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# THE PATHOGENETIC EFFECT OF THE HYDROGEL PRESERVING THE EXCUDATIVE PHASE OF INFLAMMATION

**Yakubova Umida Bahtiyarovna[1], Nurullayev Sardor Xushnudovich[2]**

[1]Senior Lecturer, Department of Physiology and Pathological Physiology, PhD

[2]Assistant of the department of microbiology, virology and immunology

*Urganch State Medical Institute, Urgench, Uzbekistan*

**Tel.:** +998977920182

**E-mail:** umida_umida2020@mail.ru

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**Abstract:** Many plants have been known to cure various diseases since ancient times. Even the oldest examples of writing, created in the years before Christ, contain information about the healing properties of plants. Some natural drugs considered valuable were isolated in pure form decades ago. But there are many plants that have not yet been studied and whose medicinal properties have not been scientifically tested.

**Key words:** Phlogogens, medicinal substance, alkaloids, histamine, dextran, leaf sap.

## Introduction

A number of scientific studies are being conducted around the world to improve the therapeutic efficacy and prevent side effects of anti-inflammatory drugs. Despite the wide range of anti-inflammatory drugs currently used in practice, there is a high demand for new drugs that exhibit high pharmacological activity and have minimal side effects.

One such plant is the field ivy, a member of the Ivy family, which is widespread in all regions of Uzbekistan. The peoples of Central Asia call this plant differently. The Turkmens call it cherapechak, the Kazakhs call it shermatik, the Turks call it chermashik, and the Russians call it vyunok polevoy. The Institute of Plant Chemistry of the Academy of Sciences of Uzbekistan has made a great contribution to the discovery of medicinal plants and the extraction of

alkaloids from them. The field ivy plant is a perennial herb from the family Ivyaceae, growing as a creeper or creeping plant, with a stem length of 40-100 cm. Its leaves are arcuate, lanceolate with a sharp tip. The field ivy blooms in March-April. It blooms from March to August. The flowers are white or pink, trumpet-shaped. The fruit ripens in June-September. The fruit is broadly ovoid, hairless, 6-8 mm long. The field ivy grows abundantly in irrigated lands. It is spread everywhere in our republic. In order to prepare medicines from the plant, the above-ground part of the plant is collected and dried in a cool, shady place. The above-ground parts of the plant contain flavonoids, caffeic acid, carotene, vitamin C, resins and some alkaloids. Many medicinal preparations are prepared from this plant.

The scientific significance of the results of the research is that it is used for the first time in the form of a gel from local plant sources, the possibility of finding among them highly effective agents that stimulate anti-inflammatory properties, and the main aspects of the mechanism of action of the gel that preserves the extract of field ivy are highlighted.

Our research investigated the anti-inflammatory effect of a hydrogel containing field ivy extract. The object of the study was a gel prepared from a complex of biologically active substances isolated from the aerial parts of the field ivy plant. The anti-inflammatory effect of the gel containing field ivy extract was compared with ibuprofen gel. Due to the complexity of the inflammatory process, it is difficult to select drugs that will act against it. In our research, the anti-inflammatory effect of a hydrogel containing a dandelion extract was studied. The object of the study was a gel prepared from a complex of biologically active substances isolated from the aerial parts of the dandelion plant.

**Materials and research methods.** The anti-inflammatory effect of the studied drugs is determined by the difference between the growth of the paw volume of the experimental and comparison group animals or the difference between the amputated paws of mice. To carry out the tasks set before us, white rats weighing 155-180 g were used. Formalin, dextran, histamine, serotonin and carrageenan were used as phlogogenic agents. It is known that physiologically active substances - inflammatory mediators (histamine, serotonin, bradykinin) are released under the influence of various tissue-injuring agents.

These active substances play an important role in the course of the inflammatory process. It is clear from this that the inflammatory process can be induced by the introduction of the above-mentioned agents into the body. In the initial period of inflammation, a significant exudation phase is observed. After the primary alteration, increased vascular permeability in response to the action of the injurious agent leads to the passage of blood plasma and formed elements from the focus of inflammation into the surrounding tissues, which causes the edema characteristic of inflammation.

**The obtained results and their analysis.** Histamine and serotonin are of practical importance for 15-20 minutes after exposure to inflammatory agents, and then, when proteolytic enzymes are released in damaged cells, they decrease in tissues, and an increase in the concentration of biogenic amines leads to increased activity of the kallikrein-kinin system. Kinins are neurovasoactive polypeptide substances that have various effects on the function of smooth muscles, kidneys, lungs and heart, and on the permeability and tone of the blood vessel walls. Among the above-mentioned phlogogenic agents, formalin is widely used by most researchers because formalin-induced inflammation occurs rapidly, with maximum swelling occurring after 5-6 hours and is rapidly reabsorbed. In addition, formalin-induced inflammation is close to the inflammatory process that occurs in the human body. 0.1 ml of a 0.1% histamine and 0.2% serotonin solution was injected under the aponeurosis of the hind paw of the rat using a syringe. The volume of the rat paws was measured oncometrically before and every 60 minutes for 4 hours after the administration of the phlogogenic agents, and the last time was 24 hours later. Inflammation under the influence of histamine and serotonin occurs very quickly, with maximum swelling of the paws observed after 1-1.5 hours and resorption within the last 24 hours.

In experiments, we conducted studies to determine the antiexudative effect of Field ivy extract gel in comparison with ibuprofen gel in histamine and serotonin aseptic models. The results of these series of experiments show that subplantar administration of histamine increased the paw volume of rats by 72.3% compared to the initial volume.

**Table 1**

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**Anti-inflammatory effects of 5% hydrogel containing field ivy extract and 5% ibuprofen gels on histamine-induced inflammation**

| Groups | Initial paw size is cm3 | After 1 hour, the size of the paw is cm3 | After 1 hour, the size of the paw is cm3 | After 3 hours, the size of the paw is cm3 | After 4 hours, the size of the paw is cm3 |
|---|---|---|---|---|---|
| Control | 100% | 72,3% | 57,4% | 38,6% | 19,8% |
| FIE | 100% | 38,3% | 48,3% | 58,9% | 65,0% |
| IBP | 100% | 28,8% | 34,5% | 38,5% | 40,0% |

In histamine-induced animals, 1 hour after application of the gel, the anti-inflammatory activity of the ivy extract was 38.3%, and the anti-inflammatory activity of the ibuprofen gel was 28.8%. It can be seen that the used gels significantly affect the exudation process caused by histamine.

Histamine (produced in basophilic and mast cells) exerts its effect through 2 different types of receptors, N1 and N2. When histamine acts on N1 receptors, it causes pain. When acting on N2 receptors, it increases the production of prostaglandins and thromboxane, reduces chemotaxis and phagocytic activity of neutrophils, and reduces the release of lysosomal enzymes by neutrophils. Acting through both types of receptors, histamine dilates precapillary arterioles at the site of inflammation, narrows vessels in the lungs, and increases the permeability of the vascular wall in the skin and some organs.

**Table 2**

**Anti-inflammatory effects of 5% hydrogel containing field ivy extract and 5% ibuprofen gel on serotonin-induced inflammation**

| Groups | Initial paw size cm $^3$ | After 30 min, the size is cm3 | After 60 min, the size is cm3 | After 90 min, the size is cm3 | After 120 min, the size is cm3 | After 180 min, the size is cm3 | After 240 min, the size is cm3 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Control | 100% | 74,1% | 90,6% | 78,8% | 54,1% | 38,8% | 23,5% |
| FIE | 100% | 39,7% | 41,5% | 47,8% | 47,8% | 69,7% | 90% |
| IBP | 100% | 28,6% | 33,7% | 35,8% | 35,8% | 63,6% | 80% |

The anti-inflammatory activity of the tested drug in the serotonin model was highly effective, and its effect was similar to the anti-inflammatory effect induced by histamine.

**Summary**

1. Gel containing field ivy extract, when applied topically, showed high antiexudative activity in aseptic inflammations caused by various phlogogens. At the same time, it is not inferior in its pharmacological activity to the well-known nonsteroidal anti-inflammatory drug ibuprofen.
2. The fact that the gel prepared from field ivy extract did not cause changes in hematological and biochemical parameters with prolonged use indicated that it is a non-toxic compound.

**Literature:**

1. Хакимов З.З., Рахманов А.Х., Шукурлаев К.Ш., Якубова У.Б. Противовоспалительная активность экстракта вьюнка полевого при местном применении. // Назарий ва клиник тиббиёт журнали. – Тошкент, 2020. №3. –С. 73-75. (14.00.00; №3).

2. Khakimov Z.Z., RakhmanovA.Kh. ShukurlaevQ.Sh., Yakubova U.B.Study of Antiexudative effect of gel containing extract of convolvulus arvensis. // American journal of Medicine and Medical Sciences. – 2021, 11 (3): – P. 219-223. (14.00.00; №2).

3. Якубова У.Б. Фармакологическое изучение геля содержащий экстракт вьюнка полевого-convolvulus arvensis. // Academic Research in Educational Sciences. –2021. Volume 2, Issue 7. – С.44-51. (SJIF 2021: 5.723 №23).

4. Yakubova U.B. Study of the effect of Convolvulus arvensis extract gel on the aseptic arthritis caused by different phlogogens in white rats. // Биомедицина ва амалиёт журнали: 2021. №4 –С. 31-36. (14.00.00; №24)

5. Хакимов З.З., Рахманов А.Х., Якубова У.Б. Эффективность геля, содержащего экстракт Convolvulus arvensis, в лечении ожоговых ран.// Инфекция, иммунитет и фармакология.-2021. №5-С. 284-290. (14.00.00; № 15)

6. Якубова У.Б. Изучение влияния геля содержащий экстракт Convolvulus arvensis на течение экссудативных и пролиферативных процессов воспаления.// Инфекция, иммунитет и фармакология.-2021. №5 - С. 338-345. (14.00.00; № 15)

7. Khakimov Z.Z., Rakhmanov A.Kh., Yakubova U.B. Pre-clinical study of the safety of gels containing convolvulus arvensis extract. // Re-Health journal. –2021. №2 (10). – P. 214-219. (DOI:10.24411/2181-0443).

8. Khakimov Z.Z., Rakhmanov A.Kh., Shukurlaev Q.Sh., Yakubova U.B. Experimental substantiation of anti-inflammatiry activity of gel containing Convolvulus arvensis extract in carrageenan-induced aseptic artryritis. // National Journal of Physiology, Pharmacy and Pharmacology Accepted: 2021. April 17. – P. 645-647.

9. Якубова У.Б. Convolvulus arvensis экстрактидан тайёрланган гелнинг хар хил агентлар билан чақирилган яллиғланишга қарши таъсири. // Халқ табобати: 2021. – №3 – С.36-39.

10. Yakubova U.B. The importance of field bindweed in folk medicine// Journal of biomedicine and practice — 2023 — Vol/8, Issue 2 — P. 371–374.

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