Morphological and anatomical study of the raw material Artemisia vulgaris L. - Common wormwood used in traditional medicine in Russia and China

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SUMMARY

The flora of Russia and China is in many respects similar, but earlier we found that only 42 plant names are allowed simultaneously in Russia and China. The exchange of goods between our countries is constantly expanding, including for herbal medicines. Therefore, a comparative study of plants that are allowed only in one of our countries, but are used in traditional medicine in both countries, is relevant. One of these plants is wormwood.

We have studied the morphological and anatomical characters of the common (Artemisia vulgaris L.) growing in Russia. Anatomical and diagnostic signs of the aerial part (grass) and rhizomes with roots of wormwood were found, which can be used as a criterion for assessing the authenticity of raw materials. The results of the study were used to develop a draft Pharmacopoeia Monograph for freshly harvested raw wormwood.

The raw material Artemisia vulgaris L. is absent in the State Pharmacopoeia of China, but is widely used in traditional Chinese medicine. In the future, we plan to study the anatomical structure of raw wormwood growing in China, and compare it with the anatomical features of raw materials growing in Russia.

Key words: wormwood, anatomical and diagnostic signsraw materials, morphological signs of raw materials, external signs of raw materials, folk medicine, traditional medicine, official medicine, homeopathy.

I. INTRODUCTION

One of the tasks of the scientific activity of the Institute of Homeopathy and Naturotherapy of the Federal Scientific Clinical and Experimental Center for Traditional Methods of Diagnostics and Treatment of Roszdrav (Moscow, Russia) is the study of medicinal plant materials that have a centuries-old history of use in many countries of the world, among peoples with different national cultures and nomenclature of medicines. Currently, in a comparative aspect, the nomenclature of pharmacopoeial therapeutic agents of plant and animal origin in Russia and China has been studied [5, 7].

A comparative analysis of the assortment of medicinal products of natural origin showed that in the flora of Russia and China there are the same or

closely related plant species used in medicine in both countries.

One of these plants is wormwood (Chernobyl) - Artemisia vulgaris L., of the Asteraceae (Compositae) family - Asteraceae (Compositae). There is evidence that a subspecies of wormwood - Artemisia vulgaris L. var. Grows on the territory of China and in the Far Eastern regions of Russia. indica Max. [eight]. However, according to the list of plants in Russia and neighboring countries, this subspecies is only a local race, and not a subspecies of common wormwood [10]. Currently, in Russia, the official type of raw material is dried wormwood herb, officially approved for medical use in Russia as a sokogonny and appetite-increasing agent [2, 9].

The wormwood root is not a pharmacopoeial raw material in Russia, but was included in the Russian Pharmacopoeia I (1866) - III (1880) editions [11]. Fresh underground organs of wormwood are included in the nomenclature of homeopathic medicines in Russia [1, 4] In China, raw wormwood is not official [5, 6], despite its wide distribution in China and experience in traditional medicine of the country [6].

The foregoing testifies about relevance comparative pharmacognostic research of common wormwood, harvested in Russia and China, in order to develop modern regulatory documentation.

This publication is devoted to the results of studying the macroscopic and anatomical and diagnostic signs of raw materials (aboveground parts and underground organs)Artemisia vulgaris L. growing in Russia.

II. MATERIALS AND METHODS

The object of this study was freshly harvested grass andrhizomes with roots of wormwood. The grass was collected in a meadow inSerpukhov district of the Moscow region, and the roots and rhizomes - at the edge of deciduous forest in the Sergiev Posad district of the Moscow region. Microscopic examination was carried out in accordance with the general article of the State Pharmacopoeia of the XI edition "Technique of microscopic and microchemical examination of medicinal plant raw materials" [3].

All parts of the plant intended for microscopic examination were preserved in 90% alcohol immediately after collection. In order to obtain a well-clarified micropreparation in the study of the leaf blade, the pharmacopoeial technique was modified by us in the following way.

The boiling time in 5% alkali solution (1: 1) was increased to 5–6 minutes for easier separation of the epidermis from the leaf mesophyll. The study of anatomical diagnostic signs was carried out using an Olympus CX 41 microscope (Japan) with 19x eyepieces and 10x, 20x, 40x, 100x objectives. For photography, an Olympus Digital Camera C 3000 Zoom (Japan) was used.

III. RESULTS AND ITS DISCUSSION

External signs of freshly harvested raw materials

The wormwood herb is a leafy topsflowering stems that do not contain woody parts of the stem.

Flowering stems are ribbed, unbranched, glabrous.

The inflorescence consists of ovate-spherical or nearly spherical baskets with a diameter of 2.0-2.5 mm, forming a narrow, dense paniculate inflorescence. Outside, the baskets are covered with a wrapper, weakly and shortly hairy. The outer leaflets of the envelope are herbaceous, oblong-elliptical or oblong-oval, the inner ones are elliptical, along the edge wide and incised scariously bordered. Pistillate marginal flowers, including 8; corolla narrowly tubular, widened towards the base, two-toothed, punctate-glandular, stigma lobes protruding, linear, truncated, usually more or less curved; disc flowers, 14-16 in number, corolla tubular, punctate-glandular.

The leaves are simple, the lower ones are oval deeply dissected into narrowly linear slices, the upper ones are double-pinnately dissected with narrow-linear segments, the uppermost leaves are from trifoliate to whole. The nature of leaf venation is reticulate.

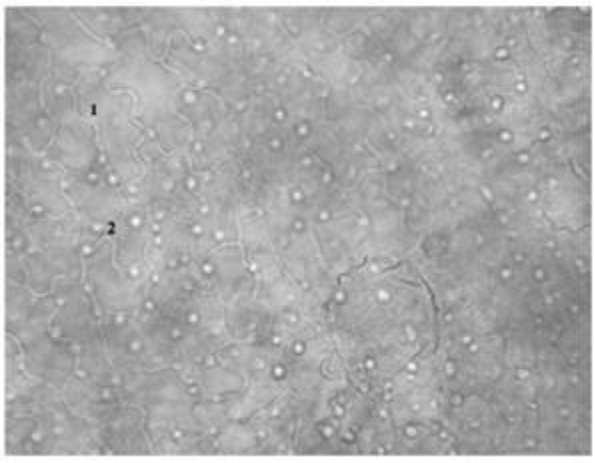
All parts of the plant are bare. The color of the stems is brownish, the leaves are bluish-green, and the flowers are yellow. The smell is fragrant. The taste is spicy bitter.

The rhizome of wormwood is strong, vertical, up to 1.5 cm in diameter, multi-headed, with a loose core. Numerous roots extend from the rhizome on all sides, up to 2 cm in diameter.

The color of the rhizome is brown on the outside, the color of the roots is light brown. In the cut, the rhizome and roots are light yellow in color. The smell is weak. The taste is slightly bitter.

Anatomical and diagnostic signs of the leaf

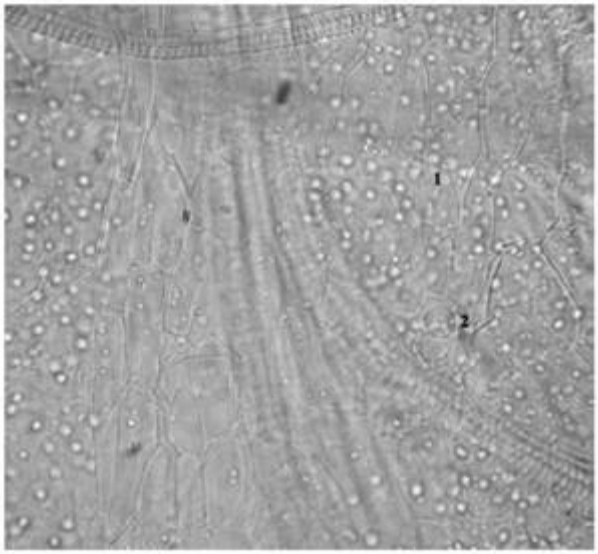
Top side of the sheet. Epidermal cells with sinuous walls (Fig.1). The stomata are not found (Fig. 1).



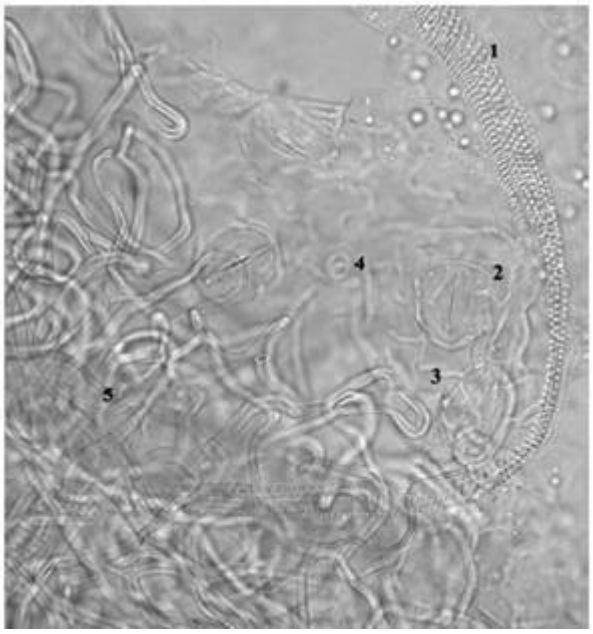
Rice. 1. General view of the top side of the sheetArtemisia vulgaris (uv. X40):
1 - cells of the epidermis with winding walls; 2 - the base of the felt hairs on the underside of the sheet.

T-shaped hairs are rarely found over the entire surface of the leaf blade (Fig. 7). The T-shaped hair consists of 2 to 3 cell stalks, which bears a long, thin-walled cell, horizontal and attached to the stalk in the middle. Other types of hairs, simple and capitate, are also found along the length of the vein. The capitate hair with a unicellular, oval head on a long multicellular (2-3) stalk (Fig. 6). Simple hairs at the base have 3 short cells with thin membranes, the terminal cell of the hair is long, slightly sinuous, with a thick membrane and a narrow threadlike cavity (Fig. 8). There are also oval-shaped essential oil glands, which are rarely located on the surface of the epidermis (Fig. 4). When examining them, it is noticeable that they consist of 8, less often 6 cells located in 2 rows and 4 tiers on a short unicellular stalk.

The underside of the sheet. Epidermal cells with sinuous walls, whentherefore, their size is smaller in comparison with the cells on the upper side of the leaf (Fig. 2). The stomata are surrounded by 3-5 cells of the anomocytic type (Fig. 3). T-shaped (Fig. 7), capitate (only along the vein length, Fig. 6) and simple hairs (only along the vein length, Fig. 8) are often found over the entire surface of the leaf blade. The structure of the hairs on the underside of the leaf coincides with the structure of the corresponding types of hairs on the upper side of the leaf. Numerous felt hairs are clearly visible, forming a continuous covering of the underside of the sheet.

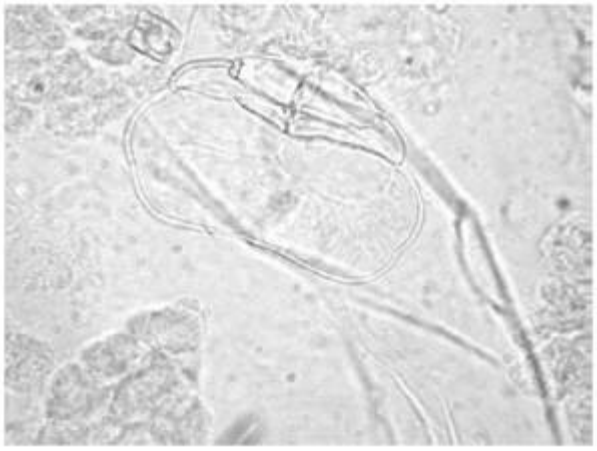


Rice. 2. Epidermis of the underside of the leafArtemisia vulgaris (sw. X40): 1 - cells epidermis with winding walls; 2 - hair base.

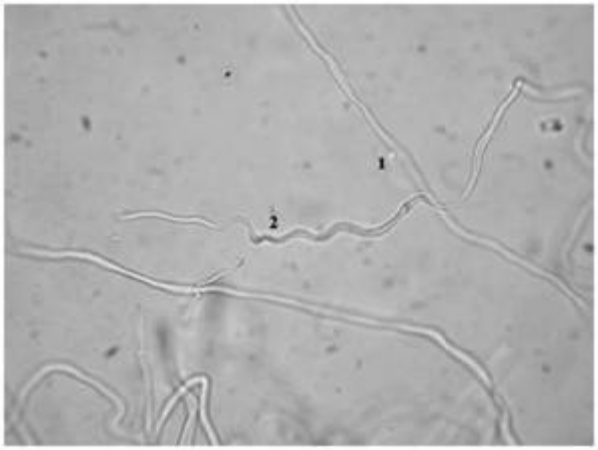


Rice. 3. Stomata on the underside of the leafArtemisia vulgaris (uv.x40): 1 - vein; 2 - stomata, surrounded by 4 cells of the epidermis; 3 - cells of the epidermis with sinuous walls; 4 - the base of the hair; 5 - tomentose pubescence.

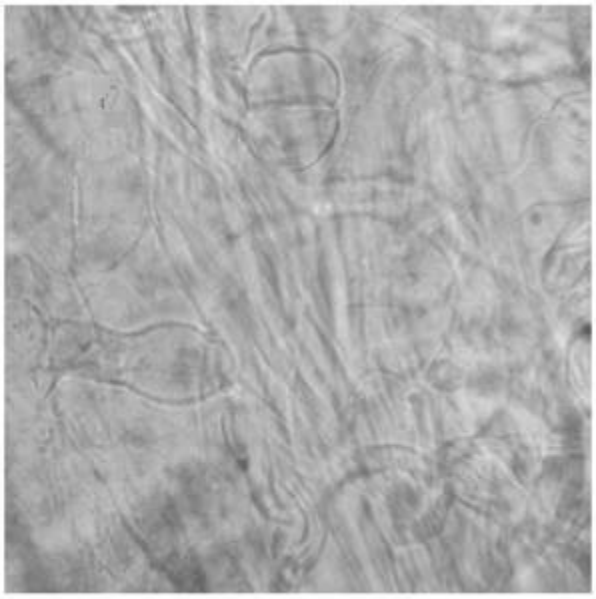
A felt hair is a simple forked hair, each part of which is a long, winding thin-walled cell with a filamentous cavity (Fig. 5). On the entire surface, oval-shaped essential oil glands are often found. When examining them, it is noticeable that they consist of 8, less often 6 cells arranged in 2 rows and 4 tiers on a short unicellular stalk (Fig. 4).



Rice. 4. Essential oil gland on the underside of the leafArtemisia vulgaris. Side view (sw.x100).



Rice. 5. Felt hair on the underside of the sheetArtemisia vulgaris (sw.x40): 1 - hair base; 2 - felt hair.

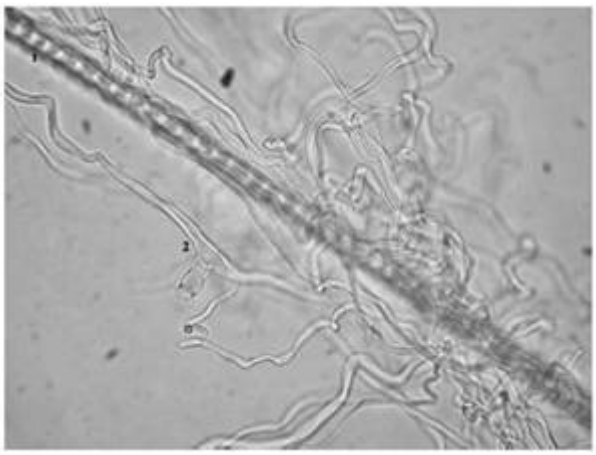


Rice. 6. Capitate hair on the upper side of the leafArtemisia vulgaris (sw. X100).

Anatomical and diagnostic signs of the root

When considering a cross section of the secondary structure of the root, it is seen (Fig. 9) that the primary xylem is located in the very center, the number of rays of which varies. It is followed by a secondary xylem, which is an alternation of narrow and wide lumen vessels. The secondary xylem contains a lot of storage parenchyma.

After the secondary xylem, there is a cambium, which consists of thin-walled living cells. Secondary phloem is represented by sieve tubes and parenchymal cells, which form a soft bast, and a hard bast. The sclerenchymal fibers of the hard bast are not located in a continuous layer, but are grouped into complexes under the primary phloem.



Rice. 7 Fragment of T-shaped hairArtemisia vulgaris (uv.x40): 1 - vein; 2 - a fragment of a T-shaped hair with 3 cells in the stem.

Rice. 8. A simple hair along the vein on the upper side of the leafArtemisia vulgaris (uv. X40): 1 - cells of the epidermis elongated along the length of the veins with straight walls; 2 - a simple hair with 3 cells at the base, bearing one long one; 3 - hair base.

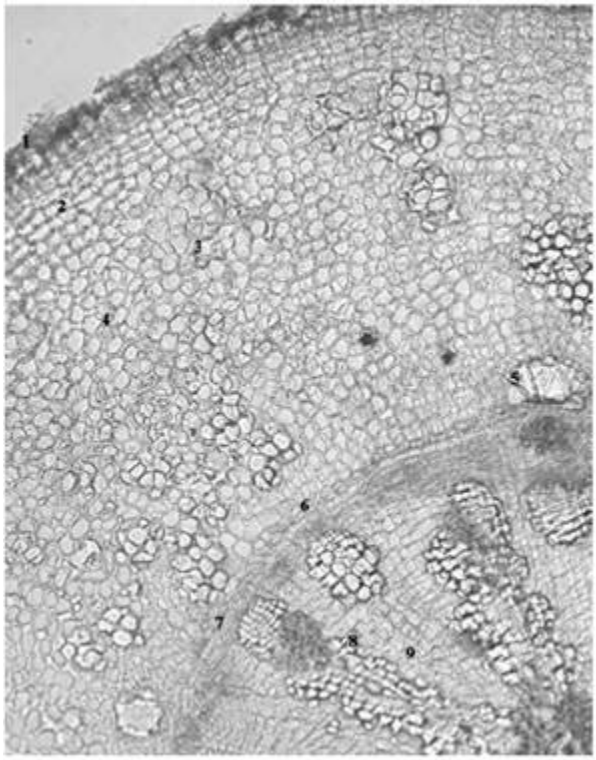
The number of areas of the primary phloem corresponds to the number of rays of the primary xylem. It is pushed back to the periphery and is strongly crumpled, therefore, it is practically invisible at the cut. The border of the phloem and the main parenchyma of the cortex is the pericycle. In the crustal parenchyma, which is a thick, loose layer of cells of a polygonal or round shape and yellowish color, there are many idioblasts filled with dark contents (Fig. 10, 11). Outside, the bark is surrounded by a highly developed periderm, which performs a protective function. Periderm

has a dark color and is peeled in places.

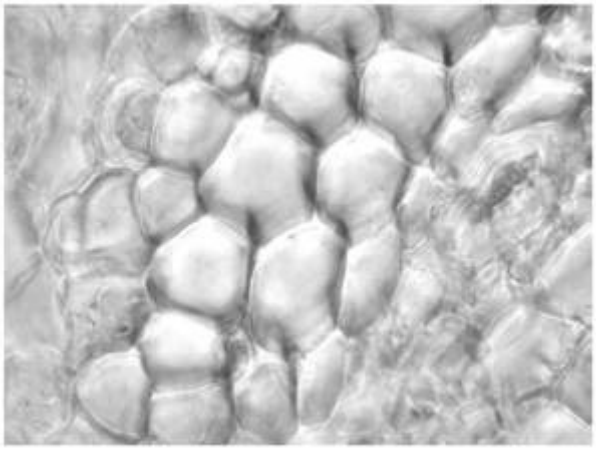
Essential oil is concentrated in lysigenic receptacles, formed as a result of dissolution of a group of cells (Fig. 12). They are one of the main diagnostic features in the root of wormwood and are located in the crustal parenchyma opposite the primary phloem. These containers have a very special shape.

When considering a cross section of the primary structure of the root, it is seen (Fig. 10), that in the very center is the central axial cylinder, consisting of a radial vascular fibrous bundle and a thin layer of the pericycle. It is followed by the endoderm, which is adjacent to the receptacle (Fig. 11). Among the oval cells of the parenchyma, groups of cells with dark contents — idioblasts — are clearly visible (Fig. 15). The border of the primary cortex is the exoderm, which is located under the integumentary tissue of the root (rhizoderm) and is a layer of rectangular cells.

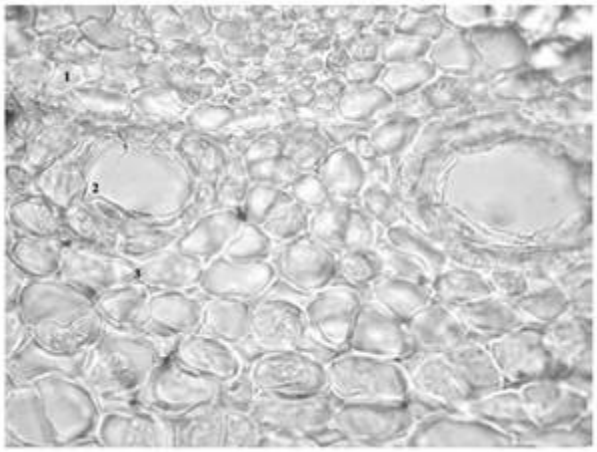
Rice. 9. Cross section of the rootArtemisia vulgaris (uv. X4): 1 - periderm; 2 - crustal parenchyma; 3 - a receptacle; 4 - pericycle; 5 - hard bast; 6 - phloem; 7 - cambium; 8 - secondary xylem; 9 - storage parenchyma; 10 - core beam.



Rice. 10. Cross section of the rootArtemisia vulgaris of primary structure (magnification x20): 1 - rhizoderm; 2 - exoderm; 3 - idioblasts; 4 - mesoderm; 5 - a receptacle; 6 - endoderm; 7 - pericycle; 8 - xylem; 9 - phloem.



Rice. 11. Idioblasts in the root parenchyma of the cortexArtemisia vulgaris (sw. X100).



Rice. 12. Receptacle in the root parenchymaArtemisia vulgaris (uv.x40): 1 - pericycle; 2 - a receptacle; 3 - storage parenchyma.

Anatomical and diagnostic signs of rhizome

When examining the cross section of the rhizome, it can be seen (Fig. 13) that the storage parenchyma is located in the center of the rhizome. The cells of the parenchyma are polygonal or rounded, located loosely and in the center can be partially destroyed. The size of the cells decreases from the core to the vascular bundles.

Conducting bundles collateral open type (Fig. 14, 15). In the lower part of the conducting bundle, there is a primary xylem, followed by a secondary xylem, consisting of narrow- and wide-lumen vessels. Next is the cambium, which is a layer of thin-walled cells and precedes the phloem. All tissues of the conducting beam are arranged in a circle, forming a closed ring. The upper parts of the vascular bundles (Fig. 15) adjoin the cells of the sclerenchyma, grouped into separate complexes above the phloem and imparting mechanical strength to the rhizome. Then a layer of endoderm is located, to which the receptacles are adjacent.

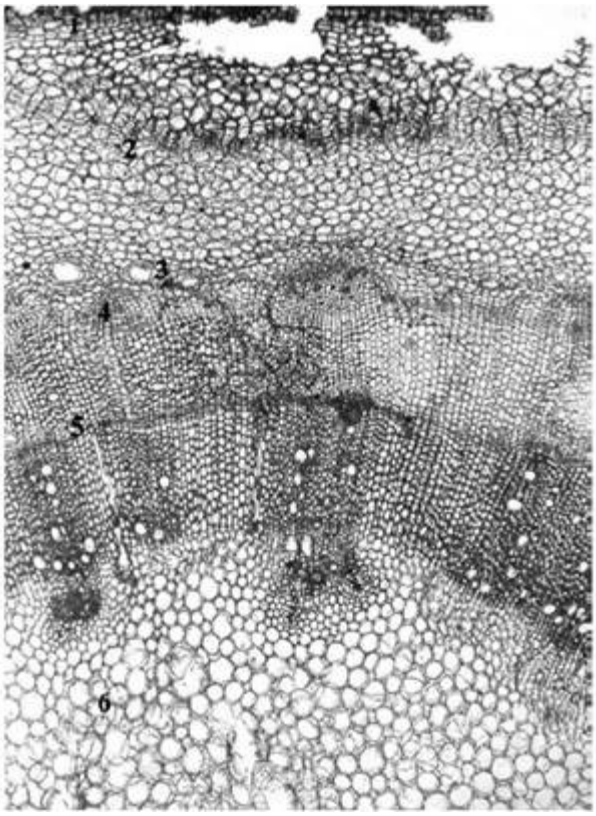
The cells of the cow parenchyma are large, rounded. Outside, the rhizome is covered with a highly developed periderm, located in a layer of various thicknesses, forming a kind of arcs.

IV. CONCLUSIONS

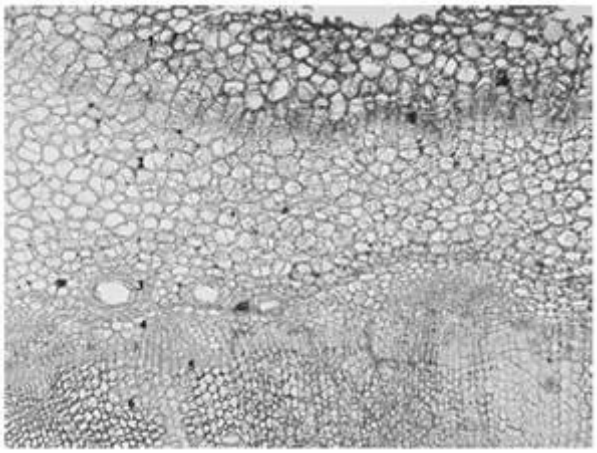
1. Studied the external signs of the aerial part and rhizomes with the roots of wormwood ordinary.

2. Studied the anatomical structure of fresh aerial parts and rhizomes with wormwood roots. Diagnostic signs of raw wormwood were revealed, allowing to identify it from raw materials of closely related species.

3. On the basis of the study, an indicator was proposed authenticity "External signs" and "Microscopy" for inclusion in the project ND "Fresh rhizome with roots of wormwood."



Rice. 13. Cross section of the rhizomeArtemisia vulgaris (uv. X4): 1 - periderm; 2 - Bovine parenchyma; 3 - a receptacle; 4 - endoderm; 5 - sclerenchyma; 6 - storage parenchyma.



Rice. 14. Cow part of the rhizomeArtemisia vulgaris (sw. X10): 1 - periderm; 2 - crustal parenchyma; 3 - a receptacle; 4 - endoderm; 5 - sclerenchyma; 6 - section conducting beam.

Rice. 15. Conductive bundle of rhizomeArtemisia vulgaris (uv. X10): 1 - crustal parenchyma; 2 - endoderm; 3 - sclerenchyma; 4 - phloem; 5 - cambium; 6 - secondary xylem; 7 - primary xylem; 8 - secondary core beam; 9 - storage parenchyma.

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