glomeruli because they are a reducing agent and donor of hydrogen and quench the single oxygen radical [19]. On the other hand, the results of the current study found a decrease in the level of kidney function in the groups treated with milk thistle, as the results agreed with the results of (Mohammadi) [20]. The reason for

the decrease is due to the aqueous extract of milk thistle, which in turn carries out the process of reducing protein. In diuresis and reduces damage to renal tissue [21].

The results of the current study indicated higher levels of lipids in the group treated with acetaminophen (paracetamol) compared to the untreated group. An increase in the level of cholesterol and triglycerides was found in the rats treated with acetaminophen. It can be concluded that acetaminophen may lead to poisoning and thus hyperlipidemia, as it reflects This is the weakness of liver cells to metabolize fats (Sharoud) [13].

On the other hand, the results of the current study indicated a decrease in fat levels in the groups treated with ginger extract, as the results [22]. indicated a decrease in the levels of cholesterol, triglycerides, and very low-density lipoprotein as a result of treatment with ginger, with no significant differences in the level of low-density lipoprotein. and high high-density lipoprotein. However, a study [23]. indicated that rabbits with high fat levels and treated with ginger showed a decrease in fat levels as a result of treatment with ginger, and these results agreed with the results obtained in this study.

On the other hand, the results of the current study found an increase in the level of fats in the groups treated with milk thistle, as the results of the current study agreed with the results of both (Mohammadi) [20]. The reason for the increase is due to the fact that the aqueous extract of milk thistle significantly reduces Absorption of cholesterol, thus lowering cholesterol and low-density lipoprotein (LDL) levels and significantly increasing high-density lipoprotein (HDL)

cholesterol in the blood, Also, the compound silymarin, at higher concentrations of 200 $\mu\text{mol/ml}$ (micromol per milliliter), has toxic effects, reduces cell vitality, and increases the release of malondialdehyde, which is an indicator of oxidative stress [24]. Gossypol poisoning also causes fatty liver disease. Milk thistle has no effect on reducing clinical effects [25].

Milk thistle is considered lipophilic and binds tightly to plasma membrane compounds, thus increasing the strength of the plasma membrane and preventing membranes from breaking and disintegrating. In addition, clinical studies indicate that milk thistle can be used as a cholesterol-lowering agent in patients who suffer from high blood cholesterol. It has inhibitory properties against inappropriate fats in the blood [26].

Figure (1) shows that the average \pm standard deviation of the urea level in the positive control group was (41.714 ± 1.132) mg/dl while the negative control group was (44.539 ± 5.236) mg/dl, as for groups G1, G2 and those treated with the aqueous extract. For milk thistle, it was (44.397 ± 3.234) and (40.960 ± 4.051) mg/dl, respectively. As for groups G3, G4 and those treated with aqueous extract of ginger, it was (40.678 ± 0.509) and (41.620 ± 6.205) mg/dl, respectively.

The results of the current study showed a significant increase in the level of urea in the blood serum of the negative control group treated with acetaminophen compared to the untreated positive control group, while the results showed a significant decrease in the level of urea in the blood serum of groups G2, G3, and G4 compared to the negative and positive control group in the shape.

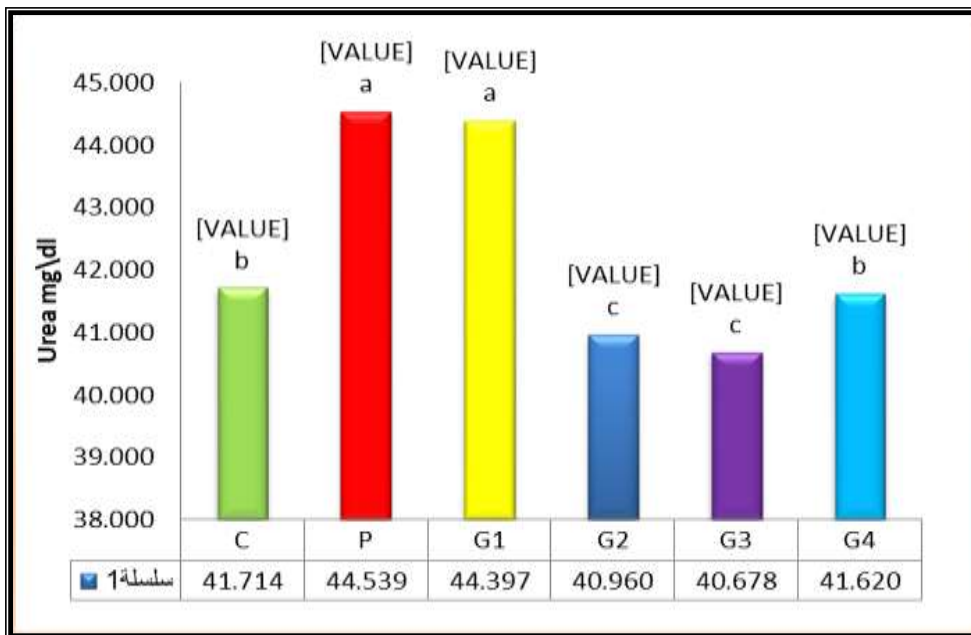


Figure (1): Effect of acetaminophen and aqueous extract of milk thistle and ginger on urea level.

Figure (2) shows that the average \pm standard deviation of the creatine level in the positive control group was (0.717 ± 0.092) mg/dL, while the negative control group was (0.783 ± 0.061) IU/L, as for groups G1, G2 and those treated with the extract. The aqueous levels of milk thistle were (0.449 ± 0.205) and (0.681 ± 0.090) mg/dl, respectively. As for the groups G3, G4 and those treated with the aqueous extract of ginger, they were (0.754 ± 0.132) and (0.761 ± 0.030) mg/dl, respectively.

.1 The results of the current study showed that there were no significant differences in the level of creatine in the blood serum of the negative and positive control groups, with a significant decrease in the level of creatine in the blood serum of the G1 group compared to the negative and positive control groups, and the absence of significant differences in all concentrations and factors studied

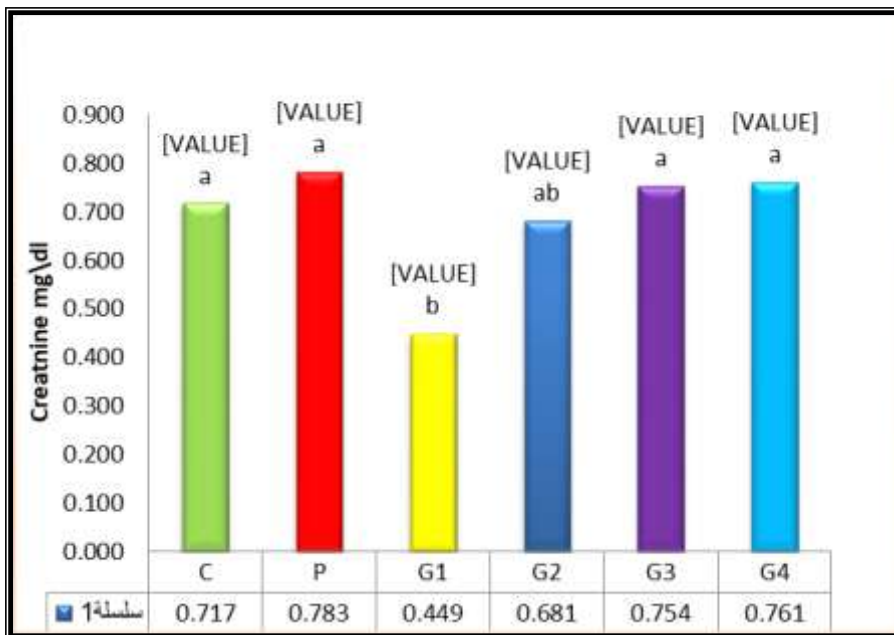


Figure (2): The effect of acetaminophen and aqueous extract of milk thistle and ginger on creatine levels.

Figure (3) shows the effect of acetaminophen and the aqueous extract of milk thistle and ginger on the cholesterol level in blood serum. It was found that the mean \pm standard deviation of the cholesterol level in the positive control group was (109.126 ± 4.799) mg/dL while the negative control group was (109.126 ± 4.799) mg/dL. 126.993 ± 4.65 mg/dl, while groups G1, G2, treated with aqueous extract of milk thistle were (100.096 ± 1.450) and (112.392 ± 8.151) mg/dl, respectively. As for groups G3, G4, treated with aqueous extract of ginger, it was (125.072) .

± 0.815), (124.419 ± 0.107) mg/dL respectively, From the results of this study, it was shown that there was a significant increase in the level of cholesterol in the blood serum of the negative control group treated with acetaminophen compared to the positive control group that was not treated, while the results showed a significant decrease in the level of cholesterol in the blood serum of group G1 compared to the negative control group, with significant differences. In the cholesterol level of groups G3 and G4 compared with the positive control group

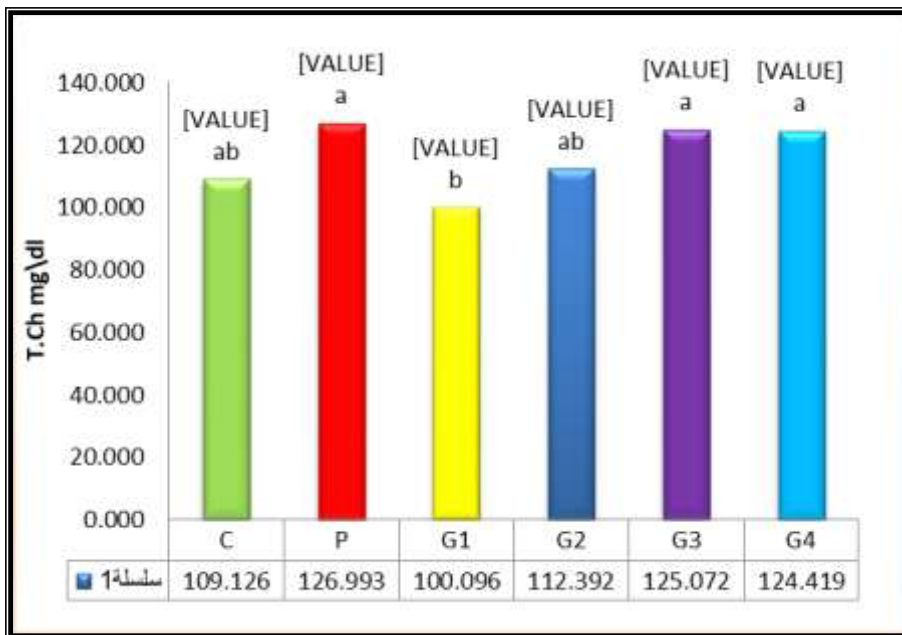


Figure (3): The effect of acetaminophen and aqueous extract of milk thistle and ginger on the level of cholesterol in blood serum.

It can be seen from Figure (4) that the mean \pm standard deviation of the triglyceride level in the positive control group was (120.031 ± 4.72) mg/dL while the negative control group was (157.277 ± 17.92) mg/dL, as for the G1, G2 and treatment groups. With the aqueous extract of milk thistle, it was (146.948 ± 9.701) , (126.761 ± 26.55) mg/dl, respectively. As for groups G3, G4 and the treatment with the aqueous extract of ginger, it was (125.587 ± 7.635) , (136.854 ± 0.995) mg/dl, respectively.

The results of the current study showed a significant increase in the level of triglycerides in the blood serum of the negative control group treated with acetaminophen compared to the untreated positive control group, while the results showed a significant decrease in the level of triglycerides in the blood serum of the first group, G2, G3, and G4, compared to the control group. Negative, with no significant differences in the level of triglycerides for group G1 compared to the negative control group.

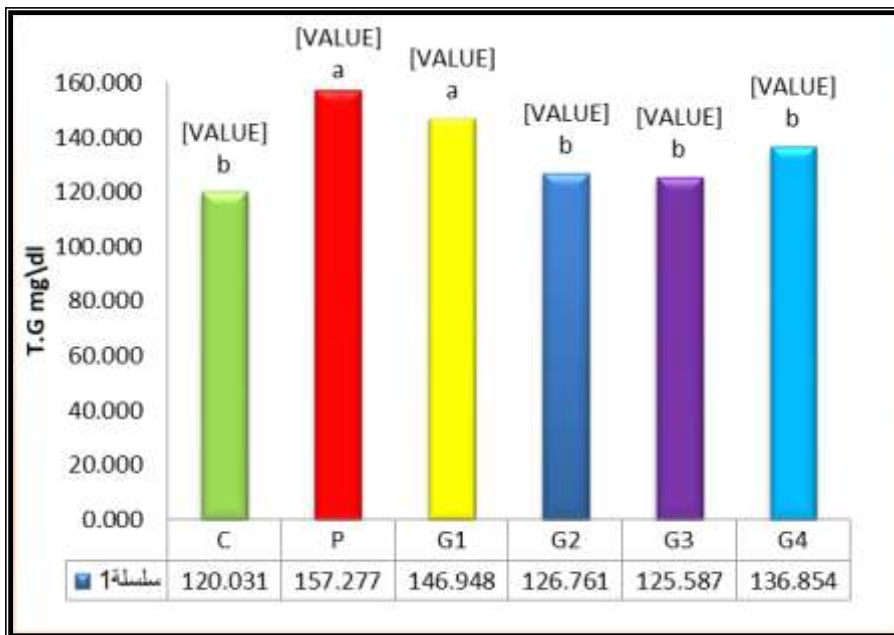


Figure (4): The effect of acetaminophen and aqueous extract of milk thistle and ginger on the level of triglycerides in blood serum.

Figure (5) shows that the mean \pm standard deviation of high-density lipoprotein level in the positive control group was (72.626 ± 1.642) mg/dL while the negative control group was (65.004 ± 10.248) mg/dL, as for groups G1 and G2. The treatment with the aqueous extract of milk thistle was (64.988 ± 9.767) , (83.744 ± 1.364) mg/dl, respectively. As for the groups G3, G4 and the treatment with the aqueous extract of ginger, it was (98.955 ± 0.556) , (94.037 ± 1.310) mg/dl, respectively.

The results of the current study showed that there were no significant differences in the level of high-density lipoprotein in the blood serum of the negative control group treated with acetaminophen compared to the positive, untreated control group, while the results showed a significant increase in the level of high-density lipoprotein in the blood serum of groups G3 and G4. Compared to the negative and positive control group, with no significant differences in high-density lipoprotein for the G1 group compared to the negative and positive control group.

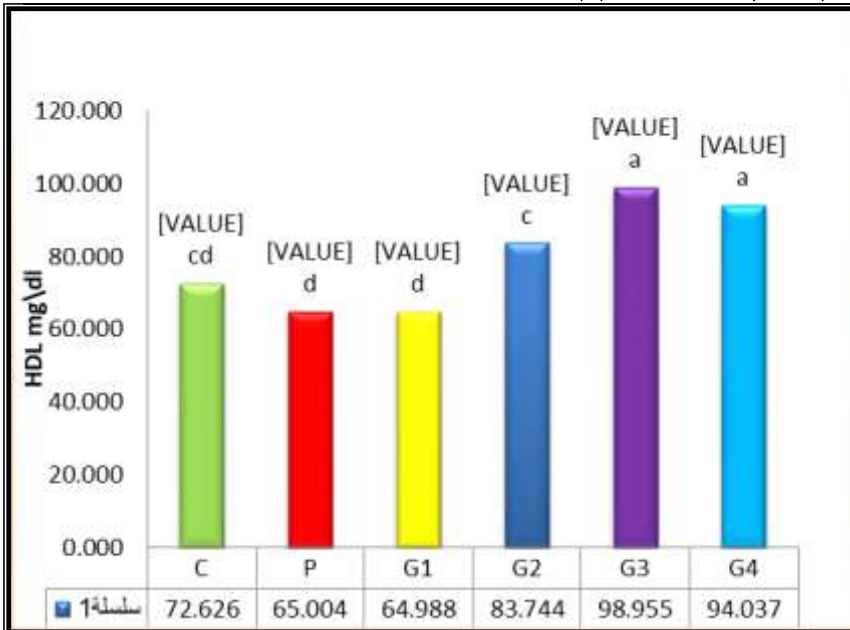


Figure (5): The effect of acetaminophen and aqueous extract of milk thistle and ginger on the level of high-density lipoprotein in blood serum.

Figure (6) shows that the mean \pm standard deviation of low-density lipoprotein level in the positive control group was (14.675 ± 2.197) mg/dL while the negative control group was (36.590 ± 6.521) mg/dL, as for groups G1 and G2. The treatment with the aqueous extract of milk thistle was (15.089 ± 5.607) , (4.402 ± 1.515) mg/dl, respectively. As for the groups G3, G4 and the treatment with the aqueous extract of ginger, it was

(1.103 ± 0.096) , (3.716 ± 1.264) mg/dl, respectively.

The results of the current study showed an increase in the level of low-density lipoprotein in the blood serum of the group treated with acetaminophen compared to the untreated group, with a significant decrease in the groups treated with extracts compared to the group treated with acetaminophen, as in Figure (6).

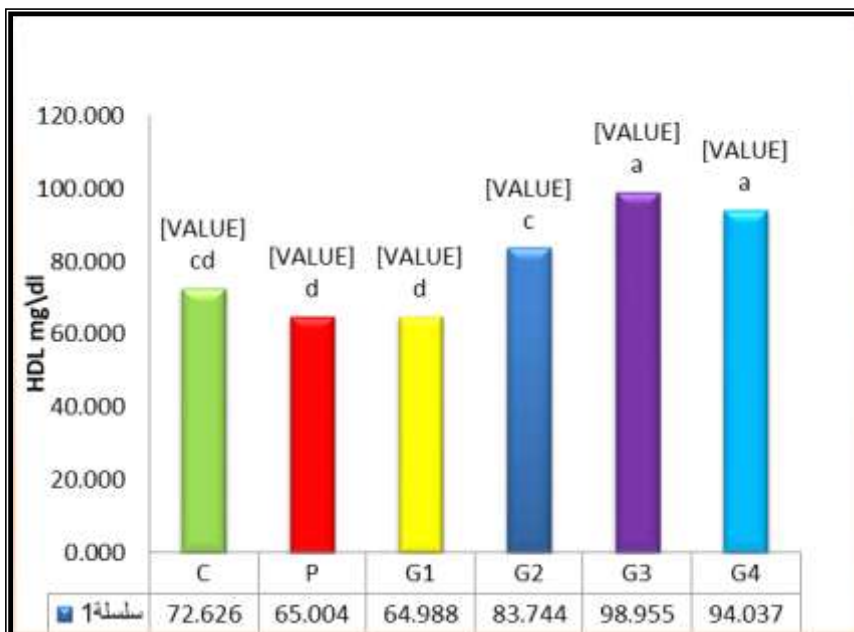


Figure (6): The effect of acetaminophen and aqueous extract of milk thistle and ginger on the level of low-density lipoprotein in blood serum.

Figure (7) shows that the mean \pm standard deviation of very low-density lipoprotein level in the positive control group was (21.825 \pm 0.960) mg/dL while the negative control group was (25.399 \pm 0.932) mg/dL. As for groups G1, G2 and treated with aqueous extract of milk thistle were (20.019 \pm 0.290), (24.246 \pm 3.271) mg/dL, respectively. As for groups G3, G4 and treated with aqueous extract of ginger, they were (25.014 \pm 0.263), (26.667 \pm 3.061) mg/dL respectively. Consecutive.

The results of the current study showed a significant increase in the level of very low-

density lipoprotein in the blood serum of the negative control group compared to the untreated positive control group, while the results showed a decrease in the level of VLDL in the blood serum of the G1 group compared to the negative control group, with no significant difference. With the positive control group, while the results showed an increase in the level of VLDL in the blood serum of groups G3 and G4 compared to the positive control group, with no significant difference with the negative control group, as in Figure (7).

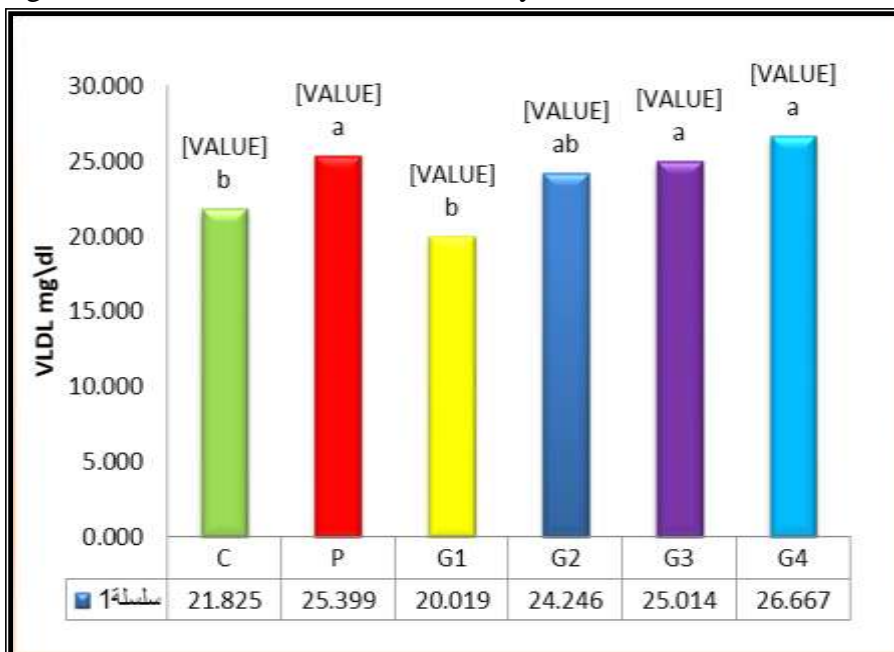


Figure (7): The effect of acetaminophen and aqueous extract of milk thistle and ginger on the level of very low-density lipoprotein in blood serum.

C: positive control treatment.

P: negative control treatment treated with acetaminophen at a dose of 200 mg/kg.

G1: treated with aqueous extract of milk thistle at a concentration of 200 mg/kg body weight.

G2: treated with aqueous extract of milk thistle at a concentration of 400 mg/kg body weight.

G3: Treatment using aqueous extract of ginger at a concentration of 200 mg/kg body weight.

G4: treated with aqueous extract of ginger at a concentration of 400 mg/kg body weight.

Conclusion

The use of aqueous extracts of ginger and milk thistle at concentrations of 200 mg/kg of body weight and 400 mg/kg caused a reduction in the level of blood fats in addition to a decrease

in kidney function, which indicates the effective role of the active compounds in these two extracts in maintaining kidney function

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