



## Hepatoprotective Effects of *Capparis spinosa* L. Fruit Extract in Mice

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### ABSTRACT

**Objective:** The aim of this study is to evaluate the hepatoprotective effect of methanolic and aqueous extract of *Capparis spinosa* L. fruit in mice. **Methods:** The hepatoprotective effects of methanolic extract of *C. spinosa* was assessed by measuring the serum levels of enzymes including bilirubin, alkaline phosphatase (ALP), aspartate aminotransferase (AST), and alanine aminotransferase (ALT) in the treated mice after oral administration of *C. spinosa* at the doses of 250, 500, and 750 µg/kg, respectively, for 14 days. **Results:** The results demonstrated that *C. spinosa* at the tested doses of 250, 500, and 750 mg/kg had no significant toxicity on the serum liver enzymes of ALT, AST, ALP, and bilirubin. **Conclusion:** The findings revealed the hepatoprotective effects of methanolic extract of *C. spinosa* in mice.

**Keywords:** *Capparis spinosa*, BALB/c mice; liver; enzymes.

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### INTRODUCTION

During human history, plants and their derivatives have been considered as the most effective source in traditional medicines to treat a lot of diseases [1]. Today, people around the world are using various herbal plants; however, it is very important to have some information and scientific confirmations about the complications and side effects of these plants [2, 3].

Based on the previous investigations on animal models, the liver is one of the main organs in the evaluation of drug toxicity; so, evaluating the function of this organ can be considered as a great method to study the toxicity of some new drug agents [4]. Today, one of the most important methods for detecting liver damage is evaluation of the level of liver enzymes in serum such as bilirubin, alkaline phosphatase (ALP),

aspartate aminotransferase (AST), and alanine aminotransferase (ALT) [5-8].

*Capparis spinosa* L. belonging to the family of Capparidaceae, called "Kabar" in Persian is a very common plant in Iran, which is widely used in traditional medicines to treat numerous diseases [9]. This plant generally grows in various parts of the world, especially in Iran. Recent studies demonstrated that in modern medicine, various parts of *C. spinosa* have a wide range of medicinal and biological effects such as antimicrobial, antioxidant, and anticancer activities [10, 11]. Based on what was said above, the present investigation aimed to assess the hepatoprotective effects of *C. spinosa* in BALB/c mice by measuring the serum level of some liver enzymes (ALT, AST, ALP, and Bill).

## MATERIALS AND METHODS

### Collection of plant materials

We collected the fruits of *C. spinosa* from the mountains of Lorestan Province, Iran. The materials were then recognized by a botanist at Razi Herbal Medicines Research Center, Khorramabad, Iran (Fig. 1).



Figure 1. The collected fruits of *C. spinosa*

### Preparation of extract

After chopping the fruits into smaller portions, drying them in the shade, and powdering, they were extracted, successively using the percolation technique with methanol at 21 °C for three days. The obtained extracts were then allowed to pass through a filter paper to take away the excess particles. Finally, the extracts were vacuum concentrated at 50 °C using a rotary evaporator (Heidolph, Germany), and kept at -20 °C until testing [12-17].

### Animals

This study was approved by the Ethics Committee of Lorestan University of Medical Sciences, Lorestan, Iran, (No. 2018/A-10-1633-4). 32 male BALB/c mice weighing between 25 to 30 g were purchased and housed with the same light-dark cycles (12:12-h) at room temperature (22±2 °C) and enough food and water. For evaluating the hepatoprotective impact of *C. spinosa* extract, mice were divided into 4 groups including:

(C): orally received normal saline for 14 days

(T1): orally received 250 mg/kg of the *C. spinosa* methanolic extract for two weeks

(T2): orally received 500 mg/kg of the *C. spinosa* methanolic extract for two weeks

(T3): orally received 750 mg/kg of the *C. spinosa* methanolic extract for two weeks

### Evaluation of the serum liver enzymes

After this time and at the 15<sup>th</sup> day, the mice were anesthetized via Ketamine (100mg/kg) – Xylazine (10 mg/kg); and then were euthanized by means of sodium pentobarbital (70 mg/kg, i.p.). After opening the abdomen, blood samples were collected from the heart and transferred to tubes without anticoagulant to create the clot, then they were centrifuged at 5000g for 10 min and serum was separated. Finally, the levels of liver enzymes such as AST, ALT, ALP, and bilirubin (direct and total) in serum were measured to assess the liver function by commercial diagnostics kits [18].

### Statistical analysis

All obtained data analysis was done by SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). We also used the one-way ANOVA test and Tukey's post-hoc test to determine the difference between the tested groups. P<0.05 was measured as statistically significant.

## RESULTS

### Hepatoprotective effects of *C. spinosa*

Table 1 shows the hepatoprotective effect of *C. spinosa* at doses of 250, 500, and 750 mg/kg for 14 days. The obtained findings revealed that after orally administration of *C. spinosa* extract although the serum level of AST, ALT, ALP, and bilirubin was changed in a dose-dependent manner, no significant difference (p>0.05) was observed in the concentration of serum liver enzymes between the treatment (with oral administrations of *C. spinosa*) and control groups.

Table 1. Effects of *C. spinosa* on serum liver enzymes after two weeks of administration in mice.

| Clinical biochemistry parameters | AST (U/L)  | ALT (U/L) | ALP (U/L)  | TB        |
|----------------------------------|------------|-----------|------------|-----------|
| Control                          | 130.6±8.15 | 38.3±4.31 | 132.3±8.15 | 0.12±0.03 |
| <i>C. spinosa</i> (250 µg/kg)    | 122.3±6.15 | 35.3±3.15 | 137.3±6.51 | 0.13±0.05 |
| <i>C. spinosa</i> (500 µg/kg)    | 129.6±3.15 | 41.3±2.51 | 143.6±3.51 | 0.16±0.04 |
| <i>C. spinosa</i> (750 µg/kg)    | 136.3±8.15 | 44.6±3.51 | 146.6±6.15 | 0.18±0.05 |

BUN, blood urea nitrogen; Cr, creatinine; ALT, alanine aminotransferase; ALP, alkaline phosphatase

phatase; AST, aspartate aminotransferase; TB, total bilirubin

### DISCUSSION

In recent decades, the tendency to use medicinal herbs and their derivatives, as well as supplements, has risen; so that 80% of the world's people rely on medicinal herbs for much principal healthcare. Reviews demonstrated that even though treatments relating to herbal medicines have revealed considerable potential with the high efficacy; the safety of some of them is still unclear and need to be used with caution. [19]. The common opinion that herbal therapies do not have adverse side effects is wrong and ambiguous. Recent studies have exhibited that some herbs are able to generate a number of dangerous and even life-threatening side effects [20, 21].

Based on the international definitions, toxicity properties are related to a number of factors including hepatotoxicity, contamination by heavy metals or microorganisms when preparing, and adverse responses because of age, genetics and underlying disease features of the consumer [22, 23].

Nowadays, reviews have demonstrated that liver enzyme measurement is an important diagnostic test to assess the liver function, inflammations, and serious damages such as hepatitis and cirrhosis [18]. According to the recent studies that have shown biological and pharmacological properties of *C. spinosa*, we decided to assess the hepatoprotective effects of *C. spinosa* in BALB/c mice.

The obtained findings revealed that after oral administration of *C. spinosa* extract for 14 days although the serum level of AST, ALT, ALP, and bilirubin was changed in a dose-dependent manner, no significant difference ( $p>0.05$ ) was observed in the concentration of serum liver enzymes between the treatment (with oral administrations of *C. spinose*) and control groups, indicating that *C. spinosa* at the doses of 250, 500, and 750 mg/kg had no hepatotoxicity effects in mice.

### CONCLUSION

The findings of the current investigation revealed the hepatoprotective effects of biosyn-

thetic copper nanoparticles from *C. spinosa* fruits. However, other supplementary tests are required to reach this conclusion.

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### Conflict of Interest

The authors declare no conflict of interest.

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