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Gastroprotective effect of Alhagi maurorum (camel thorn) in ethanol-induced gastric damage in mice

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الملخص:

Alhagi maurorum(شوك الجمل) هو نبات طبي موجود في مناطق مختلفة من العالم بما في ذلك الجزء الشرقي من ليبيا. يستخدم على نطاق واسع في أمراض الكبد مع نشاطه الوقائي لكن تأثيره كمضاد للتقرح غير معروف محليًا. أجريت هذه الدراسة للتحقيق في التأثير المضاد للقرحة لدى Alhagi maurorum.تم تحضير مستخلص شوكة الجمل (CTE) وتم إعطاؤه لمجموعة من الفئران لمدة خمسة أيام قبل أن يتلقوا الإيثانول للحث على قرحة المعدة. كانت المجموعات المماثلة عبارة عن مجموعة تحكم سلبية من الفئران التي تلقت مجموعة تحكم ملحية وإيجابية من الفئران التي تلقت الإيثانول. تم إجراء الدراسة المرضية النسيجية للمعدة وتصنيفها حسب نظام تسجيل الآفة. إحصائيًا، أظهرت الفئران التي تلقت شوكة الجمل تحسنًا كبيرًا في درجة الآفة مقارنةً بالحيوانات المستقبلة بالإيثانول. نستنتج أن Alhagi maurorum له نشاط معدي ضد قرحة المعدة التي يسببها الإيثانول.

الكلمات المفتاحية: الحقبي مايروم، الإيثانول، الغشاء المخاطي في المعدة.

Abstract

Background: Alhagi maurorum is a medicinal plant found in different regions of the world including the eastern part of Libya.

Aim: It is widely used in liver diseases with its hepatoprotective activity but its effect as an anti-ulcerogenic is not known locally. This study was undertaken to investigate the anti-ulcer effect the Alhagi maurorum has.

Methods: A camel thorn extract (CTE) was prepared and administered to a group of mice for five days before they received ethanol to induce gastric ulcers. Comparable groups were a negative control group of mice that received normal saline and a positive control group of mice that received ethanol. The histopathological study of all stomachs was performed and graded according to the lesion scoring system.

Result: Statistically, the mice that received CTE showed a significant improvement in the lesion score as compared to the animals that received ethanol.

Conclusion: We conclude the Alhagi maurorum has gastroprotective activity against ethanol-induced gastric ulcers.

Keywords: alhagi maurorum, ethanol, gastric mucosa.

1. INTRODUCTION

Gastric ulcers are one of the most common gastrointestinal diseases [1]. However the exact causes of this disease are not clearly understood but any reason such as stress, drug use and smoking that results in an imbalance between aggressive and protective factors may be considered an etiology [2]. The major challenge of prolonged use of antiulcer drugs such as proton pump inhibitors, H2-blockers, and many others is their adverse effects [3, 4]. Therefore, researchers have focused on the investigation of the medicinal plants used in traditional medicine for the prevention and treatment of gastric ulcers. Many medicinal plants have shown antiulcer effects in animal studies [3, 5]. One of the medicinal plant families that may have a great role in the treatment of gastric ulcers is the Leguminosae.

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The Leguminosae is a family of plants that is composed of hundreds of genera and thousands of species [6]. A variety of plants in this family contain raw materials that are used as herbal medicines [7]. Alhagi maurorum (camelthorn) belongs to this family. It is a spiny plant with strong, stiff, abundant spines and produces small size, bright pink to maroon flowers. The plant grows in sandy and loamy soils in North Africa, the Middle East and South East Europe [8]. Chemically, it has been found that the Alhagi maurorum is composed of many fatty acids and sterols, coumarins, alkaloids, vitamins and flavonoids such as tamarixtin, isorhamnetin, quercetin chrysoeriol and kampferol [9-14]. Although there is not enough data to reveal the importance of this herb in traditional medicine, some researchers showed that the Alhagi maurorum is used for rheumatic pains, and liver and gastrointestinal disorders [15-17]. It is also used for polyps in nasal cavities, certain tumors, kidney stones and as a diuretic, laxative, expectorant, antiseptic and anti-diarrheal medicine and herb [8, 18-20].

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2. MATERIALS AND METHODS

Plant collection and preparation of extracts

An sufficient amount of fresh herb of *Alhagi maurorum* (Camel thorn) was gathered from Jagbob, a city in the eastern south of Libya. The plant was washed with tap water and left to dry at room temperature then crushed and ground by continuous soxhlation; 85 grams of the dried powders of Camel thorn were gradually extracted with petroleum ether, chloroform, ethyl acetate and ethanol (500 ml) respectively. By using a rotary evaporator, the Camel thorn ethanolic extracts (CTE) were evaporated and preserved for use in the pharmacological study. Twelve grams of CTE were obtained from 85 grams of the crude plant [21].

Experimental animals

Both sexes of albino mice weighing 25-30 g were maintained and bred in the animal house of the Faculty of Medicine - Benghazi University, Benghazi, Libya. All animals were kept in standard cages (48x35x22 cm), at room temperature (20 ±5°C) with artificial light from 7.00 am to 4.00 pm, and supplied with food and tap water ad libitum. All animal experiments were carried out in accordance with the Benghazi University Ethical Committee regulations.

The mice were divided into 3 different groups each of 6 mice. The first (control (N)) group received normal saline orally.

The second group (E) received 1 ml/kg body weight of 95% ethanol orally 11. The third group received CTE and ethanol (C+E). Oral doses of 660 mg/kg of CTE were administered for 5 consecutive days. The last dose of CTE was received 120 min prior to the ethanol receiving. All animals were starved of food but not water 18 hours before the administration of the ethanol. All animals were terminated and their stomachs were removed and opened along the lesser curvature. The stomachs were dropped in 10% formalin and sent for histological examination.

Histological procedure:

All the specimens were stained with haematoxylin and eosin (H&E). The stained slides were examined by a histopathologist who was blind to the groups under a light microscope for any histopathological changes. These changes were graded according to the lesion scoring system [22]. The total score was 14. It was assigned as 1. Epithelial cell loss (Score: 0-3); 2. Oedema in the submucosa (Score: 0-4); 3. Haemorrhagic damage (Score: 0-4) and 4. Presence of inflammatory cells (Score: 0-3). The total score was 14.

Statistical analysis

The statistical significance was determined by one-way analysis of variance (ANOVA) followed Mann-Whitney U test as a post-hoc analysis between different groups. The value of $P < 0.05$ is considered statistically significant. value of $P < 0.01$ is considered highly significant All statistical analyses were done using the GraphPad prism Software.

3. RESULT

The histological evaluation of sections of the stomach of mice in the first group (N) is shown in Figure (1 A). The sections (H/E stain, 10X) showed a normal histological appearance of the stomach with normal mucosa (M), the sub-mucosa (SM), muscular external (ME), and the blood vessels (BV)

In contrast, the histological sections of gastric mucosa in mice administered oral ethanol (E group) revealed a moderate to severe disruption of the epithelium surface (white arrow in figure 1 B) and edema of the sub-mucosal layer with massive leukocytes infiltration (black arrow in figure 1 B (H/E stain, 20X)).

Figure 1 C shows the histological section of gastric mucosa in mice that received camel thorn and ethanol (C+E group). As noticed, there was only mild to moderate damage to the surface epithelium and there was no edema of the sub-mucosal layer and some infiltration of leukocytes (H/E stain, 20X).

According to the histological score system mentioned previously, there was a significant difference of the ethanol received group (E) as compared with control group (N) (Figure 2). Although there was a significant difference of (C+ E) group as compared with group (N), the ethanol-induced histological changes were much improved in this group compared with group (E). P value is < 0.01

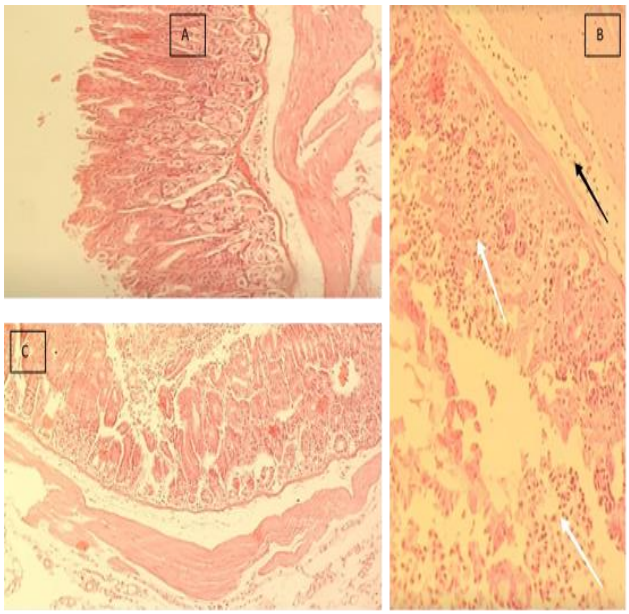

Figure 1: Histological changes in the stomach of different groups of mice. A: normal stomach. B gastric changes in Ethanol received group. C: gastric changes in Camel thorn and Ethanol received group

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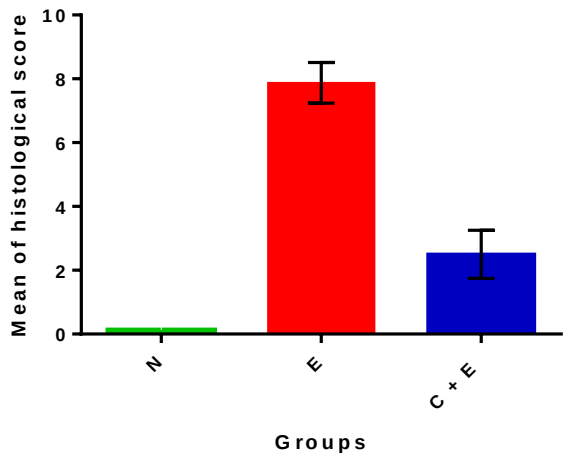

Figure 2:Histological score of stomachs of different groups

**** highly significant**

4. DISCUSSION

Ethanol penetrates the gastric mucosa rapidly and results in damage of the gastric layers [23]. In the current study, oral administration of ethanol resulted in histological changes. Moderate to severe changes were observed on the gastric mucosa, sub- mucosa and muscle layers of ethanol-receiving groups. The group treated with camel thorn significantly decreased the mucosal damage, edema and leukocyte infiltrations of ethanol-induced damage. The histological ulcer score was higher in the ethanol group when compared with the scores of both C+E group and N group. These findings were concomitant with other studies. Shaker (2010) reported that an inflammation of the gastric wall and vascular dilatation were detected [24]. In another study, Alhagi extract caused a significant improvement in gastric damage induced by indomethacin in rats [25]. Furthermore, the camel thorn increased pH and reduced gastric acid content and it was suggested that this plant had anti-secretory and mucosal protective effects on gastric mucosa in rats [26].

The mechanism of gastric improvement is not fully understood. It could be explained by the presence of flavonoids and triterpenoids [27]. It has been reported that these compounds have a cytoprotective effect [28, 29]. Different studies showed that the terpenes were associated with the antiulcerogenic effects of different herbs and it has been suggested that the terpenes decrease prostaglandine metabolism and vascular permeability [30-32]. The anti-ulcer activity is also attributed to the presence of flavonoids. Many flavonoids contained in several medicinal plants have antioxidant activity that inhibits lipid peroxidation and free radicals; therefore they prevent the gastric alteration caused by different gastric layer barkers [33-35]. In a previous study in our laboratory, we isolated phyto chemical compounds such as flavonoids, phenols and terpen [36].

In conclusion, the Alhagi maurorum extract improved ethanol-induced gastric damage and significantly reduced the histological score. Further studies are required to investigate the mechanism of anti-ulcer and cytoprotective activity of Alhagi maurorum.

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