Effect of Caper Root Extract on Rats Suffering from Fatty Liver

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المجلة العلمية المحكمة لدراسات وبحوث التربية النوعية

المجلد العاشر– العدد الأول– مسلسل العدد (٢٣) – يناير ٢٠٢٤م

رقم الإيداع بدار الكتب ٢٤٢٧٤ لسنة ٢٠١٦

ISSN-Print: 2356-8690 ISSN-Online: 2974-4423

موقع المجلة عبر بنك المعرفة المصري https://jsezu.journals.ekb.eg

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تاريخ رفع البحث: ٢-١١-٢٠٢٣م تاريخ تحكيم البحث: ١٩-١١-٢٠٢٣م
تاريخ مراجعة البحث: ٢٣-١١-٢٠٢٣م تاريخ نشر البحث: ٧-١-٢٠٢٤م

Abstract

The purpose of this study was to examine how caper root affected fatty liver in rats. There were 36 male albino rats utilized in this work, and each one weighed 150 ± 5 g. The first group (n = 6) consumed the control diet (-ve). The second set of animals (n = 6) were given a high-fat diet along with fructose to cause fatty liver. Fructose (10, 15, 20 %) from caper root was added to the high-fat diets of groups (3-6). Weight gain, food intake, and the feed effectiveness ratio were all improved across the board for the fatty liver groups that were given 10%, 15%, 20% caper root Extract. Animals given the high-fat diets and the caper root treatments had significantly lower body weights than those given the positive-control diets ($P \leq 0.05$). Statistical analysis, however, showed that the 20% caper root rat group was not substantially distinct from the control group ($P \geq 0.05$). The data revealed, in comparison to the positive control group, that the treated groups' levels of AST, ALT, ALP enzymes, creatinine, blood urea, and uric acid were significantly lower. When compared to the control (+ve) group, the findings indicated that high-fat diet rat groups given Caper at concentrations of 10, 15, 20% caused significant reductions ($P \leq 0.05$) in the values of serum total cholesterol, TG, LDL-cholesterol, VLDL, and HDL-cholesterol while showing a mostly significant increase ($P \leq 0.05$) in the values of serum HDL-cholesterol. Malondialdehyde was reduced and serum glutathione levels were increased due to caper. Because of its ability to reduce cholesterol and improve liver and kidney function. The study concluded that caper root should be incorporated into diets to combat hypercholesterolemia.

Key words: Fatty liver- caper – Liver function-Kidney function.

Introduction

Winter-deciduous perennial shrub Capparis spinosa (caper) is a dependable floristic component of Mediterranean ecosystems, blooming continuously during the long summer drought from May to October. Capers, a plant of significant utility and aesthetic appeal, belongs to the Capparidaceae botanical family, are now widely cultivated and can be found growing wild throughout the Mediterranean (for example, in France, Spain, Italy, and Algeria); additionally, the plant is cultivated in a

number of Mediterranean countries (Iran, Cyprus, and Greece), but it is thought to have originated in the arid regions of Western or Central Asi. **(Aghel *et al*.,2007).** The immature flower buds of the caper plant are used in cooking and are known as capers. Capers can be pickled in vinegar or preserved in granulated salt. The caper plant is widely recognized for its gastronomic use. In order to impart a pungent and spicy flavor as well as a scent to food, they've always been a staple ingredient in many different kinds of salads, pasta, meat, sauces, and garnishes. Before it was used in cooking, capers were utilized in a variety of other contexts. In 2000 BC, the Sumerians were the first people to exploit the caper bush for its medical properties. Capers have been and possibly still are used for treating rheumatism, anemia, and gout, as well as reducing flatulence. Diuretics, kidney disinfectants, and aids to liver function are further medical use. **(Ozcan, 2005).**

C. sepiaria is a 3–4 m tall, thorny, woody climber with many thorny branches. It grows in the dry regions of India, such as the Deccan Peninsula and the Andaman Islands. C. sepiaria has many Ayurvedic applications, including as a blood purifier, a stomachic, a tonic, and an appetizer. It is also used to treat inflammation, wound healing, muscle ailments, and fever. The ground-up roots of this plant are used to treat skin problems and poisonous snake bites. **(Kirtikar and Basu, 1993; Mohammad *et al*., 2000).**

Numerous toxicants target the liver because of its central role in metabolism **(Meyer and Kulkarni, 2001).** Lipid peroxidation, reduced activities of antioxidant enzymes, and free radical production are the primary causes of carbon tetrachloride (CC_{l4})-induced liver injury **(Castro *et al*., 1974; Poli, 1993**). Centrilobular necrosis and cellular enzyme leakage defined the resultant liver damage. **(Muriel *et al*., 2001).**

There are several different types of liver injury that fall under the umbrella term "fatty liver disease," including simple steatosis, steatohepatitis, advanced fibrosis, and cirrhosis **(Angulo, 2002; Esposito *et al*., 2009).** The effectiveness of drugs intended to slow the development of NAFLD was mixed. 4-9 Research into new pharmacological and/or supplementary foods for slowing the course of NAFLD is warranted due to the ineffectiveness of lifestyle adjustments and medications. Plants and/or functional foods are increasingly employed for disease prevention and treatment because of their availability and, in certain cases, lack of side effects. **(Shidfar *et al*., 2015).**

The use of herbal medicines for the prevention and control of chronic liver diseases is currently receiving a lot of attention from medical professionals, pharmaceutical companies, and patients. Some of the reasons for this shift toward the use of herbals include the high cost of

conventional drugs, adverse drug reactions, and the ineffectiveness of conventional drugs.

Fibroblast growth factor 21 (FGF21) has been found to play a crucial role in the development of NAFLD, according to recent research (Liu *et al*., 2015). Hepatocytes are responsible for the production of FGF21, a major metabolic regulator that directly regulates lipid metabolism and accumulation in the liver. **(Su *et al*., 2019).** FGF21 improves insulin sensitivity and fatty acid consumption while decreasing endogenous synthesis of glucose, fat, and low-density lipoprotein (LDL) (Jeon *et al*., 2016). FGF21 has been found to have beneficial effects in the etiology of NAFLD, specifically through ameliorating hepatic steatosis and inflammation and lowering insulin resistance. **(Asrih, and Jornayvaz , 2015).**

Materials and Methods

Materials:

The caper root powder was sourced from the Agriculture Research Center in Egypt and then processed. (National Research Center, Giza, Egypt)

Rats:

Sprague-Dawley adult male albino rats (n = 36) weighing 150 ± 5g were acquired from Helwan Farm of Experimental Animals in Helwan, Egypt. VACSERA (Dokki, Egypt) was the source of the cholesterol.

Chemicals:

The Elgomhoria Company, located in Egypt, provided casein, vitamins, minerals, and cellulose for the study. The kits were procured from Gama Trade Company, located in Dokki, Egypt.

Methods:

Plant extract:

The Soxhlet procedure was used to make the ethanolic extract. For 5 hours, 200 grams of finely powdered plant bark were subjected to an ethanolic extraction (80% v/v in water). Following filtration through filter paper, the ethanolic extract was evaporated at temperatures below 50 °C under vacum. The ethanolic extract of Caper root , after evaporation and solvent removal, yielded 7.35 percent w/w and was kept in the fridge until further usage.

Determination of Nutritive Value:

Various techniques from **AOAC (2010)** were used to establish the approximate composition of caper powder.

Biological Experiment:

The high-fat emulsion (HF) used in this study was composed of specific quantities of various ingredients, as outlined in the methods described by **Zou *et al*. (2006) and Rasoul *et al*. (2020).** The

composition of the HF included 400.0 one digit in all text in all running text of corn oil, 150 g of saccharose, 80 g of milk powder, 100 g of cholesterol, 10 g of sodium deoxycholate, 36.4 g of Tween-80, 31.1 g of propylene glycol, 2.5 g of a vitamin mixture, 10 g of cooking salt, 1.5 g of a mineral mixture, and 300 mL of distilled water. Before the HF model was developed, the rats were housed in a controlled environment for 7 days to acclimate them to their new home. Next, we randomly assigned the rats to either the normal control (NC, n = 6) or high-fat model (HF, n = 30) groups. Daily gavage administration of high-fat emulsion (10 mL/kg) was used for the HF group. All of the rats in the study had unrestricted access to water and their regular diet. Six weeks later, the rats in the HF group were divided into two subgroups: those who continued to receive high-fat emulsion and those that received high-fat emulsion plus CS extract at a dose of 20 mg/kg via gavage daily.

In Closing, thirty-six rats were kept in clean circumstances and provided a baseline diet **(Reeves *et al*., 1993)** for a week so that they could adjust. The rats were then randomly split into six groups after a week. Six individuals made up the first group, which received the control diet (-ve).A high-fat diet combined with fructose was used to promote fatty liver in the second group (n = 6). Groupd from third to the sixth , respectively, were given a high-fat diet with fructose supplements of 10%, 15%, and 20% caper root extract.

The collection of blood samples:

After eight weeks on the feeding trial, the animals spent the night fasting while under little ether anesthesia. We used dry, sterile centrifuge tubes for the blood collection. After centrifuging the blood samples, the resulting sera were placed in a sterilized, well-stopped container and frozen at -20 degrees Celsius for further analysis.

Feeding and growth parameters:

Based on the methodology established by **Chapman *et al*. (1959),** Through these methods, we assessed nutrient intake (NI), feed efficiency ratio (FER), body weight growth percentage (BWG%), and organs' relative weights.

Biochemical analysis:

The levels of alanine and aspartate aminotransferases were calculated using the methods described by **(Thomas, 1998).** Alkaline phosphatase (ALP) levels in the blood were measured as described by **(Roy, 1970). Henry (1974)** described the procedure used to measure serum creatinine (Cr). **Fossati *et al*., (1980)** provided the methodology used to measure serum urea levels. Both malondialdehyde (MDA) and glutathione levels in the blood were tested using established protocols (**Sinha, 1972; Draper & Hadly, 1990). Meiattini (1978), Fossati and**

Praneipe (1982), and Young (2001) were used to calculate total cholesterol (TC), triglycerides (TG), and high-density lipoprotein (HDL). VLDL-c and LDL-c were calculated as described by **Friadwald *et al.*, (1972)** equations:

VLDL-c (mg/dl) = (Triglycerides /5)

LDL-c (mg/dl) =TC-(HDL-c+VLDL-c).

Statistical analysis:

The SPSS application was used to examine the data. To determine whether there were statistically noteworthy variations among the groups, an ANOVA was performed. **(SPSS, 1986).**

Results and Discussion

Table (1): Caper chemical composition (100g).

Nutrients (100 g)		%
Nutrients	Energy	20 Kca
	Fats	0.8
	Carbohydrate	7
	Fiber	5.4
	Moisture	12
	Proteins	3.2
	Vitamin C	6

Capers have 3.2% protein, 7.0% carbohydrates, 0.8% fat, 5.4% fiber, and 6% vitamin C, as indicated in Table (1). Capers have been found to be high in vitamin and fiber content while having low fat and calorie profiles (Tlili *et al.*, 2009). The nutritional content of the plant is low to moderate in vitamin E and high in B1, B3, B6, and B9. Capers' flower buds are a rich source of vitamins A, C, and K. (Tlili *et al.*, 2010; Nabavi *et al.*, 2016; Ulukapi *et al.*, 2016). Caper also contains a wealth of minerals, particularly calcium, iron, potassium, phosphorus, magnesium, zinc, and manganese, all of which are vital to healthy metabolic function. (Ozcan *et al.*, 2004; Arslan and Ozcan, 2007).

Table (2): Caper's Impact on Fatty Liver Rats' Body Weight, Food Consumption, and Energy Expenditure.

Parameters / Groups	Body weight Gain (%)	Feed intake (g/day/rat)	Feed efficiency ratio
Control (-Ve)	141.80±1.92^{b}	12.90±0.42^{a}	10.94±0.44^{c}
Group 2	131.60±2.07^{c}	10.30±0.16^{c}	12.74±0.30^{a}
Group 3	136.80±1.78^{c}	10.94±0.42^{c}	12.49±0.52^{a}
Control (+Ve) group 4	140.40±1.14^{b}	11.63±0.26^{b}	12.12±0.28^{a}
Group 5	142.60±1.14^{b}	12.12±0.22^{a}	11.75±0.27^{b}
Group 6	146.40±1.52^{a}	12.31±0.10^{a}	11.86±0.23^{b}

*Values are expressed as means ±SE.

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

Table 2 shows that the body weight growth percentage for the (+ve) control group was significantly less than that of the negative control group (131.60±2.07 vs. 141.80±1.92%, respectively; P< 0.05). In contrast to the control group, the high-fat diet and fructose groups that consumed varying amounts of caper showed a statistically significant (P< 0.05) rise in body fat percentage. The +ve control group had a lower mean FER (12.24±0.30) than the -ve control group (10.94±0.44), which is a substantial disparity when measured statistically (P< 0.05). Comparing the negative control group to the groups fed various amounts of caper, there were significant differences in FER between the healthy and fatty liver groups.

Therefore, adding capers to diets resulted in a greater body weight increase, feed intake, and feed efficiency ratio than the positive control group at all supplementation doses. Feed intake was also found to be affected by the diet's palatability and flavor. Results show that body weight, feed intake, and development rate all improved in conjunction with an increase in the proportion of capers in the diet of fatty liver rats.

Rats' body weight was assessed before and during the 12-week intervention period and again afterward to determine any changes **(Rasoul *et al*., 2020).** After 6 weeks on the high-fat emulsion diet, the HF group had gained more weight than the NC group had (p<0.001). Body weight gain was significantly reduced in the CS extract group after 12 weeks compared to the HF group (p<0.001). The liver weight and index of the rats treated with CS extract for 6 weeks were considerably lower than those of the rats treated with HF alone (p<0.001).

Table (3): Effect of Caper on Relative Organs Weight of Rats with Fatty Liver.

Parameters / Groups	Liver (%)	Kidney (%)
Control (-Ve)	13.34±0.24^{c}	4.22±0.13^{b}
Group 2	14.04±0.35^{b}	4.44±0.28^{b}
Group 3	13.86±0.27^{b}	4.32±0.08^{b}
Control (+Ve) group 4	15.38±0.19^{a}	5.00±0.35^{a}
Group 5	14.74±0.23^{a}	4.70±0.23^{a}
Group 6	14.60±0.40^{a}	4.46±0.24^{b}

The results of the variations in the relative weights of the organs are indicated in Table (3). The rats that were part of the positive control group and were given a diet high in fat and those fed fructose experienced increases in the average relative weight of their enlarged livers and kidneys in comparison to the rats that were part of the negative control group. When compared to the (+ve) control, a high-fat diet and fructose

with supplemented caper induced a drop in the mean value of relative liver and kidney weight; however, rats fed caper at levels of 25% or higher were not affected by this.

Table (4): The Impact of Caper on Serum Liver Function in Rats Afflicted with Fatty Liver.

Parameters / Groups	ALT	AST	ALP
	(U/L)		
Control (-Ve)	35.80±1.92^{d}	44.80±0.83^{d}	840.00±1.58^{d}
Group 2	46.20±2.38^{c}	51.20±1.30^{c}	845.60±1.81^{c}
Group 3	41.20±1.30^{c}	48.20±0.83^{d}	844.40±1.14^{c}
Control (+Ve) group 4	53.80±1.30^{b}	126.40±2.30^{a}	855.40±1.94^{a}
Group 5	69.80±1.92^{a}	58.60±1.14^{b}	854.40±1.14^{a}
Group 6	58.60±1.67^{b}	52.80±0.83^{c}	848.00±1.00^{b}

The preventive impact of caper on alanine aminotransferase (ALT) activity is seen in Table (4). Rats fed cholesterol plus colic acid (the "positive control group") had a serum ALT level of 69.80±1.924 U/L, which was considerably higher than the level in the "negative control group," which was 35.80±1.924 U/L. In contrast to the positive control group, rats fed a high-fat diet and fructose supplemented with capers demonstrated a decrease in blood activity of ALT across the board.

When comparing the AST activity of animals fed a high-fat diet and fructose (positive control group) to those fed a low-fat diet and no fructose (negative control group), the difference was statistically significant (mean value, 126.40±2.302 U/L vs. 44.80±0.837 U/L). The serum level activities of AST were significantly reduced in rats fed caper diet at any consumption level in contrast to the (-ve) control group.

Serum ALP activity was found to be statistically substantially higher ($P>0.05$) in the high-fat diet and fructose-treated rats compared to the comparable values of the normal group (table 4). When viewed in relation to the +ve group, caper-fed high-fat diets and fructose dramatically lowered serum ALP levels ($P>0.05$). Serum ALT and AST levels rarely differed significantly from one another based on the amount of caper supplementation.

The combination of atorvastatin with caper treatment improved lipid profiles. After eight weeks of treatment, caper fruit pickle (CFP) was found to minimize ALT elevation, a common side effect of atorvastatin medication. **(Saeed *et al.*, 2019).**

Serum levels of ALT, AST, ALP, bilirubin, creatinine, urea, and uric acid, as well as histopathologic characteristics of the liver, kidneys, pancreas, and stomach, were measured and compared before and after administration of caper fruit extract in a rat model of type 1 diabetes (**Taghavi *et al.*, 2014).** To a lesser extent than in the control group, cellular necrosis was observed in the diabetic rats' liver, pancreas, and

kidneys after treatment with caper fruit extract. Creatinine, liver enzymes, and other variables all showed reduced concentrations in the serum. The cell line was also used in another study evaluating caper for its anti-inflammatory effects. They discovered that the cytokine genes IFN, IL-17, and IL-4 are suppressed by eating caper fruit. They determined that the caper fruit's beneficial properties stem from its high concentration of saponins, flavonoids, and alkaloids. (**El Azhary *et al*., 2017).**

Furthermore, the study conducted by **Kazemian *et al*., (2015)** revealed a notable reduction in liver enzyme testing within the group that consumed caper extract. A study has demonstrated the potential of Capparis spinosa as a plant with antidiabetic properties, as it was found to effectively lower blood glucose levels in rats with streptozotocin-induced diabetes. **(Eddouks *et al*., 2017).** In a separate study conducted to assess the hepatoprotective properties of C. spinosa, an ethanolic extract derived from the root bark of this medicinal plant was examined using a mouse model of hepatotoxicity produced by **CCl4**. The group that received the ethanolic extract of C. spinosa experienced a decrease in serum liver enzymes **(Aghel *et al*., 2007).** As a result, it's possible that the effective dose plays a role in the contradictory findings of prior investigations. Additionally, the agricultural soil may affect the components and/or levels of polyphenols found in caper fruit from region to region. Studies have shown conflicting results when comparing serum levels of the lipid profile and/or liver enzymes. The outcomes of these variations are different **(Khavasi *et al*., 2017).**

Tir *et al*., (2019) introduced evidence of the protective properties of caper seed extract against CC_{l4} and cisplatin-induced toxicity. Histopathological studies confirmed that antioxidant enzyme levels were raised and indicators of liver and kidney damage were normalized after treatment of the animals, as evidenced by a reduction in the degree of tissue fibrosis **(Tir *et al*., 2019).** An aqueous fruit extract of Caper was studied by **Ali Al-Nuani and Kadhim (2020)** to see how it compares to paracetamol in terms of its effect on two detoxifying enzymes. Extract injections preceded by paracetamol decreased cytochrome P450 2E1 levels from 249.28 to 196.73%, and extract injections followed by paracetamol decreased levels from 249.28 to 200.59%.

Table (5): Caper's Impact on Liver Fat and Kidney Functions in Serum Rats.

Parameters / Groups	Urea	Creatinine	Uric acid
	mg/dl		
Control (-Ve)	42.20±1.92^{c}	0.82±0.08^{b}	4.14±0.05^{b}
Group 2	44.20±0.83^{b}	0.86±0.05^{b}	4.82±0.08^{a}
Group 3	44.00±.1.00^{b}	0.84±0.05^{b}	4.32±0.08^{b}
Control (+Ve) group 4	49.80±0.83^{a}	1.28±0.08^{a}	5.26±0.16^{a}
Group 5	47.60±1.67^{a}	1.26±0.08^{a}	3.88±0.05^{c}
Group 6	47.20±0.83^{a}	1.04±0.13^{a}	3.80±0.07^{c}

The impact of caper on the renal functions (serum urea, creatinine, and uric acid concentration) of fatty liver rats is shown in **Table (5).** The serum concentration of urea was substantially higher in the high-fat diet and fructose group (49.80±0.837 mg/dl) compared to the negative control group (42.20±1.924 mg/dl). The experimental group of rats that were fed a high-fat diet, supplemented with fructose and caper at varying amounts of ingestion, exhibited a notable reduction in blood urea levels, bringing them closer to normal levels when compared to the positive control group. Additionally, it was observed that the concentration of urea in serum exhibited a substantial decrease in rats that were fed a basal diet and supplemented with caper at three different consumption levels. The mean values for these levels were recorded as 47.60±1.673, 47.20±0.837, 44.20±0.837, and 44.00±1.000, respectively.

Table 5 shows that the creatinine levels of the positive control group, which was fed a high-fat diet and fructose, were 1.28±0.84 mg/dl higher than those of the negative control group, which had a level of 0.82±0.084 mg/dl. In comparison to the positive control group, the group of rats who were given a high-fat diet, fructose, and caper supplementation showed a substantial decrease in the concentration of serum levels of creatinine.

The effect of caper on the levels of uric acid in the serum of rats fed a high-fat diet may be seen in Table (5). According to the findings, the positive control group had a significantly higher uric acid level than the negative control group, which was 4.14±0.055 mg/dl, with a mean value of 5.26±0.167 mg/dl. In contrast, the blood uric acid levels of rats provided caper in their diets decreased significantly as compared to those of the positive control group.

Table (6): Effect of caper on Serum Lipid Profile of Rats with Fatty Liver.

Parameters / Groups	TC	TG	HDL-c	LDL-c	VLDL-c
	(mg/dl)				
Control (-Ve)	136.60±8.67^{d}	101.40±1.67^{e}	35.60±1.51^{d}	80.72±9.59^{d}	20.28±0.33^{c}
Group2	149.20±1.64^{c}	133.60±2.30^{c}	42.40±.1.81^{b}	80.08±2.37^{d}	26.72±0.46^{b}
Group3	147.60±4.50^{c}	106.40±2.40^{d}	38.20±.1.30^{c}	88.12±5.40^{b}	21.28±0.48^{c}
Control (+Ve) group4	249.20±7.85^{a}	187.60±1.67^{a}	46.60±2.40^{a}	165.08±7.31^{a}	37.52±.033^{a}
Group5	154.20±1.64^{b}	112.60±3.36^{d}	47.20±1.30^{a}	84.48±2.83^{c}	22.52±0.67^{c}
Group6	152.60±4.50^{b}	145.20±2.28^{b}	40.80±.83^{b}	82.76±4.49^{c}	29.04±0.45^{b}

Total cholesterol levels, triglyceride levels, VLDL levels, and HDL levels are the most commonly measured lipids in a blood lipid profile. As can be seen in Table 6, the positive control group significantly outperformed the negative control group. But there was a substantial ($P < 0.05$) drop in serum high-density lipoprotein cholesterol (HDL-C). Serum lipid profile mean values were significantly lower in caper-supplemented diets ($P < 0.05$). Serum HDL-C, however, was significantly elevated ($P<0.05$) in comparison to the (+Ve) control group. A high-fat diet, fructose, and caper significantly improved the lipid profiles of rats compared to the positive control group (+Ve). Incorporating these changes into one's diet may help treat and prevent cardiovascular disease.

For eight weeks, CFP was shown to have a hypolipidemic impact in a human trial of people with nonalcoholic fatty liver disease (NAFLD) **(Khavasi *et al.*, 2018).** Capers have been shown to reduce cholesterol absorption in the intestine, which may be the underlying mechanism for their lipid-lowering impact. **(Kritchevsky, 1978).** Vascular inflammation caused by LDL-C has been well documented and shows that LDL-C acts as a proinflammatory molecule. It has been shown that oxidized LDL can induce inflammatory signaling pathways by activating toll-like receptors on macrophages **(Miller *et al.*, 2003).**

Table (7): Caper's Impact on Fatty Liver-Induced Serum Malondialdehyde and Glutathione in Rats.

Parameters / Groups	Malondialdehyde	Glutathione
	(ng/ml)	
Control (-Ve)	64.80±3.11^{e}	4.20±0.35^{a}
Group2	92.20±2.16^{c}	4.70±0.12^{a}
Group3	74.60±2.70^{d}	4.70±0.14^{a}
Control (+Ve) group4	151.20±3.11^{a}	2.74±0.28^{c}
Group5	106.00±2.34^{b}	2.86±0.15^{c}
Group6	101.80±1.78^{b}	3.68±0.16^{b}

The average value of glutathione activity (Table 7) was significantly lower in the high-fat-diet group of rats compared to the control group ($P>0.05$). In contrast to the normal group, the positive control group had a considerably ($P>0.05$) higher mean value of malondialdehyde level.

Furthermore, the average levels of glutathione activities exhibited a statistically significant increase (P>0.05) when rats were administered caper at a concentration of 10%. This increase was observed in comparison to the equivalent values of the positive control group. Nevertheless, in rats fed a high-fat diet supplemented with capers, average malondialdehyde activity decreased significantly (P>0.05) compared to the control group. The experimental analysis of caper demonstrated positive impacts on the activity of glutathione as well as on the levels of malondialdehyde.

According to **Yang *et al*., (2008),** caper is an herb that has the ability to act as an antioxidant. Furthermore, it has been demonstrated that both the alcoholic and aqueous extracts of caper have hepatoprotective and nephroprotective activities against toxins, in addition to their impact on the lipid profile. This is in addition to the effect that the extract has on the lipid profile. **(Tlili *et al*., 2017).** The health benefits of caper fruit pickles primarily stem from their abundance of bioactive chemicals, particularly polyphenols. **(Nabavi *et al*., 2016).**

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تأثير مستخلص جذور القبار على الفئران التي تعاني من الكبد الدهني

الملخص:

الهدف من التجربة هو دراسة تأثير مستخلص جذور القبار على الفئران التي تعاني من الكبد الدهني. تم استخدام ستة وثلاثين من ذكور الجرذان البيضاء وزنها (١٥٠±٥ جم) في هذه الدراسة. المجموعة الأولى (٦ فئران) تم إطعامها على النظام الغذائي الأساسي، المجموعة الثانية (٦ فئران) تم إطعامها على نظام غذائي عالي الدهون والفركتوز لتحفيز حدوث الكبد الدهني. تم تغذية المجموعات (٣-٦) على نظام غذائي عالي الدهون والفركتوز مع تدعيم بنسب (١٠، ١٥، ٢٠٪) من مستخلص جذور القبار. أظهرت النتائج أن جميع مجموعات الكبد الدهني التي تغذت بنسبة (١٠%، ١٥٪، ٢٠٪) من نبات القبار أدت إلى زيادة متباينة في زيادة وزن الجسم، والطعام المتناول، ونسبة كفاءة الغذاء. أظهرت النتائج وجود فرق معنوي ($P\leq0.05$) بين المجموعة الضابطه الموجبة ومجموعات النظام الغذائي عالي الدهون المعاملة بمستويات مختلفة من القبار في أوزان الأعضاء الداخلية. حيث أظهرت البيانات عدم وجود فرق معنوي ($P\geq0.05$)بين مجموعة الضابطة السالبة ومجموعة الفئران التي تغذت على القبار بنسبة ٢٠٪. أظهرت النتائج انخفاضًا معنويًا في نشاط إنزيمات الكبد **AST** و**ALT** و**ALP** والكرياتينين واليوريا في الدم وحمض البوليك للمجموعات المعالجة مقارنة بمجموعة الضابطة الموجبة. أشارت النتائج إلى أن مجموعات الجرذان التي تناولت نسبة عالية من الدهون والتي عولجت بنسبة ١٠، ١٥ أو ٢٥٪ أدت إلى انخفاض معنوي ($P\leq0.05$) في قيم الكوليسترول الكلي في الدم و**TG** و**LDL-Cholesterol** و**VLDL** و**LDL-Cholesterol** ولكنها أظهرت في الغالب زيادة معنوية ($P\leq0.05$) في قيم الكوليسترول HDL في الدم مقارنة بمجموعة التحكم (+ve). أيضًا، يخفض المالوندهيد، بينما يرفع الجلوتاثيون في المصل. لذلك أوصت الدراسة باستخدام الكبار في الحميات الغذائية للتغلب على مشاكل ارتفاع الكولسترول وتحسين وظائف الكبد والكلى.

الكلمات المفتاحية: جذور القبار، وظائف الكبد، وظائف الكلي، الكبد الدهني.