Structural Peculiarities of the Vegetative Organs of the Species of Vinca

(V. minor L and V. Herbacea waldst et Kit)

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Plant Vinca grows in broad-leaved forests, shrubs and on dry slopes. At some place it produces bigger bush woods. It is native to the middle and south Europe. It is decorative and medicinal plant. Generally the family of Vinca – Vinca L. unites 7 species. There are two species commonly spread in Georgia: V.herbacea Waldst et Kit and V.pubescens. The plants including in the genus of Vinca – Vinca L. are characterized by perennial, salverform, simple and broad (20-30 mm long) flowers and free stamen.

The aim of the research was to investigate the anatomy of morphological elements of V.minor L. and V.herbacea Waldst et Kit and accordingly to outline the microstructural features of mentioned species in order to exclude the mistakes and inaccuracy while fixing the identity of the raw material[1-8].

The samples were obtained in the conditions of middle moisture in Tbilisi in 2011 y. Cross and longitudinal sections are made by upper ground and under ground organs of the middle part of the plant. Preparatory strips were made in live unfixed material by hand – using a sharp razor. The samples were painted in light safranin solution for 24 hours and were placed on a glass in the drop of glycerin. For micro-structural researches there were used light (Carl Zeiss, Jeneval) and stereoscope (МВС-2) microscopes. The photo-material is fixed by digital photo camera (Canon Digital IXVS75). Selected photos are processed by computer program”Adobe Photoshop 2007”.

Leaf: The leaf mesophyll of both species of Vinca belongs to dorzoventral type. It is characterized by thin cuticle, single-layered upper and lower epidermis and middle sized cells. The tissue of upper epidermis of V. herbacea exceeds the size of V. minor. V.minor has double-layered palisade Parenchyma and V. herbacea has single-layered but elongated shape. Both species are characterized by palisade Parenchyma that stimulates the activity of chlorophyll. Cloud-shape Parenchyma is characterized by rounded, thin membrane structure. The species of V.herbacea is characterized by abundance of conductive bundles. Conductive bundles are concentric type, sometimes there is anatomical arrangement. The basic cells of upper and lower epidermises of the leaf of the species of Vinca for research belong to different type of curvilinear clan. The apparatus of ventilation system – stoma is placed only in the tissue of lower epidermis. The basic cells of upper epidermis of V. minor belong to the 2-order of curviwalled and those of V.herbacea belong to the first order of curviwalled order. The basic tissue of their lower epidermis belongs to curvilinear clan. There are characterized the basic cells of the 3-order of curviwalled for V.minor and the based cells of 2-order of curvilinear for V.herbacea. For both species there are characterized difficult, dissectional (paracytal) stomas. According to satellite shapes they belong to pararugocyte type.

Major vein of the leaf of the mentioned species is bow-shaped, a single-layered thin epidermis cuticle. The cells of lower epidermis of V. herbacea have papillary shape; trichomes are placed in units on upper hoop of only V.minor, they belong to simple, single-celled coned type. For major vein of the leaf of both species of Vinca is characterized intermixed collenchymas tissue that is placed on in the peripheries of the major tissue. The basic parenchyma of the major veins is active and is characterized by the cells of dense structure, thin membrane, and rounded, cut-shaped cells. The structure of basic tissue of V. herbacea is distinguished in upper periphery, there are fixed the habitus and disposition characteristic for the tissue of parenchyma cells. The conductive pile of the major vein of both species is bow-shaped, difficult, open bicolateral type. Phloem fibers are placed individually and in groups as well only in the side of lower arch. In the tissue of wood there is differentiated rarely circle-shape, and often vessels with thick membrane. For the major vein of both species there are characterized the radial rays of a single-layered type of wood (Picture 1 & 2).
PETIOLE

The petiole of mezophylole zone of the leaf of research species of Vinca is bow-shaped; *V. herbacea* is characterized by elongated lobe and cone-shape rib; *V. minor* has comparatively small arch on the rib and lobes. Both species are characterized by thin united cuticle and a single-layered epidermis. The rib and lobes of *V. minor* petiole is actively covered by single-celled, cone-shape trichoma. On the covering tissue of petiole of the species to research there is the apparatus of ventilation system – stoma. In petioles of both species the intermixed collenchyma is active and especially in lobes and sinuses. The main tissue of the petiole of mentioned species is presented by rounded shape cells of dense structure and thin sheath. In the parenchyma of major tissue there are idioblast cells, complex grains of chlorophyll and starch, raphides. Conductive bundles of both species of Vinca are bow-shaped, conductive bundle of *V. minor* is placed in the centre of petiole and *V. herbacea* is characterized by central and lateral additional conductive bundles. Conductive bundles of both species are complex and belong to open bicolateral type. Phloem fibbers in both sides make bundles, there are also fixed idioblast cells. Wood is presented by libreform, spiral, rounded-spiral and rarely stair like bundles. Radial rays of wood are single or double-layered. Additional bundles of *V. herbacea* belong to concentric type. Besides, there are also differentiate transitive forms of conductive bundles between concentric and bicolateral ones (Picture 3).
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Picture 2: F Upper and lower epidermis of leaves of *V. herbacea* and *V. minor*
A) *V. herbacea*; B) *V. minor*: Upper epidermis
C) *V. herbacea*; D) *V. minor*: lower epidermis
E) *V. herbacea*; F) *V. minor*: stoma of dissectic type
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The basic tissue of the central cylinder of both species is identical – slightly dense, rounded, with thick sheath and middle sized cells. In the parenchyma of central cylinder there are fixed as iodblast cells as raphides and other kind of cell bodies (Picture 4).

**STEM**

The stem of *V.minor* of Vinca species has round shape and it is characterized by two weakly expressed opposite ribs, as for *V.herbacea* it is characterized by cone-shape bent particles at the ends of opposite ribs of oval form. Nether species has any kind of covering; cuticle is thin and united. The epidermis cells are single-layered and dense structure. There are stomas in epidermis tissue of both species. Collenchyma of plate type is basically of double-layered, but in cone-shaped sinuses there is only placed the collenchyma tissue. Parenchyma of stem of both species is characterized by middle sized thin cells of dense structure. They have more active central cylinder tissue than membrane parenchyma. The tissues of phloem and wood are the same. There are fibber bundles of phloem presented actively in phloem and there are iodblast cells among them. The phloem fibber is bounded by double-layered cambium. There is differentiated the parenchyma of thick sheath in the wood, rarely circular and stair like and also spiral vascular bundles. Radial rays of wood are single or double layered. The parenchyma of wood is bounded by perimedular tissue and the bundles of inner

**RHIZOME**

Underground stem of the species of Vinca for research – rhizome is characterized by thin and weak cuticle, single-layered epidermis placed like palisade cells and having elongated square shape. Plate-like collenchyma is double or triple layered and united. In the rhizome of *V.herbacea* the wood parenchyma and conductive system are separated by endoderm tissue that is characterized for underground stem of *V.minor*, at the same time this species is characterized by differentiated and active conductive system, it may be said that phloem and phloem fibber are as active as wood elements; there are distinguished parenchyma and vascular bundles of wood of primary and secondary development; in primary wood vascular bundles have thick sheath and in secondary wood they

**Picture 3:** cross dissection of petiole (mezopetiole) *V.herbacea* and *V.minor*  
*A.B.* *V.herbacea*; *C.D.* *V.minor*: 1. Simple trichoma; 2. epiderma; 3.Collenchyme; 4.Main parenchyme; 5. conductive bundle; 6.additional bundle; 7. Phloem; 8. rounded-spiral and rarely stair like bundles; 9. Floem fibbers; 10. idioblast cells
are circle-spiral and spiral. Inner phloem, phloem fibbers and perimedial tissue are more active than in rhizome of *V. herbacea*. In underground stem of *V. herbacea* due to endoderm tissue the conductive system is concentrated. The tissue of inner phloem isn’t fixed and accordingly neither - phloem fibbers. Parenchyma of central cylinder of both species is characterized by rounded cells with thin sheath (Picture 5).

**ROOT**

In the primary root of Vinca to research there is differentiated single layered epidermis, primary wood parenchyma, endoderm and conductive bundle of concentric type. Endoderm is single-layered and there are Caspar spots fixed on the cell membrane. Phloem is united and it covers the primary wood tissue. There are pericyclic elements placed in the wood of primary root of the mentioned species of Vinca; Wood parenchyma is presented by libreform, vascular bundles have thick sheath.

The structure of secondary root of the same species of Vinca is differentiated and accordingly covering, basic and conductive system is very active. There are distinguished the wood elements as well. The wood elements are also distinguished; wood parenchyma and vascular bundles of primary and secondary development. In the wood parenchyma there are actively placed the cell bodies (Picture 6 & 7).

**CONCLUSION**

Due to the goal of the research there were expressed the microstructural features of morphological elements of the species of *Vinea V. minor L* and *V. herbacea* Waldst et Kit. The mesophyll of both species is dorsiventral; The basic
cells of upper and lower epidermis belong to curvilinear clan and according to the order – different types of curvivalled – upper epidermis of *V. minor* L. - to the 2nd order of curvivalled, and lower – to the 3rd order. The basic cells of upper epidermis of *V. herbacea* belong to the first order of curvivalled and lower epidermis to the 2nd curvivalled order. The ventilation apparatus is placed in lower epidermis in both species and both are identical, - by new scheme.
dysectal (paracytal) and satellite cells are pararegocytal type. The activity of mid rib of both species is defined by collenchyme, rich structure of cell and dence bodies of major parenchyma and strong conductive system. The conductive bundle of mid rib of a leaf of both species is complex and open bicolateral type.

The research of a structure of petiole of research patterns showed that in petiole of \textit{V. herbacea} there is fixed the great influence of inner structure of leaf mesophyll that is proved by existence of palisade cells. This fact is essential as the mentioned species are characterized by small petioles, but the existence of palisade tissue in any organ of the plant is determinant of its activity and inner hardness. So this fact gives positive characterization to the species of \textit{V. herbacea}. At the same time this species is characterized by central and additional conductive bundles along with basic conductive bundles that points on its archaic structure. Basic conductive bundles of both species belong to complex, open bicolateral type. In both cases there are iodblast cells next to conductive bundles.

Nearly identical inner structure is characterized for the stems of the species for research, covering tissue is single-layered and there are small number of stomas there; plate form collenchymas is united; wood parenchyma is of dense structure; phloem fibbers and inner and outer phloem are active; wood tissue where there are placed vascular bundles of different type points on functioning of strong and active conductive-supplier system. The stem plasticity is stipulated by plastic cells (cell bodies) placed in parenchyma of crust and central cylinder. Conductive bundle of complex and bicolateral type is characterized for both species.

According to living conditions, the rhizome of research object (underground stem) unlike stem has developed palisade type epidermis cells. In rhizome the mechanical tissue is more weakly presented and there are no stomas in covering tissue. There was no fixed endoderm.

The root system of mentioned species is characterized by typically similar primary and secondary differentiation, the difference is only in features of structural elements. In primary root the parenchyma of primary crust and endoderm tissue are active where there are Caspar fats; the primary conductive system is concentric type, in case of \textit{V. herbacea} there are fixed procambium cells. The central cylinder of primary cell is wholly filled by wood tissue. In case of secondary root the conductive system is more active and the tissue of phloem and wood are more differentiated. There are expressed the elements of primary and secondary wood; lybreform, circle and spiral vascular bundles. The central cylinder is filled by parenchyma tissue, where there are fixed plastic cells.

REFERENCES