THE ANATOMICAL STUDY OF SHEPHERD’S PURSE HERB

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The results of the anatomical study of shepherd’s purse (Capsella bursa-pastoris L.) herb are presented in the article. The main diagnostic features have been identified. The preparations were studied by a “LOMO Mikmed 1” light microscope at a magnification of 60-400 times. The research results were recorded with a SCIENCELAB 10.0MPix Colour CMOS digital camera. The results of the study can be used when developing a monograph “Shepherd’s purse herb” for the State Pharmacopoeia of Ukraine.

The medicinal raw material is one of the most important sources for developing drugs. Consistent quality and the proven pharmacological activity are the main requirements for using herbal drugs of both cultivated and wild medicinal raw material. The monographs of the State Pharmacopoeia of Ukraine are documents that regulate the quality of herbal drugs in Ukraine. They are presented both harmonized with the European Pharmacopoeia monographs and the national parts of monographs [2]. In certain cases the European Pharmacopoeia (Ph. Eur.) and the Pharmacopoeia of the Soviet Union of the XII-th edition have a different approach to standardization of the raw material, its quality indicators, methods of control, regulation, etc. However, focusing only on the requirements of the European Pharmacopoeia consumers and producers can lose a great number of the raw material, which is popular in Ukraine. Shepherd’s purse herb belongs to these kinds of the raw material used in medicine from ancient times [7, 10-13].

According to the concept of creation and introduction of monographs to the State Pharmacopoeia the herb of shepherd’s purse belongs to the list of herbal drugs described in Pharmacopoeia of the Soviet Union of the XII-th edition, and it is absent in the European Pharmacopoeia [2, 3, 6]. Therefore, development of the monograph for shepherd’s purse herb to include it to the State Pharmacopoeia of Ukraine is a topical issue. However, it is necessary to consider the world experience in the study of this type of the raw material, first of all, the requirements of the World Health Organization and various Pharmacopoeias (German, French, etc.) [2-4, 6].

One of the sections of the pharmacopoeial monograph is identification, which provides morphological and anatomical features of the medicinal raw material. The raw material of shepherd’s purse is called herb in the appropriate monographs in different Pharmacopoeias of the USSR, but identification includes only the microscopic characteristics of the leaf surface. Only Pharmacopoeia of the Soviet Union of the IX-th edition included description of the leaf surface and the stem epidermis [2]. The British Herbal Pharmacopoeia determines the microscopic characteristics of the stem, leaves, flowers, fruits, seeds [9].

Shepherd’s purse – Capsella bursa-pastoris L. (Medic.) is an annual herbaceous plant of the Brassicaceae family. The stem is erect, simple or branched, 10-50 cm tall. Leaves are alternating; radical leaves – in the socket, petiolate, pinnate, divided into triangular serrated shares; stem leaves – sessile, entire, sagittiform at the base, and amplexicaul. Flowers are bisexual, regular, small, 4-petal, white in terminal racemes. The fruit is silicle. It blossoms from April to September [3, 8, 9].

The aim of this work was to study the anatomical structure of shepherd’s purse herb and to determine the main diagnostic features of the raw material under research for development of the appropriate section “Identification” of the “Shepherd’s purse herb” monograph of the State Pharmacopoeia of Ukraine.

Materials and Methods

A fresh shepherd’s purse herb fixed with ethanol-glycerol-water (1:1:1) was used for the anatomical studies. Shepherd’s purse herb was collected in the Kharkiv region in 2013-2014. The preparations were prepared according to conventional methods. Time microslides were prepared manually. The mixture of chloral hydrate-water-glycerol (120:100:5) was used as an antireflective liquid [1, 5]. The preparations were studied by a “LOMO Mikmed 1” light microscope at a magnification of 60-400 times. The research results were recorded with a SCIENCELAB 10.0MPix Colour CMOS digital camera.

Results and Discussion

Leaf. The lamina is dorsoventral type. The epidermis is uniseriate. The cells of the upper epidermis are slightly sinuous; the cell membranes are evenly thickened. The stomatal apparatus is of the anisocytic type; stomata are small. The cells of the lower epidermis have a sinuous wall, and they are evenly thickened. The stomata on the lower epidermis are larger than the upper epidermis stomata (Fig. 1). Hairs are numerous. Stel late hairs are unicellular (3-6 pointed, sometimes they are 7-pointed) with a warty surface. The rays of hairs are pressed to the lamina surface. Double-pointed hairs
have rays, which rise above the surface of the lamina. There are also simple, single-celled, conical hairs with a wide base, an acute apex and with sufficiently large internal cavities (Fig. 2).

The midrib is a single-beam on a cross section. A fibrovascular bundle is collateral. The parenchyma consists of large parenchymal cells and intercellular spaces. The sclerenchyma layer is observed from the phloem layer. The palisade parenchyma consists of 1-2 rows; a spongy parenchyma includes 4-6 rows with friable intercellular spaces (Fig. 3).

**Stem.** The epidermis of the stem is presented by prosenchimal, wall-sided cells, the stomata are small (with the prosenchimal stomatal apparatus). The stem...
has a rounded triangular shape, slightly ribbed on a cross section of the bottom part. The epidermis is monolayer. The cork parenchyma is situated under the epidermis. Fibrovascular bundles alternate with the areas of mechanical fibres. The groups of sclerenchyma fibres are situated above the beams. Large bundles protrude into the core. The core is quite large and presented by thin-walled parenchymal cells, sometimes it is broken (Fig. 4).

**Flower. Petals.** The inner petal epidermis is presented by parenchymal slightly sinuous cells with papillary excrescences. Epidermal cells have an elongated shape along the axis of petals at the base of the petals. Papillary excrescences are smaller or almost absent. The cells have straight wall membranes. The cells of the sepal epidermis are oblong, and the membranes are slightly

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**Fig. 5.** The surface of the shepherd’s purse petals: A – upper epidermis of petals; B – lower epidermis of petals.

**Fig. 6.** The surface of the shepherd’s purse sepals: A – upper epidermis of sepals; B – lower epidermis of sepals.

**Fig. 7.** The fragment of the cross-section of the axis of the shepherd’s purse inflorescence.

**Fig. 8.** The surface of shepherd’s purse fruits: A – external epidermis; B – internal epidermis.
sinuous and thickened. The cuticle is wrinkled. Hairs are long, unicellular, with a warty surface. Hairs from the abaxial side are more common. The stomata are small (Fig. 5-6).

The axis of inflorescence. The axis has a round, ribbed form on a cross section. The anatomical structure is similar to the structure of the stem, but the fibrovascular bundles are smaller in size. The sclerenchyma between beams is underdeveloped (Fig. 7).

Fruit. The external epidermis is built of parenchymal cells with a sinuous wall. The cells have an elongated shape closer to the axis of the fruit. The stomatal apparatus is of the anisocytic type. The cuticle is longitudinally folded. The epidermal cells are inner narrow, elongated, thick-like fibres (Fig. 8).

CONCLUSIONS
1. The anatomical structure of shepherd’s purse herb has been studied. The main diagnostic features have been determined.
2. The results of the study can be used when developing a monograph “Shepherd’s purse herb” for the State Pharmacopoeia of Ukraine.

REFERENCES
1. Бавтуто Г.А., Ерей Л.М. Практикум по анатомии растений: Учебное пособие. – Мн: Новое издание, 2002. – 464 с.
2. Гризодуб А.И., Георгиевский Г.В., Тихоненко Т.М. и др. // Фармаком. – 2004. – №4. – С. 3-17.
3. Кисличенко В.С., Кузнецова В.Ю., Колисник Ю.С. // Зб. наук. праць НМАПО ім. П.Л.Шупика. – 2014. – Вип. 23, кн. 4. – С. 281-287.
4. Котов А.Г. // Управління, економіка та забезпечення якості в фармації. – 2011. – Ч. 1, №6 (20). – С. 16-22.
5. Справочник по ботанической микротехнике. Основы и методы / Р.П.Барыкина, Т.Д.Веселова. – М.: Изд-во МГУ, 2004. – 321 с.
6. Тихоненко Н.И., Войч. О.Г., Котов А.Г. и др. // Управління, економіка та забезпечення якості в фармації. – 2010. – №5 (13). – С. 4-15.
7. Assessment report on Capsella bursa-pastoris (L.) Medikus, herba [Електронний ресурс]. – Режим доступу: http://65.55.108.4/bvsandbox.aspx?&lo=ss&dl=ru&from=en&to=ru
8. Barnes J., Anderson L., Philipson J.D. Pharmaceutical Press. – 2007. – Р. 541-542.
9. British Herbal Pharmacopea. – 1996. – Р. 169-170.
10. Choi W.J., Kim S.K., Park H.K. et al. // Korean J. Physiol. Pharmacol. – 2014. – Vol. 18, №1. – P. 33-39.
11. Grosso C., Vinholes J., Silva L.R. et al. // Brazilian J. of Pharmacognosy. – 2011. – Vol. 21, №4. – P. 635-644.
12. Hasan R.N., Ali M.R., Shakier S.M. et al. // American J. of Biosci. – 2013. – Vol. 1, №1. – P. 6-10.
13. Kubinova R., Spaĉkova V., Svajdlenka E. et al. // Ceska a Slovenska Farmacie. – 2013. – Vol. 62, №4. – Р. 174-176.