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Testing the Therapeutic Role of the Crude Alcohol Extract of the *Onopordium acanthium* Plant on Induced Eczema in White Rats

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اختبار الدور العلاجي لمستخلص الكحول الخام لنبات الاقسون الشوكي *Onopordum acanthium* على مرض الاكزما المستحث في الجرذان البيض

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ABSTRACT

Background:

The study examined the efficacy of the alcoholic extract of the plant *Onopordium acanthium* on acetone-induced eczema in white rats (*Rattus norvegicus*). The research aimed to investigate therapeutic alternatives for patients with chronic skin eczema, as the drugs currently used are associated with side effects that can be more severe than the disease itself.

Materials and Methods:

In the experiment, 40 male rats were used and divided into four groups, each consisting of 10 animals. The experiment lasted for 18 days, and the test was conducted on the animal's ear. The first group received distilled water, while the second group was treated with 5% acetone to induce eczema. The third and fourth groups were treated with the plant's alcoholic extract at concentrations of 100 µg/mL and 200 µg/mL, respectively, in addition to acetone as a control treatment group.

Results:

The results indicated a significant change ($P \leq 0.05$) in skin thickness in the second group compared to the control group. It was also observed that there was a change in skin colour, losing its natural rosy hue and developing cracks with dryness. While there were no statistically significant differences ($P \leq 0.05$) in the third and fourth groups that received the extract at concentrations of 100 and 200 µg/ml, with redness remaining, the dryness and skin cracks were less pronounced compared to the second group treated with acetone alone. While the change in ear weight showed negligible differences in the first group (control), statistically significant differences were observed in the second group. The third and fourth groups did not show any differences in ear weights when compared to the control.

Conclusion:

The thistle plant *Onopordium acanthium* is a medicinal plant that contains antioxidant compounds and exhibits anti-inflammatory effects, primarily in the treatment of skin diseases such as eczema. It helps reduce damage to the skin barrier and accelerates its repair. There is no significant toxicity of the plant towards skin cells at the applied concentration levels.

Key words: Eczema; Alcoholic extract; Acetone; *Onopordium Acanthium* ; *Rattus norvgicus*

INTRODUCTION

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Current knowledge of medicinal plants has accumulated through observation, measurement, and experimentation, highlighting their preventive and therapeutic importance and the actual need for humans to seek natural remedies with a direct impact on health [1]. The spiny thistle it is an annual medicinal plant with many branches, reaching a height of up to two meters sometimes, living in dry environments. *Onopordum acanthium* on riverbanks, it grows in spring, with purple flowers and a winged stem that has a woolly appearance [2].

The plant contains many medically important antioxidant compounds in its various aerial parts, such as flavonoids and monounsaturated fatty acids [3]. The root of the plant also contains highly active substances against certain types of human cancers. Lactone and aldehyde compounds have been isolated and are distinguished by their antioxidant activity. Additionally, it possesses a high percentage of linoleic acid and alpha-linolenic acid, which are found in significant amounts in the roots [4]. Despite the widespread use of chemical compounds in the treatment of diseases, the phenomenon of drug hypersensitivity and the side effects associated with treatment remain. Among the challenges faced by physicians and drug developers is the use of corticosteroids to treat or relieve symptoms of certain skin conditions such as eczema and psoriasis, which are accompanied by serious side effects such as skin thinning, increased susceptibility to bacterial infections, and immune suppression [5].

Eczema is a skin condition characterized by bothersome symptoms such as itching, disturbances in the skin barrier, and changes in skin color. This disease is classified among those resulting from the interaction of environmental and genetic factors, which is what makes treatment difficult. Eczema affects both children and adults alike, with symptoms initially appearing as redness of the skin and worsening when accompanied by microbial infections, leading the disease to take on a chronic nature [6]

MATERIALS AND METHODS

- **Collection of the plant and extraction method**

The plant used in the experiment was collected from the areas adjacent to the Euphrates River near the Al-Musayyib district in Babil Governorate, Iraq, during the spring season in March. The plant was then cleaned of dirt, washed, and dried for use in the laboratory. After the plant was well-dried, the aerial and root parts were used, ground with an electric grinder, and 50 grams of the plant powder were taken. The plant powder was then placed in 70% alcohol to prepare the raw alcoholic extract of the plant according to Method [7].

- **Animals used in the experiment**

In the experiment, 40 male white rats were used, which were provided by the animal house of Kerbala University / College of Pharmacy. Their ages range from 12 to 14 weeks, with an average weight of 244 g. They were fed a diet consisting of grains and powdered milk.

- **Preparation of the concentrations used in the experiment**

The concentrations were prepared from the crude alcoholic extract at two concentrations of 100 and 200 µg/ml, following step [8].

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- **Experimental Design and Treatment Method**

The animals were randomly divided into four groups, each containing 10 rats, and were kept in suitable conditions of temperature and humidity. Water and food were freely available to the animals. Acetone and plant extract were applied during the 18-day experiment according to the measurement. The thickness of the animal's ear was measured on several days as follows (the first day - the fifth - the ninth - the thirteenth - the sixteenth and the eighteenth day) of the experiment.

The animals were divided as follows:

The first group was given distilled water only.

The second group was treated with 5% acetone only to induce eczema [9].

The third group was treated with 5% acetone and the plant extract at a concentration of 100 µg/ml.

The fourth group was given 5% acetone and the extract at a concentration of 200 µg/ml.

- **Statistical Analysis**

Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 25, in order to determine the extent of variation in ear weights as well as changes in ear thickness in the animals [10].

- **Observational Notes and Measurement Method**

The thickness of the rat's ear was measured before and after the test using callipers. After the experimental period, the animals were sacrificed, and the ear weights were measured after carefully and precisely removing the treated area from each animal. The ears of each rat were weighed individually for each of the four groups, and then statistical analysis was conducted.

RESULTS AND DISCUSSION

Dermatological diseases are among the most common illnesses nowadays. Some of these conditions can be chronic, remaining a source of concern and discomfort for the patient throughout their lifetime. Eczema is one of the most treatment-resistant skin diseases today and is therefore classified as a chronic disease, as it involves both genetic and environmental ,causes meaning it results from an interaction between genes and environmental factors [11].

Observations recorded that the skin had a soft texture and a natural pink colour, with no thickening, in the animals of the first group. In contrast, the skin of the animals in the second group, which had eczema induced using 5% acetone, became noticeably thicker and rougher, as well as exhibited changes in skin colour, compared to the first (control) group. These results indicated abnormal thickening and cracking in the affected skin, which necessitates the use of a topical treatment strategy along with systemic therapy, as noted in reference [12].

Chemical treatments often lead to many side effects, especially with repeated use. Among these drugs is cortisone, which is prescribed to relieve symptoms of eczema and psoriasis.

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Unwanted side effects include skin thinning and the loss of the skin's immune barrier function, making it more susceptible to inflammatory microbes.

Meanwhile, both the third and fourth groups, which were treated with acetone and the plant extract at concentrations of 100 and 200 µg/ml, respectively, showed milder symptoms. The ear skin was less thick, especially in the fourth group, compared to the second group that received acetone only. However, there was still a slight statistically significant difference between the third and fourth groups compared to the first group at a probability level of ($P \leq 0.05$). See Table (1). These results are consistent with those found in study [13], which showed that plant extracts contain biologically active compounds that reduce skin inflammation and prevent eczema-induced thickening. The same study also reported that the crude extract significantly reduced transepidermal water loss, thereby preventing dryness and cracking, and positively impacting the prevention of itchiness associated with eczema.

Table (1): Changes in Animal Ear Thickness(mm) at Different Periods of the Experiment.

Variable	Group 1 (control)	Group 2 (acetone %5)	Group 3 acetone %5 and the plant extract at a concentration of 100 µg/ml.	Group 4 acetone %5 and the plant extract at a concentration of 200 µg/ml.
Before the experiment	0.22±0.181	0.24±0.189	0.21±0.184	0.21±0.183
Day 1 of the experiment	0.26±0.189	0.31±0.193	0.17±0.190	0.10±0.191
Day 5 from start of experiment	0.10±0.192	0.03±0.224	0.30±0.198	0.05±0.194
Day 9	0.02±0.195	0.08±0.289	0.07±0.212	0.09±0.203
Day 13	0.03±0.196	0.10±0.335	0.02±0.247	0.04±0.232
Day 16	0.01±0.196	0.12±0.389	0.08±0.259	0.07±0.241
Day 18	0.09±0.201	0.13±0.421	0.05±0.281	0.01±0.261

(Standard error ± mean)

There are many medicinal plants, including *Onopordium acanthium*, which contains natural compounds with diverse chemical structures, including monounsaturated fatty acids such as oleic and linoleic acids. It also contains antioxidant compounds like flavonoids and terpenes. These compounds act synergistically to reduce and alleviate disease-related symptoms without causing harmful side effects. In particular, free fatty acids play a major role in penetrating deep into the skin layers, making them effective in treating eczema [14].

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A study [15] conducted on mice with induced eczema highlighted the importance of natural plant-derived extracts. Among these compounds is hydroxyluteolin, a member of the flavonoid family, which is abundant in the extract of *Onopordium acanthium*. This compound elicited a strong local anti-inflammatory response, reduced skin redness, prevented cracking and skin thickening, and showed fewer side effects or immune reactions compared to corticosteroid derivatives.

Table (2): Changes in Ear Weight in Rats

No.	Group (N=10)	Ear Weight(g)
1	Control	0.012
2	Model	0.037***
3	Treatment Con.. (100)	0.023**
4	Treatment Con..(200)	0.014*

The use of natural compounds is considered a top priority in alternative medicine, providing therapeutic alternatives such as herbal preparations in the form of creams, which are created by mixing plant extracts to produce effective formulations. The results of numerous studies have demonstrated that such formulations reduce the incidence of side effects associated with synthetic or hormonal drugs [16].

In a study [17] conducted on a murine in vitro model to test extracts of the plant *Onopordium acanthium*, it was found that the plant possesses unique antioxidant and antimicrobial properties relevant to inflammatory environments, particularly chronic skin diseases. The use of plant-derived compounds resulted in a reduction in local cytokine and inflammatory factor levels, while enhancing immunity. Such studies open broad horizons for research and the development of drugs or plant-based preparations with milder effects compared to currently used chemical substances.

CONCLUSIONS

The thistle plant, *Onopordium acanthium*, is a medicinal plant that contains antioxidant compounds and exhibits anti-inflammatory effects, primarily when used to treat certain skin conditions, such as eczema. It helps reduce damage to the skin barrier and accelerates its repair. The plant shows no notable toxicity toward skin cells within the applied concentration limits. Plant extracts may serve as safe alternatives to corticosteroid-based drugs, offering fewer side effects. *Onopordium acanthium* is considered a promising plant in pharmaceutical research and alternative medicine for the development of safer and more effective drugs.

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Conflict of interests

There are non-conflicts of interest.

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الخلاصة

المقدمة:

تناولت الدراسة بيان فعالية المستخلص الكحولي لنبات *Onopordium acanthim* على مرض الاكزيما المستحث بالاسيتون 5% في الجرذان البيض *Rattus norvgicus* بهدف البحث والتحري عن بدائل علاجية لمرضى الاكزيما الجلدية المزمن، أذا أن العقاقير المستخدمة في الوقت الحاضر تترافق مع أعراض جانبية تصل الى حد الخطورة أكثر من المرض ذاته.

طرق العمل:

استخدمت في التجربة 40 من ذكور الجرذان قسمت الى أربع مجاميع، كل مجموعة مكونة من 10 حيوانات، ودامت التجربة 18 يوم. تم الاختبار على أذن الحيوان حيث تلقت المجموعة الأولى ماء مقطر، أما الثانية فقد وضع عليها الاسيتون 5% لأحداث مرض الاكزيما فيها اما المجموعتين الثالثة والرابعة فقد عوملتا بالمستخلص الكحولي للنبات بالتراكيز µg/mL (100، 200) على التوالي بالإضافة الى الاسيتون كمجموعات علاجية.

النتائج:

حيث بينت النتائج أن هناك تغير ملحوظ ذو دلالة معنوية بنسبة احتمال ($P\leq0.05$) في سمك الجلد في المجموعة الثانية مقارنة مع مجموعة السيطرة كما لوحظ ان هناك تغير في لون البشرة حيث فقدت اللون الوردي الطبيعي وتشققات مع جفاف. بينما لم تكن هناك فروق ذات دلالة معنوية ($P\leq0.05$) في المجموعتين الثالثة والرابعة اللتين تلقتا المستخلص بتركيز µg/ ml (200،100) مع بقاء الاحمرار، كما ان جفاف الجلد والتشققات اقل عند المقارنة مع المجموعة الثانية التي عوملت بالاسيتون وحدة. في حين ان التغير في وزن الاذن فقد كانت الفروق المعنوية تكاد لا تذكر في حيوانات المجموعة الاولى (السيطرة) بينما كانت هناك فروق ذات دلالة احصائية في المجموعة الثانية فيما لم تسجل المجموعتان الثالثة والرابعة اي فرق في الاوزان للأذن عند المقارنة مع السيطرة.

الاستنتاجات:

نبات الاقسون الشوكي *Onopordium acanthim* من النباتات الطبية يحتوي على مركبات مضادة للأكسدة وذات تأثير مضاد للالتهابات وخاصة على الأمراض الجلدية منها الإكزيما، ويعمل على تقليل الضرر في حاجز البشرة وتسريع إصلاحه، لا يوجد سمية تذكر للنبات تجاه الخلايا الجلدية عند حدود التراكيز المطبقة.

الكلمات المفتاحية:

الاكزيما; المستخلص الكحولي; الاسيتون; *Rattus norvgicus; Onopordium acanthium*