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Morphological and anatomical study of the common self-heal (*Prunella vulgaris* L.), Native to Uzbekistan

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Abstract

The article presents the results of a morphological and anatomical study of the aboveground part of the common self-heal (*Prunella vulgaris* L.) collected during the mass flowering period in the Bustanlik district of the Tashkent region. Despite the fact that the common self-heal is not a pharmacopoeia plant and is not used in official medicine, thanks to the healing chemicals that make up its composition, it has some medicinal properties. Data on the morphology and main diagnostic microscopic features of the herb *Prunella vulgaris* L., which are of decisive importance for establishing the authenticity of medicinal plant raw materials, were obtained. The purpose of the study: to determine the morphological and anatomical features of the grass of the common self-heal. Materials and methods. The plant material was collected during the period of mass flowering in the Tashkent region. Microscopic signs were studied according to the methods of the State Pharmacopoeia of the Russian Federation of the XIII edition using a Micromed-1 light microscope, photos were edited in the program Paint. NET.3.5.11. Results. Morphological analysis of the whole leaves and stem of the common self-heal showed compliance with the literature data. The leaves are whole, simple, lanceolate with a wedge-shaped base and a blunt tip, the stem is tetrahedral, reddish, whitish-woolly at the tip. The main diagnostic microscopic signs of the herb can be indicated as follows: cone-shaped unicellular trichomas, simple multicellular trichomas, trichomas with a multicellular pedicle and funnel-shaped trichomes and with a unicellular pedicle and spherical head, radial-type essential oil glands with 6-8 excretory cells. Conclusion. During the morphological and anatomical study of the grass, diagnostically significant microscopic signs of raw materials were revealed. The results of experimental studies supplement the data of the scientific literature and can be used to confirm and establish the authenticity, identification and standardization of the aboveground part of this sample.

Keywords: Common self-heal, morphology, leaf, flower, authentication, microscopic signs, diagnostic signs

Introduction

Despite the fact that the common self-heal is not a pharmacopoeia plant and is not used in official medicine, thanks to the healing chemicals that make up its composition, it has some medicinal properties. Self-heal herb is recommended in homeopathy and folk medicine in many countries as an antibacterial, antiviral, antioxidant and anticancer agent [1-2]. In Chinese traditional medicine, the common self-heal is widely used as an effective remedy for the treatment of various diseases [3-4]. To date, about 200 compounds have been isolated from plants, and most of them are characterized mainly as triterpenoids, steroids, flavonoids coumarins, phenylpropanoids, polysaccharides and essential oils [5-7]. Taking into account the peculiarities of the chemical structure, each class and group of active substances have a certain spectrum of pharmacological activity [8].

The common self-heal (*Prunella vulgaris* L.) is a perennial herbaceous plant of the clear-flowered family (Lamiaceae). Stems are erect, tetrahedral, simple or branched, smooth from below, in the upper part along the ribs with sparse and long, upward adjacent trichomass. The leaves are whole, without stipules, lanceolate or ovate. The upper leaves are sessile. The flowers are small from red-purple to dark purple, the head inflorescence has a brown color. The flowers are bisexual, but there are four stamens with underdeveloped anthers, two of them are longer. The fruit consists of four nut-shaped fruits - erema [9-10].

In the framework of improving the standardization of the domestic studied object, it is relevant to identify additional diagnostic signs related to the peculiarities of the anatomy and histology of medicinal plant raw materials.

The aim of the study is to study the macroscopic morphological and anatomical features of the herb of the medicinal self-heal, growing on the territory of the Republic of Uzbekistan.

Materials and Methods

The object of the study was the herb of the medicinal self-heal harvested during the period of mass flowering of the plant (June – July 2022) in the places of its natural growth in the vicinity of the Bostanlik district (Chimgan), in compliance with the generally accepted rules of harvesting [11]. The climate of the region is moderately continental, with hot summers and rather cold winters. There are fluctuations by season and during the day: during the day it is warm, in the evening it is cool. Spring comes from April in the middle mountains, the highlands hold snow and coolness until midsummer. The average annual temperature is +15.0°C [12]. Morphological analysis of raw materials was carried out according to the requirements of the State Pharmacopoeia of the Russian Federation XIII [13]. Micropreparations were prepared according to the method: pieces of raw materials were placed in a flask and boiled for 2-3 minutes in 5% sodium hydroxide. If necessary, the raw materials were

thoroughly washed with water and the operation was repeated. After enlightenment, the raw materials were thoroughly washed with water, placed on a slide in a drop of chloral hydrate solution [14-15]. The finished micropreparations were studied under an optical microscope of the Micromed-1 brand.

The results of the study and their discussion.

The morphological analysis of the whole leaves, flowers and stem of the common self-heal showed that the sizes of the studied leaves varied from 4 to 7 cm (Figs.1 and 2). The leaves are simple, petiolate, oblong-ovate or lanceolate, with a wedge-shaped base and a blunt tip. The upper leaves are sessile, toothed. The stem is tetrahedral, ascending, reddish, glabrous in the lower part, in the middle, along the ribs, diffusely pubescent, and whitish-woolly at the top. The flowers are small from red-purple to dark purple collected in dense spike-shaped or head-shaped inflorescences. Flowers on short pedicels in false whorls 2-4 cm long, bisexual, sometimes found with underdeveloped anthers.

Next, anatomical features of the studied object were investigated (Fig.2-4).

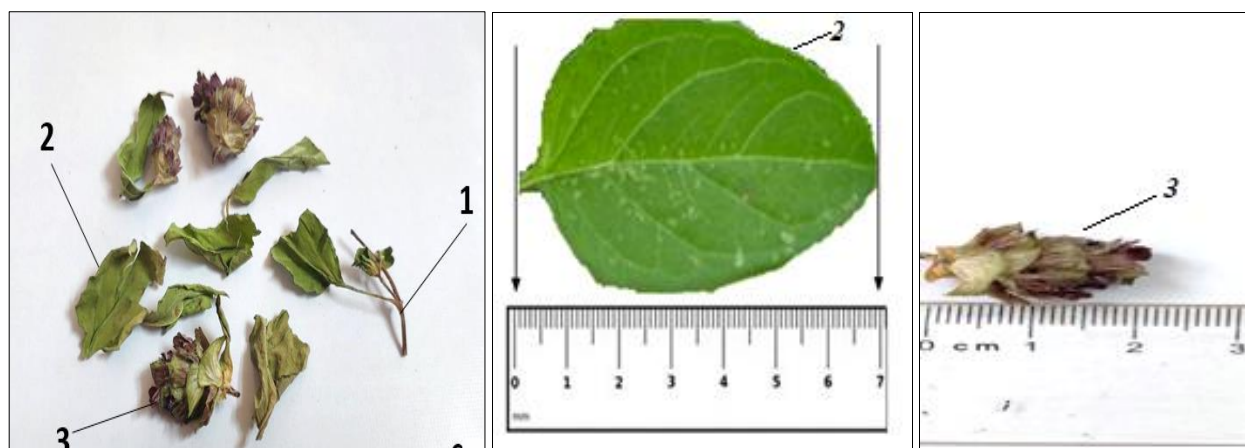
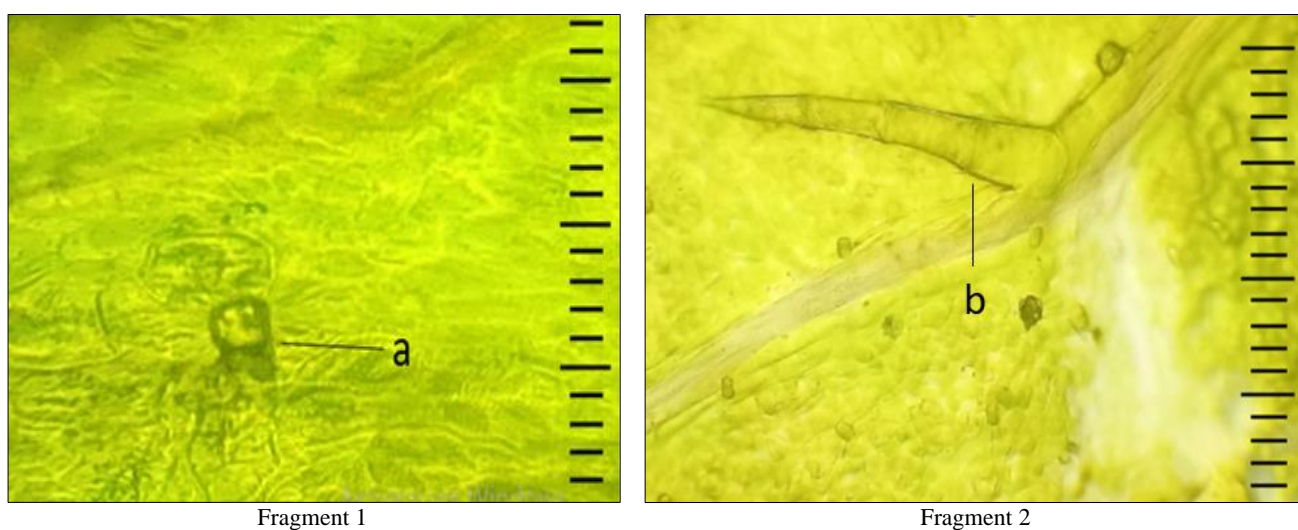


Fig 1: Morphological features of the grass of the common self-heal *P. vulgaris*.: Designations 1 – petiole; 2 – leaf blade; 3 – flower.



Fragment 1

Fragment 2

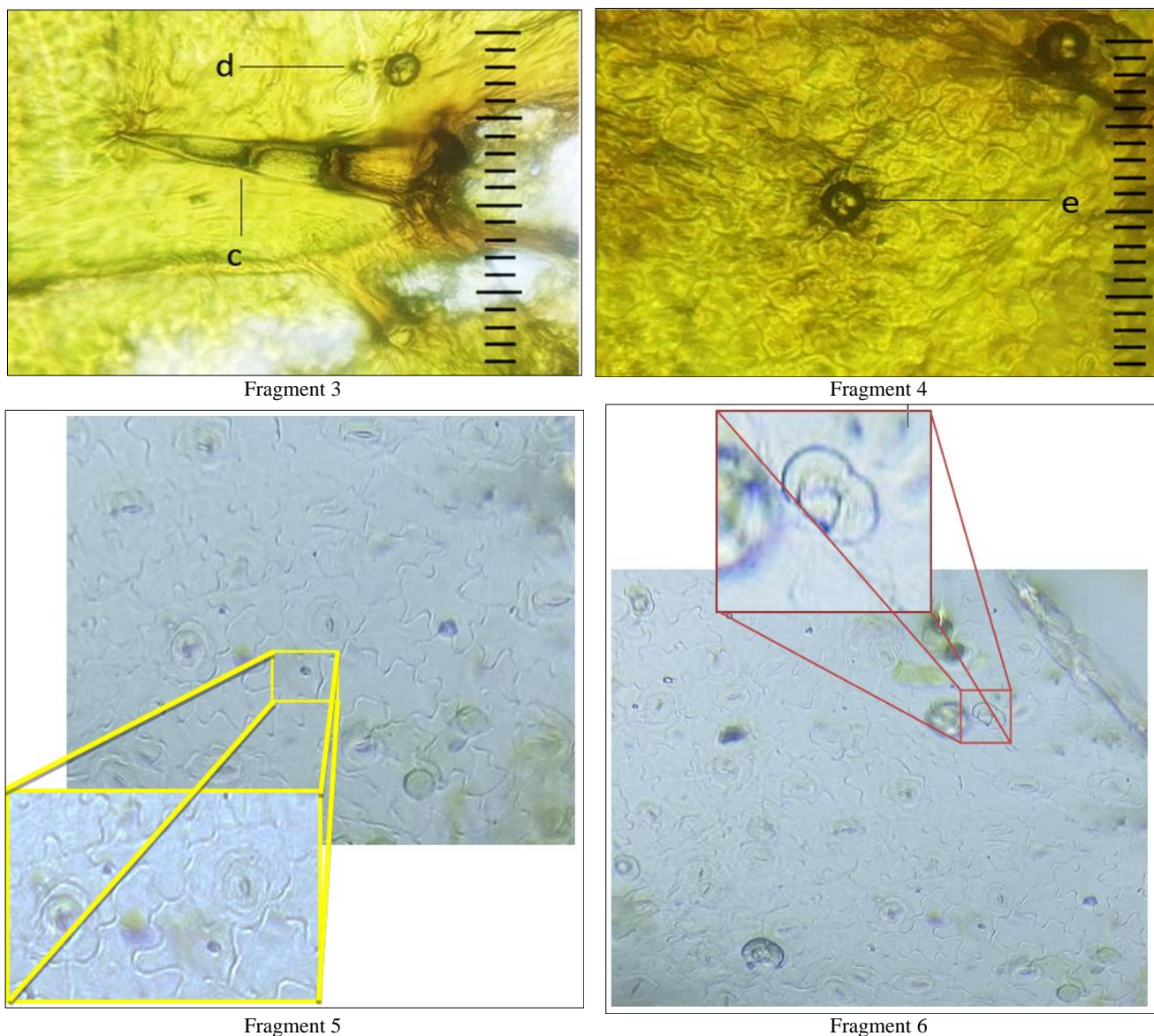


Fig 2: Anatomical and diagnostic signs of *P. vulgaris* leaves. a- trichomes (fragment 1); b- non-glandular trichomes located on the leaf vein (fragment 2); d-the place of attachment of the trichomes (fragment 3); c-a simple multicellular non-glandular trichomes (fragment 3); e- essential oil glands (fragment 1,4); stomato apparatus (fragment 5); glandular trichomes (fragment 6).

The surface of the leaf of the common self-heal is covered with an epidermis. Multicellular trichomass are marked on the upper epidermis. The cells of the epidermis have a sinuous shape, and the cells of the upper epidermis are less mosaic and somewhat larger than the cells of the lower epidermis. Since this raw material is harvested in the mountains in the summer, due to a decrease in the amount of moisture and an increase in the amount of sunlight, the anatomical elements of the leaf become smaller, their number per unit surface is greater, and the closeness between them is higher. Stomata (diacytic type) are located among the cells of the epidermis. They were found on both the upper and lower sides of the

leaf. The largest number of stomata is on the underside of the leaf.

As a result of microscopic analysis, diagnostically significant signs of the leaf of the common self-heal were established:

- Multicellular trichomass on the upper epidermis.
- there are glandular trichomass on the lower epidermis.
- the cells of the upper epidermis are less mosaic and smaller than the cells of the lower epidermis.
- stomatal apparatus of the diacytic type.

According to the results of the above studies, the quantitative content of diagnostic significant particles was established, which amounted to 50%.

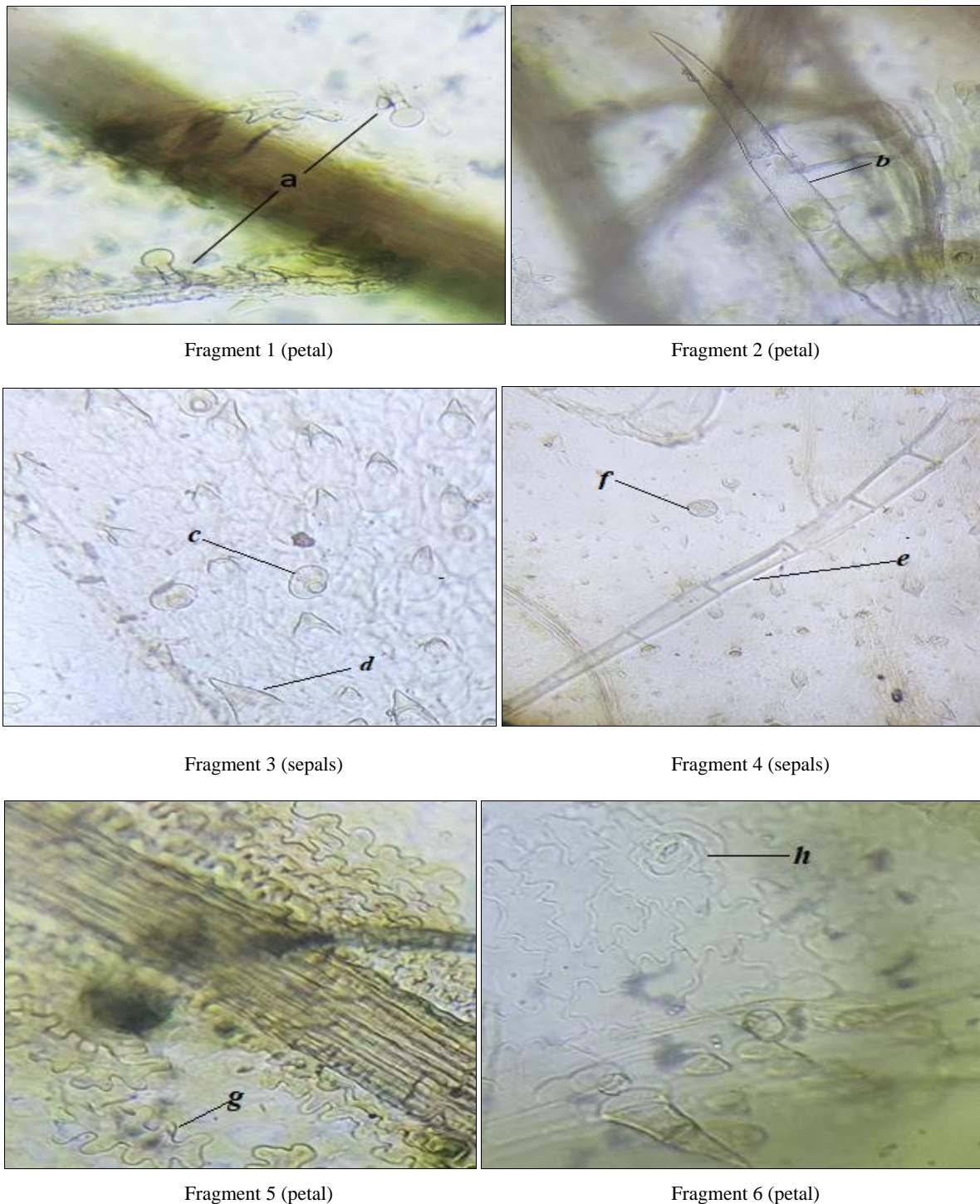


Fig 3: Anatomical and diagnostic signs of *P. vulgaris* flower. **a-** trichomas (fragment 1); **b-** simple multicellular trichomas (fragment 2); **c-** glandular trichomas (fragment 3); **d-** spiny trichomass (fragment 3); **e-** simple multicellular trichomas (fragment 4); **f-** essential oil glands (fragment 4); **g-** cells with sinuous walls (fragment 5); **h-** the stomato apparatus (fragment 6).

As can be seen from Fig. 3, the trichomass are represented by several types: simple unicellular, spiny, covering multicellular, glandular and glandular trichomass. The stomato apparatus of the diacyte type. The essential oil glands

characteristic of lipocolor are visible. Cells of the epidermis of the sepals and petals with sinuous walls. Due to the presence of a large number of trichomass, the pubescence of the calyx is strong.

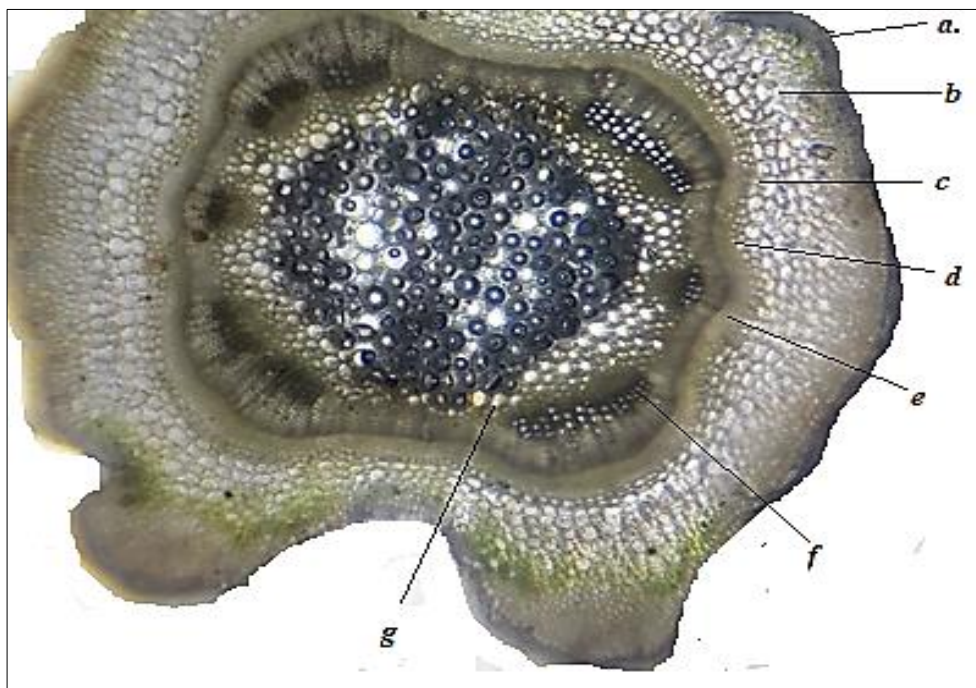


Fig 4: Anatomical characteristics of the stem of *P. vulgaris*. a-epidermis; b-collenchyma; c-cortical parenchyma; d-endoderm; e-phloem; f-xylem; g-core parenchyma

The structure of the stem of the common self-heal is typical (Fig.4). From the outside it is covered with an epidermis, under which the primary cortex is well expressed. Open collateral conducting bundles are marked in the central cylinder, the interstitial parenchyma is sclerified, as a result of which a continuous ring of sclerenchyma is formed along the periphery of the central cylinder. The phloem (the proportion of which is significantly inferior to the xylem) consists of sieve-shaped tubes with satellite cells, bast fibers and bast parenchyma. Cambium does not differ. The core of the stem is well expressed, formed by a multitude of parenchymal cells, the cells are larger in the center, and the core cells become smaller along the periphery.

Conclusions

For the first time, morphological and anatomical features of the grass of the common self-heal, growing in the Tashkent region, were studied.

Based on the results of morphological and anatomical studies, differential diagnostic criteria have been developed to reliably identify the medicinal raw materials of this plant.

The results obtained will be used in the preparation of a regulatory document regulating the quality of this raw material.

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