

Study of the anti-inflammatory and
antibacterial activity of the herb
hawk throat

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The study of anti-inflammatory and antibacterial activities
of the herb *Picris hieracioides* L.

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SUMMARY

Acute toxicity, anti-inflammatory and antibacterial activity of the herb hawk-throat were studied. Acute toxicity study according to the method of B.M. Shtabskiy showed that the infusion of throat herb is practically non-toxic. The anti-inflammatory activity of the infusion from the herb throat hawkworm was studied by its effect on different stages of the inflammation process: exudation and proliferation. Antiexudative activity was studied in a model of acute inflammatory edema caused by subplantar injection of 0.05 ml of a 2.5% formalin solution into the hind paw of a mouse. The anti-inflammatory activity of the infusion was 43.17%. Antiproliferative activity was studied using the "cotton granuloma" model, the antiproliferative effect was 59.19%. Antibacterial activity was determined in vitro on the reference strains of test cultures: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia Coli*, *Proteus vulgaris*, *Bacillus cereus*, *Candida*. It was shown that the herb of throat hawkworm in the form of an infusion exhibits antimicrobial activity against fungi of the genus *Candida* and the test culture of *Pseudomonas aeruginosa*.

Key words: grass, hawk throat, acute toxicity, antiexudative activity, antiproliferative activity, antibacterial activity.

RESUME

An acute toxicity, anti-inflammatory and antibacterial activity of a herb of *Picris hieracioides* L. were studied. An acute toxicity was studied by the Shtabsky method, as a result of it, it was determined that infusion of a herb of *Picris hieracioides* L. is non-toxic. Anti-inflammatory activity of this infusion was studied by influence on the different stages of inflammation process: exudation and proliferation. An anti-exudative activity was explored on the model of acute inflammatory swelling, which was raised by an injection 0.05 ml 2.5% formaline solution in the mouse hinder leg. For the discovering of proliferative properties we used a model of "cotton granuloma". An anti-inflammatory action of infusion of a herb of *Picris hieracioides* L. appears in oppression of an exudative (43.17%) and proliferative stages (59.19%). An antibacterial activity was determined in vitro on the reference strains of test-cultures: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia Coli*, *Proteus vulgaris*, *Bacillus cereus*, *Candida*. The infusion of herb *Picris hieracioides* L. has antibacterial activity against *Candida* and *Pseudomonas aeruginosa* test culture.

Keywords: herba, *Picris hieracioides* L, acute toxicity, anti-exudative activity, antiproliferative activity, antibacterial activity.

INTRODUCTION

Hawkeye throat (*Picris hieracioides* L.) - biennial or perennial herb, growing in the black earth zone of the central part of Russia is quite wide [1]. Sesquiterpene lactones, triterpenes, polysaccharides, and phenolic compounds have been identified in the grass of throat hawkworm [2, 3, 4]. Many representatives of the listed groups of biologically active substances have anti-inflammatory activity [5, 6]. In this connection, it was relevant to conduct a study of the anti-inflammatory activities of the herb throat hawkwick.

The aim of this work is to study the acute toxicity, anti-inflammatory and antibacterial activity of the herb throat hawkwick.

The object of the study was the air-dry crushed grass of the hawk's throat (*Picris hieracioides* L.). Raw materials were procured in 2016–2017 in the Kursk region during the flowering period of the plant.

MATERIALS AND RESEARCH METHODS

To study the pharmacological properties, an infusion of hawk throat herb was prepared. The infusion was received according to the article "Infusions and decoctions" of the State Pharmacopoeia of the XIII edition [7].

The experiments were carried out in accordance with the established documents "On the approval of the rules

laboratory practice "(Ministry of Health of the Russian Federation, order No. 267 of June 19, 2003), Good Laboratory Practice for Nonclinical Laboratory Studies (FDA, 21 CFR Part 58, 12/22/1978), OECD Principles on Good Laboratory Practice (OECD, ENV / MC / CHEM (98) 17, 1977).

The study of acute toxicity was based on the method of Shtabskiy B.M., according to which the obtained infusion of throat grass was injected intraperitoneally once, using doses from 1 g / kg to 5 g / kg in volumes from 0.2 to 1 ml (in terms of dry raw materials). Experimental studies were carried out on outbred white mice of both sexes, weighing 18.0–20.0 g. Each group of animals (6 mice) after the administration of the studied infusion was placed in an isolated cage and observed for 24 hours, observing the standard temperature and food regime [eight].

The study of anti-inflammatory activity was carried out on two species of animals: outbred white mice weighing 18.0–20.0 g and white outbred rats weighing 180.0–220.0 g. "

The anti-inflammatory activity of the infusion of the herb throat hawkworm was studied by its effect on different stages of the inflammation process: exudation and proliferation [6, 9, 10]. To study the antiexudative activity, a model of acute inflammatory edema was used, which is based on the subplantar injection of a 2.5% formalin solution (0.05 ml) into the hind paw of a mouse. The control group of mice was injected with an equivalent volume of purified water. To experimental animals, the studied infusion was injected intraperitoneally 2 hours before the introduction of formalin, and then after 5 and 18 hours after its administration at a dose of 1 g / kg (in terms of air-dry raw materials) of the mouse body weight.

To study the antiproliferative properties, a "cotton granuloma" model was used, for which the rats were given light ether anesthesia, while the hair was cut off in the back area and a longitudinal incision of the skin and subcutaneous tissue 1–2 cm long was made under aseptic conditions. A cavity was formed in the subcutaneous tissue with tweezers, then a pre-sterilized cotton ball weighing 25 mg was placed in it and 1–2 sutures were applied to close the wound. For 7 days, the rats received an infusion of hawkworm throat at a dose of 1 g / kg of rat body weight. After 7 days, the animals were sacrificed, the ball, together with the granulation tissue formed around it, was removed, dried to constant weight at 55–60 ° C, and weighed. The mass of the formed granulation-fibrous tissue was determined by the difference in the mass of the dried granuloma and the mass of the implanted cotton ball. The control group of animals was injected with an equivalent volume of purified water. Indomethacin was used as a reference drug at a dose of 6 mg / kg of rat weight.

The antibacterial activity of the water extract (infusion) was determined in vitro on reference strains: Staphylococcus aureus, Escherichia Coli, Proteus vulgaris, Pseudomonas aeruginosa, Bacillus cereus, Candida [10].

The data obtained as a result of experimental studies were processed statistically using generally accepted methods. For the reliability of the research results, the Student's t test was applied [7].

RESULTS AND DISCUSSION

When conducting studies on the study of the acute toxicity of the infusion of the herb throat hawkworm, lethargy, inhibition of the motor activity of animals, lethargy were observed throughout the day; these phenomena increased with an increase in the dosage of the infused infusion (water extract). However, after one day, the animals returned to normal, and their behavior did not differ from the intact ones. The experiment did not allow determining the LD50, since the administration of the maximum dose allowed by the volume of the infusion administered to the mice did not lead to the death of the animals. The results of the experiments made it possible to establish that the infusion in the studied doses from 1000 mg / kg to 5000 mg / kg can be classified as "practically non-toxic" according to the classification of EA Luzhnikov. [eight].

The study of the antiexudative activity of the infusion of the herb throat hawkweed on the model of inflammation caused by the introduction of a formalin solution, made it possible to establish that the administration of the infusion led to inhibition of edema (34.47 ± 3.78 mg) in comparison with the data of the control group (60.65 ± 1.55 mg) (Table 1). At the same time, the antiexudative activity (the effectiveness of the anti-inflammatory action was 43.17%) of the infusion of the throat herb hawkweed exceeds the effect of the reference drug - acetylsalicylic acid (anti-inflammatory activity - 29.20%).

The study of the influence of the infusion of the herb throat hawkworm on the proliferative phase of inflammation showed that the introduction of this infusion leads to a slowdown in the development of granulomas, which is close in action to the reference drug indomethacin (Table 2). Thus, in the control group of animals, the weight of granulation tissue was 139.95 ± 8.16 mg. We took this value as 100.00%. The effect of infusion of hawk throat on the size of granulation tissue in comparison with the control data was 44.44 ± 3.28 mg, which led to a significant decrease in the inflammatory process by 68.25%.

Table 1

Influence of the herb infusion of throat hawkworm on exudation processes
(formalin edema model)

Injected drug, dose	Weight of legs, mg		Edema mass		Efficiency proinflammatory actions, %
	Left	Right	(M ± m), mg	%	
Control group	130,60	191.25	60.65 ± 1.55	100,00	-
Acetylsalicylic acid, 300 mg / kg	115.31	158.26	42.95 ± 3.04 *	70,80	29.20
Grass throat hawkworm (infusion), 1 g / kg	123.16	167.63	34.47 ± 3.78 *	56.83	43.17

Note: * - differences in comparison with the control data are statistically significant at $P < 0.05$; the number of animals in each variant of the experiment is 6.

table 2

Influence of infusion of the herb throat hawkworm on the development of "cotton granuloma"
when administered orally

Injected drug, dose	Number of animals in Group	Dry granuloma weight (M ± m), mg	Percentage of oppression education granulomas
Control	6	139.95 ± 8.16	-
Indomethacin, 6 mg / kg	6	44.44 ± 3.28 *	68.25
Grass throat hawkworm (infusion), 1 g / kg	6	57.12 ± 6.44 *	59.19

Note: * - the differences are statistically significant at $P < 0.05$ versus control data; the number of animals in each variant of the experiment is 6.

The study of antibacterial activity showed that the infusion of throat herb hawkworm showed a pronounced antimicrobial activity against fungi of the genus *Candida* at concentrations of 1: 2 and weak growth at a concentration of 1: 4 and 1:10; in relation to the culture of *Pseudomonas aeruginosa*, the infusion exhibited antimicrobial effect at a concentration of 1: 2, at a concentration of 1: 4, a bactericidal effect was observed.

CONCLUSIONS

1. The results of a study of the acute toxicity of the infusion of the herb throat hawkworms allowed to refer it to a class of practically non-toxic.
2. The anti-inflammatory effect of the hawk throat infusion is manifested in the inhibition of the stage exudation and proliferation, while antiexudative activity was 43.17%, antiproliferative - 59.19%.
3. It has been established that the grass of throat hawkworm exhibits antibacterial activity against mushroom genus *Candida* and *Pseudomonas aeruginosa* test cultures.

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