

## SECTION XXV. PHARMACY AND PHARMACOTHERAPY

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### ANALYSIS OF THE PHYTODRUGS MARKET BASED ON COMMON IVY (*HEDERA HELIX L.*)

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UKRAINE

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**Abstract.** A review of the literature devoted to the study of common ivy and the prospects of its use in medical and pharmaceutical practice was carried out. Information on botanical characteristics, distribution in nature, chemical composition and spectrum of biological activity is summarized. An analysis of the pharmaceutical market of Ukraine for preparations based on common ivy and complex products containing this medicinal plant was carried out.

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The range of medicines on the pharmaceutical market is growing every year, which is connected not only with the rejuvenation of a number of diseases, but also with the commercial aspect. One of the directions of medicine, in which the assortment is replenished mainly with generic means, is diseases of the respiratory tract. However, with this pathology, medical and pharmaceutical scientists pay great attention to medicinal plants and herbal remedies, which is primarily due to the safety and effectiveness of these remedies. The use of phytoremedies in medicine has a positive effect on the patient's well-being and improves the recovery process. According to statistics, more than 80% of people use herbal remedies due to their low toxicity and good tolerability, and the share of medicines based on plant raw materials is more than 50% [1]. In the modern pharmaceutical market, there are many drugs used to treat cough. However, the appointment of synthetic mucolytics requires a differentiated approach, taking into account the undesirable effects of each drug. At the same time, herbal remedies have become widespread, which in terms of their expectorant and mucolytic effect are not inferior to synthetic ones, and in some cases they also have an additional anti-inflammatory effect. A promising source of pharmacologically active substances is common ivy, which helps to restore the rheological properties of sputum and, accordingly, improve the drainage function of the bronchi.

**The purpose of the work** is to search for information in literary and electronic resources, systematize data on the chemical composition, biological properties, as well as possible prospects for the use of common ivy in medical practice.

**Materials and methods.** The objects of research are literary and electronic sources of information on the range, chemical composition, pharmacological activity and use of this plant in medicine. Analytical review of the pharmaceutical market of Ukraine was conducted according to the data of official sources of information on medicinal products: the State Register of Medicinal Products of Ukraine, the Compendium-online directory, IPS "Morion".

**Results and their discussion.** Common ivy unites about 15 species of plants and belongs to the Araliaceae family, however, *Hedera helix* is the only plant of this family that is found wild in the territory of Ukraine, widespread in moderately moist and shady broad-leaved and mixed forests [2].

People call ivy bereschanyk, brechytn, britsia, powiikan, the official name comes from the Greek word "oedon" - "singer, bard" [3].

The name of the plant is shrouded in legends and superstitions, so in ancient Greece and Rome, ivy was a symbol of poets, its leaves were depicted on the ornaments of cups and jugs. The cult of Dionysus is associated with this plant, his statues were always wrapped in ivy. The ivy symbolized immortality, and the lifespan of the plant itself is 200-300 years [4].

Official raw materials are leaves that contain various groups of biologically active substances, in particular, triterpene saponins, hederosaponins B and C, hederosides A1, A2, A3, C, D1, D2, E, hederacoside A, tannins, coumarins, flavonoids [5], phenolic acids, essential oils, steroids, as well as inositol, carotene, pectin, iodine, formic and malic acids, and ivy shoots mainly contain gum and coumarins [6]. About 30 amino acids have been identified in the leaves, including 8 essential ones (valine, isoleucine, leucine, lysine, tryptophan, threonine, phenylalanine, methionine) and 2 partially replaceable ones (arginine, histidine) [7].

The diverse chemical composition of ivy causes a wide range of pharmacological properties, including pronounced expectorant and antispasmodic properties. Reflex stimulation of the secretion of goblet cells of the mucous membrane

of the bronchi is caused by the presence of oleanol-type saponins, which increase the volume of the secretion and improve its rheological properties, contribute to the moistening of the mucous membrane of the respiratory tract, reduce the viscosity of the secretion, and facilitate the kinetics of the cilia of the respiratory epithelium [8]. The components of the ivy leaf extract increase the sensitivity of  $\beta$ 2-adrenoceptors to adrenomimetics, including those of endogenous origin, which determines the adrenomimetic effect, and the content of alphahedrin prevents the blocking of  $\beta$ 2-adrenoceptors, improving their full functioning, orkim of this stimulates the formation of surfactant by cells of the alveolar epithelium, which ensures optimal rheological properties of tracheobronchial secretion. Thus, in randomized studies in children with bronchial asthma, it was shown that ivy extract has effects similar to the properties of  $\beta$ 2-adrenomimetics [9]. Experimental studies have also proven the anti-inflammatory, bactericidal and antifungal effects of ivy leaf extract. Thus, the pharmacological activity of ivy leaf extract indicates a positive effect of its use in broncho-obstructive diseases.

Wider use of ivy in folk medicine: internally in the form of aqueous infusions and decoctions for bronchitis, pneumonia, pulmonary tuberculosis, acute gastritis, duodenitis, diseases of the liver and biliary tract, acute and chronic enteritis and colitis, gout, urolithiasis and rheumatism , as a tonic agent after severe operations, craniocerebral injuries and in asthenia [Grodzinsky A.M. Medicinal plants. Encyclopedic guide / A. M. Grodzinsky. - Kyiv: Olymp, 1992. - 544 p. - pp. 353-354.; Gruenwald J. Medical Economics Company, Montvale / J. Gruenwald, T. Brendler, C. Jaenicke. // PDR for Herbal Medicines. – NJ 2000. – P. 275–280.]; externally used for inflammatory diseases of the genitals, thrush, psoriasis, as a wound-healing, antibacterial and antifungal agent, for the treatment of burns, calluses, furuncles and streptoderma, mycoses of the scalp, pediculosis and scabies.

Ivy extract is used as an independent remedy for the treatment of unproductive cough in the presence of thick, viscous and poorly separated sputum, it is also widely used in combination with other plants in productive cough to facilitate the discharge of sputum [10].

The Ukrainian pharmaceutical market offers a number of medicines made on the basis of phytosubstances of common ivy leaves in convenient dosage forms: syrup, drops, pastilles, tablets, effervescent tablets, lozenges, capsules (Fig. 1).

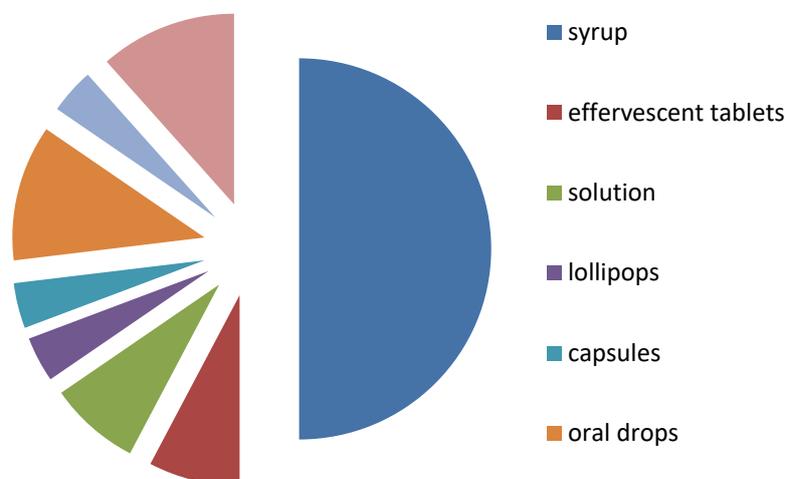


Fig. 1. A variety of dosage forms with ivy extract on the pharmaceutical market of Ukraine

It was established that the nomenclature of monopreparations based on common ivy includes 26 names among the list of those registered on the pharmaceutical market of Ukraine, three of which are complex homeopathic preparations (Table 1).

Table 1

**MEDICINAL PRODUCTS BASED ON COMMON IVY ARE REGISTERED IN UKRAINE**

<b>№</b>	<b>The name of the medicinal product</b>	<b>Medicinal form</b>	<b>Manufacturer</b>	<b>Country</b>
1	Pectolvan ivy	syrup	Farmak JSC	Ukraine
2	Prospan	syrup	Engelhard Arzneimittel GmbH & Co. KG	Germany
3	Gerbion® Ivy syrup	syrup	KRKA	Slovenia
4	Ivy syrup	syrup	PJSC Pharmaceutical factory "Viola"	Ukraine
5	Prospan forte	effervescent tablets	Engelhard Artsnaimittel GmbH & Co.KG	Germany
6	Hederal ivy	syrup	VITAMINY JSC	Ukraine
7	Bronchipret	syrup	«Bionorica AG»	Germany
8	Bronchipret	solution	«Bionorica AG»	Germany
9	Gerbion ivy	lollipops	KRKA	Ukraine
10	Ritosse ivy	syrup	PrJSC "Pharmaceutical firm "Darnytsia"	Ukraine
11	Pectolvan ivy	capsules	Farmak JSC	Ukraine
12	Bronchial plus with ivy, mallow and vitamin C	syrup	«Dr. Muller Pharma»	Czech Republic
13	Bronchipret	oral drops	«Bionorica AG»	Germany
14	Gedelix® cough syrup	syrup	«Krewel Meuselbach GmbH»	Germany
15	Gedelix® drops without alcohol	oral drops	«Krewel Meuselbach GmbH»	Germany
16	Hederin	syrup	LLC "DKP "Pharmaceutical Factory"	Ukraine
17	Dr. Theiss cough syrup with ivy extract	syrup	Dr. Theiss Naturwaren GmbH	Germany
18	Ivitusin	syrup	Borshchagiv chemical and pharmaceutical plant	Ukraine
19	Herbalor ivy against cough	syrup	Medana farm	Poland
20	Broncholex	solution	Salutas Pharma GmbH	Slovenia
21	Prospan	oral drops	Engelhard Arzneimittel GmbH & Co. KG	Germany

Continuation of table 1

No	The name of the medicinal product	Medicinal form	Manufacturer	Country
22	Prospan	lozenges for absorption	Engelhard Arzneimittel GmbH & Co. KG	Germany
23	Prospan forte	effervescent tablets	Engelhard Arzneimittel GmbH & Co. KG	Germany
24	Itires hall spag peka ointment	complex homeopathic medicine	PECANA Naturheilmittel GmbH.	Germany
25	Herbapax syrup	complex homeopathic medicine	Klosterfrau Berlin GmbH	Germany
26	Gallium-Heel drops	complex homeopathic medicine	Biologische Heilmittel Heel GmbH.	Germany

Some medicines contain additional components - menthol, anise and eucalyptus oils, which enhance the anti-inflammatory, antiseptic, expectorant effect of ivy extract. The share of Ukrainian producers compared to foreign ones is only 30% against 70%, which indicates the prospects of creating domestic preparations based on ivy.

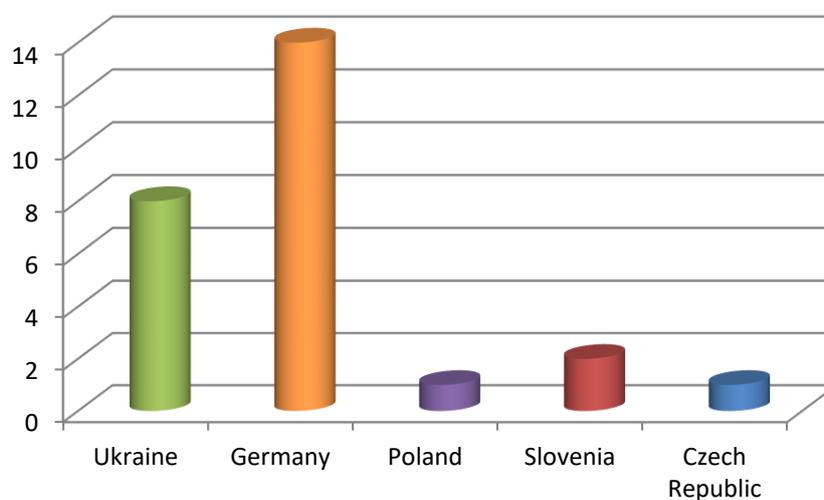


Fig. 2. **The structure of the domestic market of medicines based on ivy extract by producing countries**

All medicinal products registered in Ukraine based on the above-mentioned plant are used for the treatment of infectious-inflammatory and obstructive diseases of the respiratory system. Among these remedies are complex homeopathic drugs that have an immunomodulatory, anti-inflammatory, detoxifying and draining effect based on the activation of the body's defenses and the normalization of impaired functions [11].

Due to the natural composition, drugs with ivy extract are safe, and in terms of effectiveness, they sometimes surpass synthetic drugs, as they have a complex effect. The positive thing is that side reactions when taking such drugs occur quite

rarely, so they can be used for a long time. This is especially necessary for chronic respiratory diseases, such as bronchial asthma and obstructive lung disease. It should be noted that preparations based on ivy extract are safe for patients with diseases of the gastrointestinal tract.

**Conclusions.** A significant amount of biologically active substances contained in the leaves of common ivy and a wide spectrum of pharmacological action make it an effective therapeutic agent used in diseases of the upper and lower respiratory tract, accompanied by cough and sputum production. The analysis of the market of ivy drugs showed the need to create competitive and high-quality drugs of domestic production based on this medicinal plant.

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