

Alcohol extract of *Tribulus terrestris* ameliorates liver of mice exposed to cadmium acetate

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Received: 15 / 5/ 2019 / Accepted: 24/ 12 /2019

Abstract

Background: *Tribulus terrestris* is known as food supplements and therapeutic agent. **Objective:** This study was presented to evaluate antitoxicity of fruit alcohol extracted from *Tribulus terrestris* to be used against heavy metal (cadmium) in female of albino mice.

Methods: Twenty mice were examined in this experiment, and they were divided into three groups. The first group was a control group, while the second group was quaffed cadmium 6mg/kg, and third group was quaffed cadmium 6mg/kg and fruit alcohol extract of *Tribulus terrestris* 200mg/kg for ten days. Histological change was studied in the livers of these mice.

Results: The histological sections of the liver in the mice exposed to cadmium have shown inflammation and necrosis in hepatocytes around central vein. Moreover, the liver was also hypertrophy, karyomegaly and increases glycogenesis. The results of the cadmium-exposed mice treated with the extract of *Tribulus terrestris* showed that the damage in the liver was slight. It showed normal cell shape and hepatic plate. It also showed simple inflammation and hypertrophy in a small space.

Conclusion: The fruits of *Tribulus terrestris* can remove toxicity, protect our bodies (especially liver) against heavy metal such as cadmium.

Key words: *Tribulus terrestris*, cadmium toxicity, hepatic tissue, mice.

Introduction:

Cadmium is a heavy metal that has toxicity with destructive impact on most organs. It is widely distributed in environment, and the main sources of contamination are cigarettes, welding fumes, contaminated food, and water⁽¹⁾. Cadmium is widely used in manufacturing batteries, alloys, coatings and many other industries. People are exposed to cadmium frequently through breathing and ingesting⁽²⁾.

Cadmium is not an element in the structure of the body and does not play a vital role in it. It is absorbed through the gastrointestinal tract or through the lungs. It then accumulates in various body tissues, especially in the liver and kidney. The distribution of cadmium to the various human body organs depends on the chemical

composition of the substance containing cadmium, and the nature of exposure to it. Acute exposure to cadmium is more dangerous than chronic exposure⁽³⁾. Chronic and acute exposures to cadmium cause severe changes in tissues and organs such as liver, kidney, lung, spleen, pancreas, testes and placenta in humans and other mammals^(4,5).

The cadmium toxicity in the body may be direct⁽³⁾ or indirect effected^(6,7). Direct effect of cadmium may take place due to binding of proteins, altering the effectiveness of enzymes, and the effects on absorption and distribution of essential elements⁽³⁾. On the other hand, the indirect effect of cadmium may happen due to increasing oxidative stress, leading to increase in free radicals that cause serious damage to the body^(6,7).

Tribulus terrestris is an annual plant widely distributed throughout the world, it is adapted to grow in dry locations and deserts, in which few other plants can survive⁽⁸⁾. The *Tribulus terrestris* is herbaceous plant with various therapeutic benefits. It has an anti-bacterial activity against gram-negative and gram-positive bacteria. The extract of *Tribulus terrestris* activates the testosterone hormone, which is used in lowering blood sugar of diabetics, and decreasing lipids (triglycerides, total cholesterol and low density lipoprotein cholesterol LDL) in the body⁽⁹⁾. Previous study had shown that *Tribulus terrestris* has an important role in protecting the liver from toxic substances⁽¹⁰⁾. This plant acts as an antioxidant against free radicals^(11,12), anticancer,⁽¹³⁾ metal chelator activity, hepatoprotective activity, anti-inflammatory effects⁽⁸⁾ anxiolytic potential⁽¹⁴⁾.

Ibrahim and Kadhim show the presence of therapeutically potent compounds in the Iraqi *Tribulus terrestris* extract predominantly alkaloids, flavonoids, saponins, tannins and terpenoids⁽¹⁵⁾. Phytochemical analysis of Indian *Tribulus terrestris* showed the existence of various biologically active components, which consist of flavonoids, saponins, glycosides, alkaloids, and tannins. It is found that the quantity of main flavonoids is about one and a half times more than that of main saponins in the plant. In addition, eighteen flavonoids are found by using HPLC technique in four *Tribulus* species⁽¹⁶⁾. The *Tribulus terrestris* has no side effects if used at the range about 250-750mg per day⁽¹⁷⁾. Aim of the present study to evaluate activity *Tribulus terrestris* against cadmium toxicity

Materials and methods

Native fruit of *Tribulus terrestris* was grinded to powder. Later, the fruit powder was extracted with 70% ethanol (1g/10ml) in a Soxhlet apparatus. The extract was dried in an oven at 60°C until it becomes hardened. The extract was stored in refrigerator at 4°C.

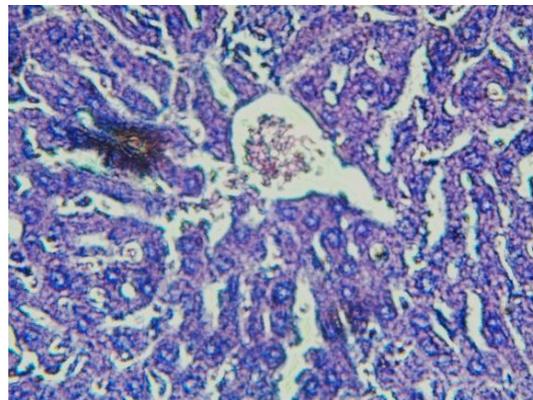
Twenty healthy adult female albino mice weighing 25-30 g. were taken from Iraqi center for cancer research and medical genetics, Al-

Mustansiriyan University, Iraq. The mice were kept under standard laboratory conditions in animal house of College Science/ University of Anbar (adaptation for six weeks). They were randomly divided into three groups: The first group was a control one; and the second group was treated with cadmium (6mg/kg p.o.) only; whereas, third group was quaffed cadmium (6mg/kg p.o.) and fruit alcohol extract of *Tribulus terrestris* (200mg/kg p.o.) for ten days.

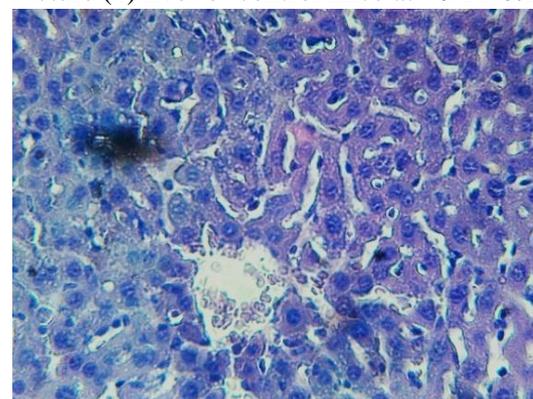
All mice were sacrificed at the end of the experimental period. The livers of the sacrificed mice were fixed in fifteen percent buffered formalin. Later, they were processed for embedding in paraffin. Sections of 4 µm were cut from tissue and stained with hematoxylin and eosin, and examined under light microscope with camera to study any histological changes taking place.

Results

All mice of the control group have normal texture tissue and consistency of cells in liver (picture 1 and 2).

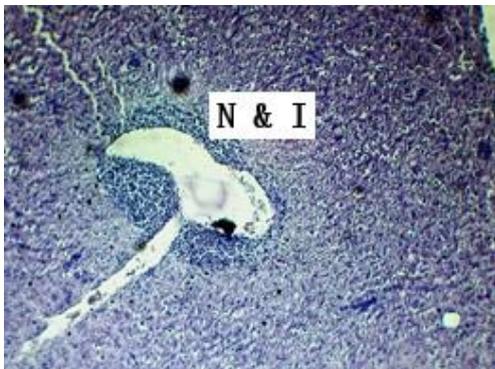


Picture (1) liver of control mice at 40X H&E

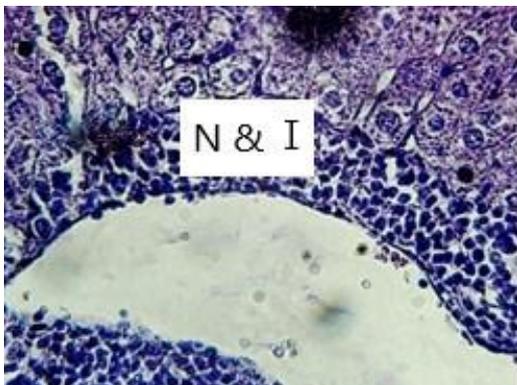


Picture (2) liver of control mice at 40X H&E stain

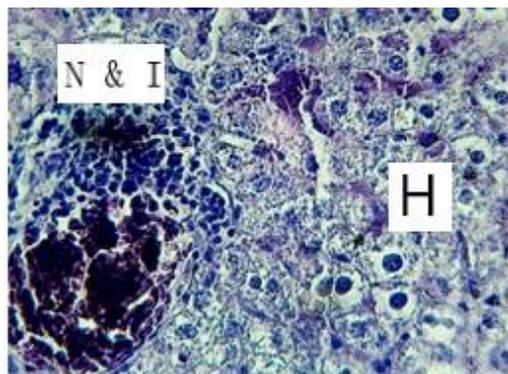
The histological sections of the liver were shown in picture (3 and 4) of the mice exposed to cadmium. These mice showed inflammation and necrosis in hepatocytes at central vein at 10X and 40X respectively. Livers of other animals treated with cadmium showed inflammation and necrosis in hepatocytes near the central vein, and hypertrophy hepatocyte (40X) as in picture (5). The liver has also hypertrophy and karyomegaly as shown in picture (6), There was also an increase in glycogenesis as shown in picture (7) at power 40X.



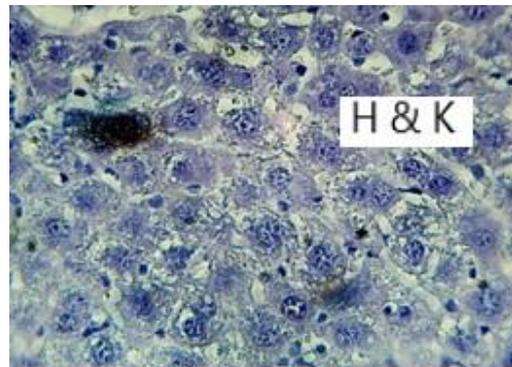
Picture (3) liver of cadmium exposed mice at 10X. H&E stain



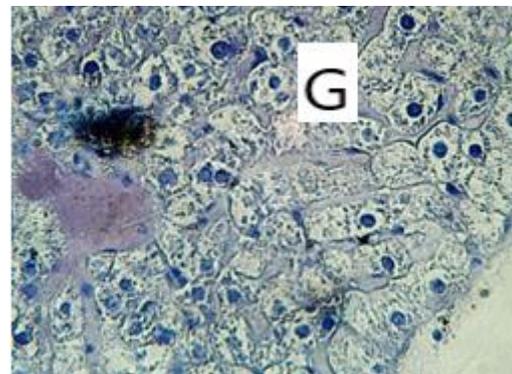
Picture (4) liver of cadmium exposed mice at 40X. H&E stain



Picture (5) liver of cadmium exposed mice at 40X. H&E stain

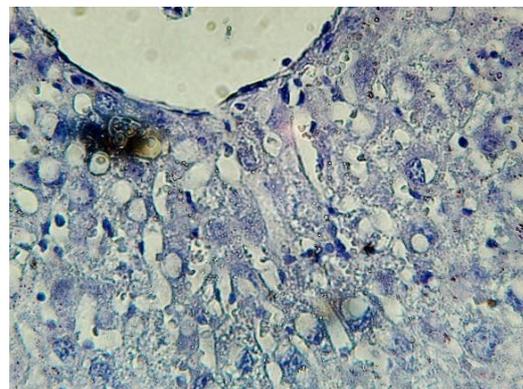


Picture (6) liver of cadmium exposed mice at 40X. H&E stain

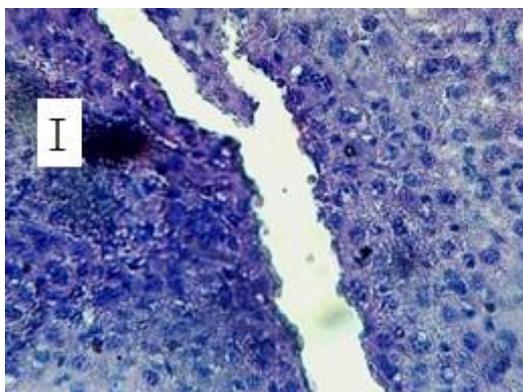


Picture (7) liver of cadmium exposed mice at 40X. H&E stain

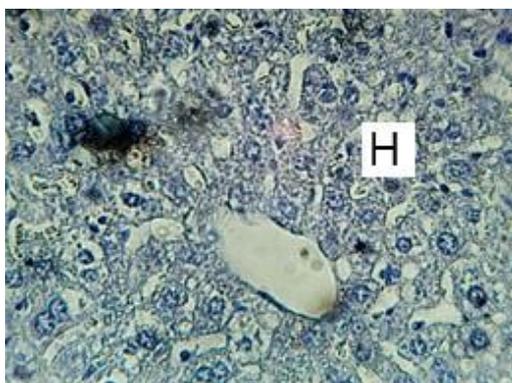
The results of the cadmium-exposed mice, which were treated with the extract of *Tribulus terrestris* showed that the damage to the liver was simple, but less than that of the cadmium-only mice. Pictures 8 showed normal cell shape and hepatic plate, while in pictures 9 (40X), a simple inflammation, and hypertrophy in picture 10 at power 40X were identified



Picture (8) liver of treated mice at 40X. H&E stain



Picture (9) liver of treated mice at 40X. H&E stain



Picture (10) liver of treated mice at 40X. H&E stain

Discussion

The accumulation of cadmium promotes oxidation⁽¹⁸⁾ and contributes to the development of serious biochemical and pathological conditions, because of its long retention in some organs. The management for cadmium toxicity include both chelating and antioxidant agent⁽²¹⁾. Cadmium increases the oxidation of the body by affecting the antioxidant enzymes⁽¹⁸⁾.

Ibrahim and Kadhim (2015) explained that Iraqi *Tribulus terrestris* has many secondary metabolites acting as free radical scavenging. This emphasizes the presence of therapeutically potent compounds in this plant such as tannins alkaloids, saponins, flavonoids, and terpenoids⁽¹⁵⁾. *Tribulus terrestris* has hepatoprotective⁽⁸⁾ activity, anti-inflammatory

effects, metal chelator activity and supplemental activity⁽¹⁹⁾.

Consistent with these results, our study showed that the administration of cadmium induced hepatic inflammations and necrosis^(18, 20). These results coincided with Rajendar *et al.*, (2011), in which they have reported that there was a positive effect of *Tribulus terrestris* on testis of mice-exposed to cadmium⁽²¹⁾. In addition Lakshmi, *et al.*, (2012) found that *Tribulus terrestris* decreases the cadmium level in rats exposed to cadmium⁽²²⁾.

Conclusion:

The fruits of *Tribulus terrestris* removes toxicity, protect our bodies (especially liver) against heavy metals such as cadmium.

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اصلاح كبد الفئران المعرضة لخلات الكادميوم بالمستخلص الكحولي لنبات الكطب

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الخلاصة :

عرف نبات الكطب *Tribulus terrestris* بانه من المكملات الغذائية ويستعمل كمادة لعلاجية ايضاً. ان هدف هذه الدراسة هو تقييم فعالية المستخلص الكحولي لثمار نبات الكطب المضادة للأكسدة ضد المعادن الثقيلة كالكادميوم في كبد الفئران. خصصت عشرون انثى من الفئران لهذه التجربة وقسمت لثلاثة مجموعات ووزعت بالتساوي ضمت المجموعة الأولى حيوانات السيطرة، والمجموعة الثانية حيوانات جرعت الكادميوم بتركيز ٦ ملغم/كغم، واخيراً مجموعة الفئران المعرضة للكادميوم والمعاملة بالمستخلص الكحولي لنبات الكطب بتركيز ٢٠٠ ملغم/كغم. بعد عشرة أيام من زمن التجربة تم تشريح الفئران واستؤصل الكبد وحفظ في الفورمالين وتم عمل مقاطع نسيجية لدراسة التغيرات التي تطرأ عليها.

أظهرت النتائج في بحثنا ان كبد فئران مجموعة السيطرة كانت ذو تناسب طبيعي في شكل الخلايا ومظهر النسيج، في حين بدت علامات التأثر في كبد الفئران المعرضة للكادميوم كظهور الالتهابات والتنخر حول الوريد البابي في الكبد وزيادة حجم الخلايا وحجم النواة داخل الخلايا وزيادة حجم الكلايكوجين في الخلية، وكانت تلك الاعراض اقل مما هو عليه في الحيوانات المعرضة للكادميوم والمعاملة بالمستخلص الكحول لثمار نبات الكطب، اذ تبين ان كبد تلك الفئران فيها التهابات بسيطة وزيادة في حجم الخلايا في مجموعة صغيرة من الخلايا. فيما عدا ذلك لم تظهر اعراض أخرى.

نستنتج مما مضى في دراستنا ان لثمار نبات الكطب القابلية على إزالة سمية المعادن الثقيلة وحماية اجسامنا وخاصة الكبد ضد سمية الكادميوم.