

Research on The Wound-Healing Activity Of “Isatis Tinctoria L. Seed Oil”

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Abstract

As a result of the study, preclinical studies were conducted to determine the wound-healing activity of Isatis tinctoria seed oil in comparison with sea buckthorn oil. It was found that the oil under study accelerates epithelial regeneration, promotes wound healing and does not cause irritation.

Keywords: Isatis tinctoria seed oil, sea buckthorn oil, laboratory mice, wound-healing activity.

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1. Introduction

Herbal remedies combine an etiotropic effect on disease pathogens with a beneficial effect (anti-inflammatory, regenerative, etc.) on the patient's body. Plant materials rich in polyphenolic compounds (phenolic acids, flavonoids, coumarins, indican glucoside, alkaloids of the indole and quinolizidine groups) have been used for centuries to treat bacterial diseases [1,2,7].

Isatis tinctoria L., widely known as woad, is a species with an ancient and well-documented history of use as an indigo dye and medicinal plant. Currently, I. tinctoria is more commonly used as a medicinal product and as a cosmetic ingredient. Previously, we conducted studies to determine the antibacterial activity of woad seeds and proved the activity of seeds and oil against certain strains of bacteria. In addition, a study of the chemical composition of woad oil revealed fat-soluble vitamins and fatty acids that have a

wound-healing effect. As a result, in order to prove these assumptions, it was decided to conduct a study of the wound-healing activity of the oil [3,4,8].

The aim of the study is to investigate the wound-healing activity of “Isatis tinctoria seed oil” in a skin wound model in mice, taking into account the dynamics of skin epithelialization and the antimicrobial effect.

The object of the study is Isatis tinctoria seed oil. The object was transferred to the scientific laboratory of innovative pharmaceutical compounds at the Tashkent Pharmaceutical Institute.

2. Methods

Wound-healing activity was studied on a model of complete skin excision in mice. The experiments were conducted on 15 white non-pedigree mice weighing 18–22 g, divided into three groups of 5 animals [5].

To simulate a wound defect in animals, a 1 cm diameter area of skin was excised from the dorsal region of the back under aseptic conditions. The wounds were not covered with bandages and remained open throughout the experiment.

The animals received the test samples for 16 days at a dose of 500 mg/kg in the form of 100% oil:

1. Control group – animals were given sunflower oil at a dose of 0.01 ml/20 g of body weight.
2. “*Isatis tinctoria* seed oil” – animals were given “*Isatis tinctoria* seed oil” at a dose of 500 mg/kg, in a volume of 0.01 ml/20 g.
3. Sea buckthorn oil – animals received sea buckthorn oil at a dose of 500 mg/kg, in a volume of 0.01 ml/20 g.

Wound healing activity was assessed every other day throughout the experiment by measuring the wound area using the ImageJ program.

The criterion for effectiveness was a reduction in wound area compared to the control group.

The results were processed using ANOVA variation statistics at a significance level of $p=0.05$, using GraphPad Prism version 8.0.0 for Windows, GraphPad Software, San Diego, California, USA, www.graphpad.com [6].

3. Results

Based on a model of complete skin excision in mice, the wound-healing activity of the samples under study was evaluated by measuring the wound area on different days of the experiment (Tables 1 and 2).

In the control group, wounds healed more slowly compared to the experimental groups. On day 6, the wound area was 87.63%, and by day 16, it had decreased to 7.38%. Complete wound closure was not achieved by day 16.

In the group receiving “*Isatis tinctoria* seed oil,” wound healing was significantly faster. By day 6, the wound area had decreased to 50.38%, and by day 12, it was only 6.94%. Complete wound closure was observed on day 14, indicating the pronounced wound-healing activity of this oil.

The group receiving sea buckthorn oil also showed a high rate of wound healing. On the 6th day, the wound area was 59.20%, and by the 10th day, it was 14.97%. Complete closure of the wound occurred by the 16th day.

A comparative analysis showed that madder seed oil has the most pronounced wound-healing activity, ensuring complete closure of wounds by the 14th day. Sea buckthorn oil also promoted accelerated healing, but the process was less intense. In the control group, wounds healed significantly slower, and complete closure was not achieved by day 16.

Table 1

**Results of a study of the wound-healing activity of “*Isatis tinctoria* seed oil”
(*** $p<0.001$, $M\pm SD$; $n=5$; $p=0,05$)**

Groups	Wound area on day 12 (mm ²)
Control group	28,43 ± 5,39
“ <i>Isatis tinctoria</i> seed oil”	6,94*** ± 1,47
“Sea buckthorn oil”	4,78*** ± 3,21

Table 2

Results of studying the wound-healing activity of “*Isatis tinctoria* seed oil”

Groups	Day	Wound area (mm ²)
Control group	0	97,66
	2	97,48
	4	100,68
	6	87,63

	8	68,67
	10	50,02
	12	28,43
	14	17,32
	16	7,38
"Isatis tinctoria seed oil"	0	95,77
	2	91,41
	4	80,5
	6	50,38
	8	30,92
	10	17,35
	12	6,94
	14	0
"Sea buckthorn oil"	0	96,11
	2	105,62
	4	88,03
	6	59,2
	8	25,78
	10	14,97
	12	4,78
	14	0,29
	16	0

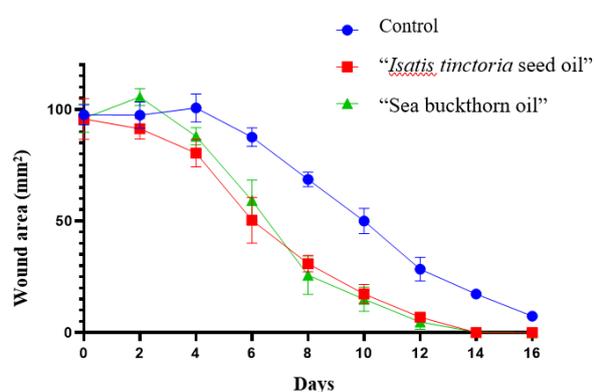


Figure 1. Results of studying the wound-healing activity of "Isatis tinctoria seed oil", by wound area (p<0.001, M±SD; n=5; p=0.05)**

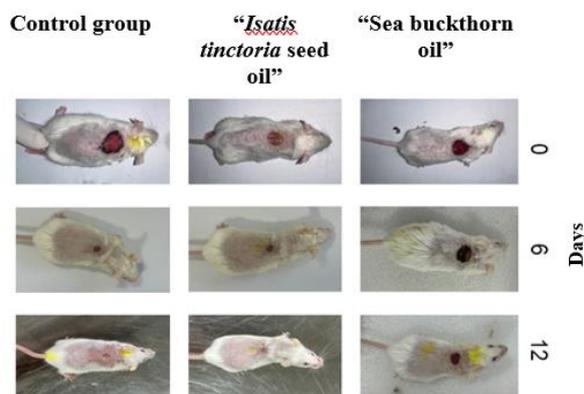


Figure 2. Results of studying the wound-healing activity of "Isatis tinctoria seed oil"

4. Conclusion

The study showed that "Isatis tinctoria seed oil" has pronounced wound-healing activity, promoting complete wound closure by the 14th day. Sea buckthorn oil also accelerated healing, but the process was less intense, and

complete closure of wounds was observed only by the 16th day. The results confirm the promise of "Isatis tinctoria seed oil" as an effective wound-healing agent.

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