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MICROSCOPIC ANALYSIS OF THE ROOT AND STEM OF A SAMPLE OF *VINCA HERBACEA* L. PLANT SPREAD UNDER EX ENVIRONMENTAL CONDITIONS

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Abstract. Morphological and anatomical characteristics of the vegetative organs of *Vinca herbacea* plant growing under ex conditions are given in the article. Here, the stem and root of the Otvari gyfoto species, which grows mainly under ex conditions, were analyzed microscopically and the characteristic anatomical signs were studied. As the anatomy of the vegetative organs was analyzed during the research, it was learned that the tissues inside them have acquired a structure in accordance with the climatic factors of the area where they spread. Vegetative organs have certain characteristic features. Here, in the anatomical structure of the root of the plant, the bark part is better. In the anatomical structure of the plant stem, a row of small epidermal cells is covered from the outside. During the microscopic analysis, it was learned that the root of the Vinca herbacea plant is in the first structure.

Keywords: *Rhizoderm, periblem, pericycle, central cylinder, xylem, phloem.*

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1. Introduction

Vinca herbacea L. is a perennial herb belonging to the genus *Vinca.* The plant has a well-developed root system up to 20 cm long. The rhizome of the plant is short and has a very angular structure. The non-bearing branches of the plant are long and spread out. These stems spread over the soil do not form a root system. The branches bearing the flowers are straight and bare (Gurbanov, 2009). The lower leaves of *Vinca herbacea* are relatively narrowly ovate or elliptic in shape. The leaves located in the middle part of the plant are elongated or oblong-lanceolate in structure. The length of these leaves is 3-4 cm and the width is 10-18 mm and the tip is pointed. The basal parts of the plant are wedge-shaped and the edges of the leaves are not whole, have an uneven structure and are on a short stalk.

The axillary flowers of the herbaceous plant are blue-purple in color. The surface of the flower stalk is bare and its length is equal to the length of the leaf or relatively larger than them. In Vinca herbacea, the diameter of the corolla is 16-20 mm, pointed, elliptic or diamond-shaped. The fruit of Vinca herbacea plant is 3-4 cm long. Due to its morphological structure, the fruits are curved and elongated. The fruits of the species are dark-brown in color and open from a slit in the middle (Tofig, 2016; Flora of Azerbaijan, 1961).

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The plant blooms in April and bears fruit in May-July. *Vinca herbacea* plant is widespread in Azerbaijan mainly in the Northern part of the Lesser Caucasus.

Figure 1. A map of the distribution area of *Vinca herbacea* L.

It grows in the eastern part of the Greater Caucasus. In addition, the plant is rarely found in Kura-Araz plain, Gobustan, Absheron. It is also found in the mountainous areas of Lankaran and Nakhchivan.

Figure 2. Morphological description of *Vinca herbacea* L. Plant

The herbaceous plant is mainly distributed on grassy slopes, meadows, among bushes, on the edge of the forest. In these areas, the plant forms part of the phytocenoses in a scattered manner (Sardarova, 2023).

Prospects for the use of *Vinca herbacea*

The composition of the herbaceous plant is rich in organic and mineral substances. The herb of the plant is used as a hemostatic agent in folk medicine. Preparations obtained from the dried raw material of the root have a curative effect. The pharmacologically active substance contained in the plant is antiseptic in nature. In folk medicine, the composition obtained by brewing the plant is used in diseases of the oral cavity. At the same time, medicinal preparations made from it are currently prescribed in medicine in stomatology in case of tooth inflammation and toothache. In modern medical practice, it has been determined that the bioactive components contained in the Vinca herbacea plant are very effective in the treatment of cancer (Karimov, 2010).

Anatomical features of *Vinca herbacea* plant

Root (*Radix*). Morphological and anatomical analyzes determined that the root of *Vinca herbacea* plant has a primary structure. The tissue that covers the root from the outside, the rhizoderm, protrudes outwards and forms the suction threads. These rhizoderm cells are covered with a transparent layer that does not contain chloroplasts. Absorbent threads, which are derivatives of rhizoderm, perform both covering and absorption functions. The cells that make up the absorbent threads are cellulose-containing. However, the cells at the end of the suction wire are composed of pectin. The primary bark under the rhizoderm consists of parenchyma cells. Living parenchyma cells make up the main part of the primary cortex formed from the periblem. The bark part of the primary root of the herbaceous plant consists of three layers. The first layer is called the exoderm and is located below the rhizoderm. Exoderm is composed of absorptive parenchyma cells (Gasimov, 2010; Humbatov, 2017). Next is the layer of mesoderm composed of cortical parenchyma, which is located below the exoderm. The cells of the mesoderm layer, ending with the exoderm and endoderm, are small and closely spaced. The cells in the center are large and intercellular spaces are observed. The presence of intercellular spaces in the mesoderm parenchyma ensures normal aeration and apoplastic movement of substances in the root of the herbaceous plant.

The last layer of the shell is the endoderm shell parenchyma, which can be clearly seen in the microscopic image as being composed of single-layered primary parenchyma cells. These endoderm cells surround the central cylinder in the form of a ring. In the endoderm belt, there are releasing cells, which are observed with a relatively thickened sheath, which are called Caspari's spots. Caspari's spots in the endoderm layer, which we observed with microscopic analysis, mainly regulate the amount of absorbed mineral substances in the water according to the needs of the *Vinca herbacea* plant.

It is observed in the anatomical structure of the root of the herbaceous plant that the endoderm cells are relatively thickened towards the radial walls. The wall of these cells of the endoderm part is cutinized and the mushrooming process also takes place. It is also clear from the microscopic image that the endoderm belt surrounds the central cylinder in the form of a belt. In the final state of the initial structure of the root, there is a normal exchange of substances between the bark part and the central cylinder. This means that the sheaths of some cells in the endoderm belt do not thicken and remain cellulose-containing. That is why the living content of these cells does not become fungal and remains active. These are the releasing cells and it is observed in the anatomical view that they are located in the endoderm belt in front of the xylem rays of the central cylinder. Such a structure of the root is also transferred from the bark parenchyma cells that release water and mineral salts to the water tubes (Sardarova, 2022).

Another group of cells in the endoderm area, which is the sheath, is a group of cells that are corky or sometimes woody and have mechanical functions. Since mechanical cells have not yet developed in the primary structure of the root of the herbaceous plant, which consists of relatively weak cells, there is a great need for a group of cells that perform this mechanical function formed in the endoderm belt. In terms of functional primary structure classification of the root, a thin suferin substance accumulates in the sheaths of part of the cells of the endoderm belt. In the next stages, the anticlinal and inner walls of these cells become strongly suberinized, undergo lingification, thicken and are destroyed. Some thin-envested cells remain alive. They ensure the integrity of the organism by creating symplastic connections with the living tissues of the cortex and modular part. Some of the pericycle cells have undergone sclerification in the root of the herbaceous plant. However, more cells of the pericycle tissue are of parenchyma type (Esau, 1990).

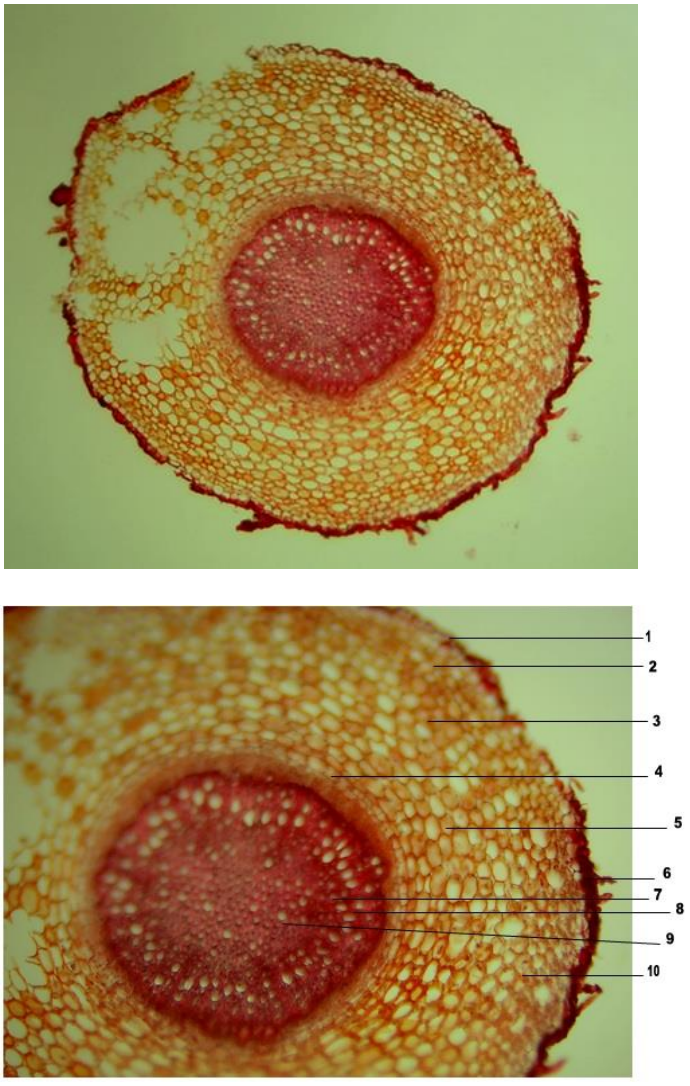

Figure 3. Anatomical structure of the root of *Vinca herbacea* L. plant/1-rhizoderm, 2-exoderm, 3-cortical parenchyma, 4-endoderm, 5-mesoderm, 6-suction wire, 7-metaxylem, 8-pericycle, 9-phloem, 10-secretory site

The central cylindrical part of the root of Vinca herbacea plant consists of pericycle, stele and radial type transmission ball. Radial rays of primary phloem and xylem alternate with each other in a circle in the primary structure of the root of the plant. Parenchyma cells are located in the intermediate part of these transmission system elements. Functionally, the central cylindrical elements of the root derive from procambial balls that differentiate from the plerom part of the crown meristem. It is also determined from the microscopic image that the central cylinder part of the Otvari gyfoto plant is separated from the cortex by pericycle cells belonging to the meristem tissue group.

The pericycle is located below the endoderm belt. The root of Vinca herbacea species is polyarch type due to the pattern of formation of the transmitting tissue elements. This structure guarantees the maximum supply of water and mineral substances from the soil to the upper organs. The radial flow of water to the xylem is regulated by the root's sucker filaments. As a result of anatomical analysis, it was determined that there is a large volume of excretory tissue of schizogenic origin in the bark of the root of Otvari gyfoto plant, which is an anatomical sign indicating the usefulness of the species. This schizogenous excretory site is surrounded by small tapetum cells.

Anatomical structure of the stem of the plant *Vinca herbasea*

The stem of Vinca herbacea (studied by microscopic analysis) has a non-spherical structure. The body is topographically divided into two parts, the shell and the central cylinder. The stem is externally covered with a smooth shell, relatively densely arranged and covered with whorled epidermal cells. It has turned into pollenchyma. This structure protects ex Vinca herbacea, which is common in mountainous areas with extreme climate, from certain mechanical effects. The trunk of the species has outwardly pointed protrusions (in 4 parts), which is very clear in the cross-sectional view of the trunk. In these 4-part protrusions of the trunk, the sheath of suberidermal cells has thickened and turned into collenchyma. The number of collenchyma cells is greater in this protruding part and they are located locally in the corners (Gasimov, 2010).

Such a 4-part protruding structure of the stem of the herbaceous plant is characteristic of the species. Through microscopic analysis, it was learned that excretory sites of xyxogenic origin were formed in the cortical part of Vinca herbacea plant stem. This is considered as evidence of the plant's usefulness. Core is the main mass of the central cylinder located inward from the endoderm layer of the body. Starch cells in the endoderm layer surround the central cylinder in the form of a belt. Phloem elements, which are conductive tissue, are also formed in the upper part of the core in the form of a circle.

From the phloem inside, the water tubes (xylem) of the first wood are observed in the form of a wide belt together with the procambium cells. From here, there are small parenchyma cells around the hairy tubes and xylem. The fiber-tube transmission system, which is located in the form of a ring in the body, also has a mechanical function. In the microscopic view of the body, the nucleus is located from the perimedullary part inwards. The nucleus is composed of relatively large cells. Aerenchyma tissue is formed in the core part of the stem of herbaceous plant and this tissue group is more suitable for providing oxygen to other vegetative organs. The derivative nature of aerenchyma tissue in a plant is mainly hereditary and is formed depending on the environmental conditions in which it grows (Lotova, 2007).

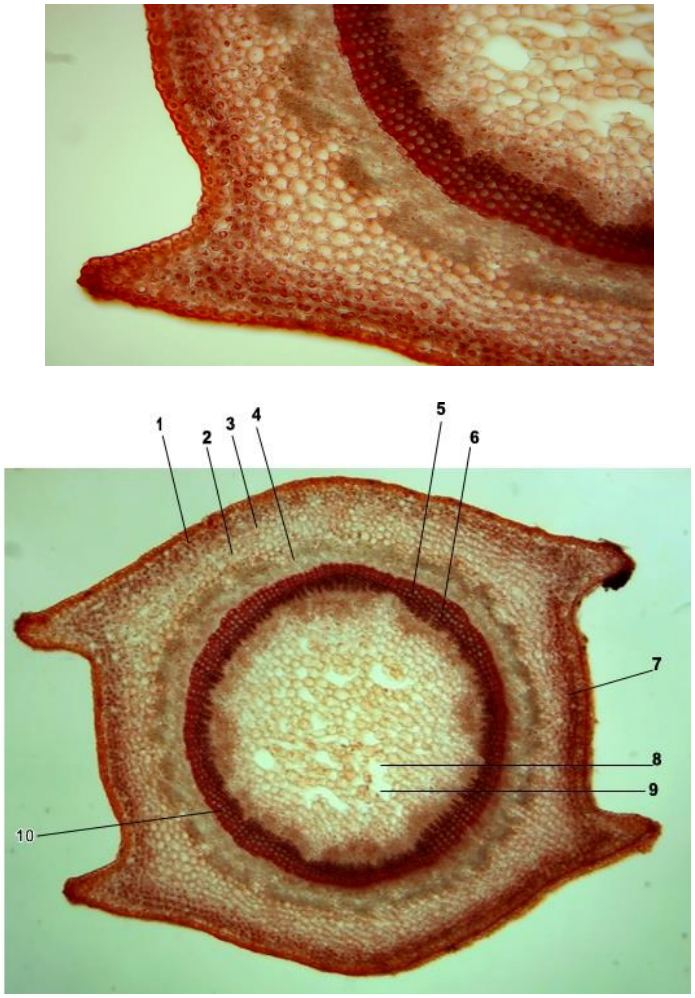

Figure 4. Anatomical structure of the stem of *Vinca herbacea* L. plant
1-epidermis, 2-subepidermal parenchyma, 3-chlorenchyma layer, 4-starchy belt, 5-phloem, 6-cambium, 7-secretory area, 8-kernel, 9-aerenchyma area, 10-xylem

2. Research material and methodology

The plant sample taken from the mountainous area of the Lesser Caucasus is in the phase of full morphological maturity. The collected plant was kept in 70% alcohol. After Vinca herbacea was kept in a solution of alcohol and distilled water and glycerin for 20 days, cross-sections were made from its root and stem. Staining agents were used to study the tissue groups in the parts of the prepared sections. By means of these substances, lignified parts in transmission tubes, periderm, surrounding cells in excretory places, etc. it is possible to determine.

Commonly accepted classical methods were used in making anatomical cuts and preparing preparations (Humbatov, 2017; Tutayuq, 1987). Prepared anatomical materials were studied under modern microscopes. MBI-3, MBU-6, MBC-9 and photomicrograph microscopes with XPRN monitors were used (Barykina, 2004).

3. The result of the study

As a result of anatomical studies, it was determined that the root and stem of the plant Vinca herbacea had a schizogenous excretory site. It was learned that core is the main mass of the central cylinder located inward from the endoderm layer of the stem and there is aerenchyma in the core. In the root of the plant, the bark part consists of exoderm, mesoderm and endoderm parts.

It is also clear from the microscopic image that the starchy cells in the endoderm layer surround the central cylinder in the form of a belt. As a result of the anatomical analysis, it was determined that the shell of the suberidermal cells thickened and turned into collenchyma, a mechanical tissue, in the bark parenchyma of the stem of the Otvari gyfoto plant grown in ex ecological conditions. At the same time, it was observed that the root of Vinca herbacea species is polyarch type due to the regularity of formation of the transmitting tissue elements.

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