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Structural peculiarities of the stem of *Betula megrelica* Sosn. and *B. litwinowii* Doluch

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Abstract
The present work describes microstructural characteristics of the stems of *B. litwinowii* and *B. megrelica*. This investigation provides referential anatomical information for correct identification and differentiation of these species. Structural peculiarities of the stem of the species such as color of the central cylinder, existence of calcium oxalate crystals, radial rays of the conductive systems and other anatomical characteristics give the possibilities to make difference among of two species of the Genus *Betula* L.

Keywords: betula, anatomy, stem, flora, endemic plant

1. Introduction
Genus *Betula* L. (*Betulaceae*) in Georgian flora is presented with 5 members - *B. litwinowii* Doluch, *B. medwedewii* Regel, *B. megrelica* Sosn., *B. pandula* Roth, *B. raddeana* Trautv. Among of them *B. megrelica* is a local subalpine endemic plant of Georgia, described by D. Sosnovskiy in 1934 [1].
The species of Gen. *Betula* L. are known for constituent triterpene and phenolic compounds. Triterpenes are presented as derivatives of pentacyclic lupane and oleanan. The Betulinic acid has clearly expressed anticancer activity. The arilbuthanoids, diarilheptanoids, lignans and phenolic compounds, possessing high antioxidant, cytotoxic, anti-cancer and antiviral activity, are isolated from the other species of *Betula* L. [2 - 10].
The aim of the research was to investigate the anatomy of the stem of *B. megrelica* Sosn. and *B. litwinowii* Doluch 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.

2. Material and Methods
Betula megrelica is a small drought tolerant mountain shrub with metallic stem and attractive yellow leaves in the autumn. At its upper limit (2000 m), it can reach heights of 5 m and forms dense thickets and dwarf forests. At its lower limit (1500 m) the shrub is much smaller, around 2 m, sparser and is heavily grazed by livestock. B. megrelica is a local endemic plant of Georgia, spread in limestone rocks of region Samegrelo. *Betula litwinowii* is branched tree, height around 15 m, bark of the stem is white, sometimes - pink, outer layer easily peeled; Leaves are thin, like leather, majorly egg shaped, at the bottom wedge - shaped, elongated head, one or sometimes two times uneven-sharped; petioles are 2-3 times smaller than plate; It generates with typical subalpine forests on the northern exposition of the upper forest; It is spread in Georgia, except for Gardabani and Kiziki floristic regions [1].
The raw materials, stem of *B. litwinowii* was found from the subalpine mountain slopes of Askhi, in 2012 and stem of *B. megrelica* was collected in classical location, floristic region of Samegrelo, north part of mountain Migaria in 2013.
Cross and longitudinal sections are made by the stems of the species. 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 glycerine. For micro-structural researches there were used light (Carl Zeiss, Jeneval) and stereoscope (MBC-2) microscopes. The photo-material is fixed by digital photo camera (Canon Digital IXVS75). Selected photos are processed by computer program “Adobe Photoshop C55”.

3. Results and Discussion
During small increasing of *B. litwinowii* young stem cross section, reflected white-pinky colored covering tissue and yellow-brown central cylinder structural elements. Panoramas of

stem texture are characterized by the active parenchyma of the stem, annual round thick central cylinder and uneven central core.

In the detailed micro-structural studying of *B. litwinowii* stem bark, reflected the structural elements of the external and internal bark: massive periderma, primary and secondary cortex parenchime cells, radial rays initials and cylinder of phloem and cambium.

The bark of the stem consists of two types of thin membrane and thick membrane cells layers, thin-membrane cells are filled with a small fine-grained,whitish colored component but thick-membrane cells are not characterized by marked component. When the bark is removed, tearing is realized between thin-membrane bark. Tangetailed overextended, blunt-angled cells of external bark parenchyma are isolated from the periderma; On the internal bark and large volume external bark cells border, massive areas of pericyclic fibers are differentiated, it is reflected scleroid cells and weakly-expressed radical rays initials in the internal cortex parenchyma. Pericyclic fibers are characterized by a dot-sized-hole habitus; fossilized cells - isodiametrical shape, wide and multiporoused structure.

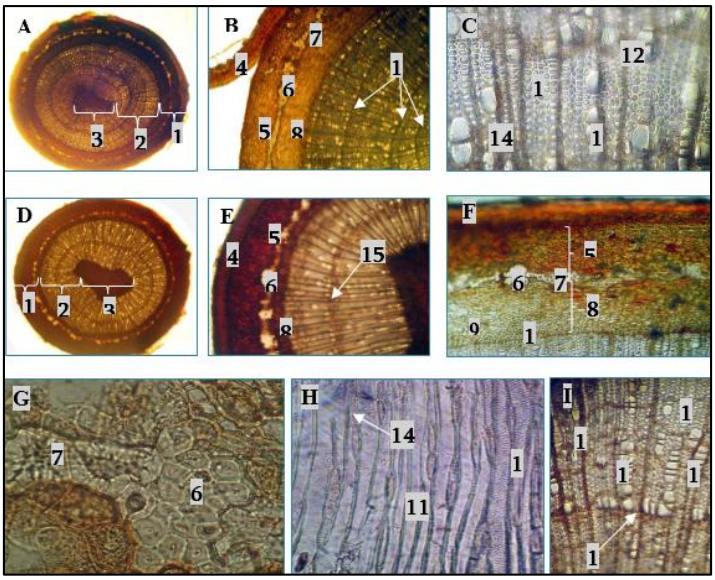
The transistor system of the stem of *B. litwinowii* is a monocyclic structure; On the tangential sections of axis organ, reflected continuous differentiated periaxilary phloem, cambium and non-formal wood cylinder. Differntiate annual rings, expressed in the wood; Small-calibre conductive bundles are less symmetrical in radial direction. The thickening of bundles is porous or spiral; The pores are quite small; Radial rays are one, two, or three lines. The central core is composed of thick, porous cells (Picture 1).

B. megrelica young stem cross section, reflected white-yellow colored covering tissue and dark-reddish central cylinder. Panorama of stem texture is characterized by the active parenchyma of the bark, thick central cylinder with annual rounds and uneven central core.

In the detailed micro-structural studying of *B. megrelica* stem bark, reflected the structural elements of the external and internal bark: periderma, primary and secondary cortex parenchimal cells, initials of radial rays and cylinder of phloem and cambium.

The cells of the phelloderme and phellogen of the bark of the stem of the species are similar. Inside exists parenchymal cells of primary and secondary cortex, bundles of pericyclic fibers and sclereids. Pericyclic fibers are spherical and have a thick shell. Stoned cells are tangential, isodiametric and have a thick shell. In the parenchyma of the cortex and phloem are occurred crystals of Calcium oxalate.

The transistor system of the stem of *B. megrelica* is a monocyclic structure; On the tangential sections of axis organ, reflected continuous differentiated periaxilary phloem, cambium and non-formal wood cylinder. Differntiate annual rings, expressed in the wood; Small-calibre conductive bundles are less symmetrical in radial direction. The thickening of bundles is porous or spiral; The pores are big. The central core is composed of thick, porous cells (Picture 1).



Picture 1: Microstructural diagnostic characteristic of the stem of *Betula megrelica* Sosn. And *B. litwinowii* Doluch. a) Texture panorama of the stem of *B. litwinowii*; b) Parts of the texture of the stem of *B. litwinowii*; c) Parts of the xylem of the stem of *B litwinowii* d) Texture panorama of the stem of *B. megrelica* e) Part of the texture of the stem of *B. megrelica*; f-g) Structural fragments of the bark of B. *megrelica* h) *B. megrelica*- Parts of the xylem of the stem 1. Bark; 2. Central cylinder; 3. Core; 4. Cortex; 5. Parenchyma of outer bark; 6. Pericyclic fibbers; 7. Sclerreids; 8. Parenchyma of internal bark; 9. Phloem; 10. Cambium 11. Parenchymal cells of the xylem 12. Porous conductive vessels 13. Spiral conductive vessels 14. Radial rays; 15. Annual rings of xylem

4. Conclusion

Due to the goal of the research there were expressed the microstructural features of the stem of *B. litwinowii* and *B. megrelica*.

The stem of *B. litwinowii* is characterized with white-pinky colored covering tissue and yellow-brown central cylinder structural elements and the stem of *B. megrelica* has white-yellow colored covering tissue and dark-reddish central cylinder.

Diagnostic characteristics of the stem of the both species are big texture of the central cylinder and unequally side central core.

The volume of the tissues of internal bark of *B. litwinowii* is bigger, than the volume of the tissues of internal bark of *B. megrelica*.

The cortex of *B. litwinowii* is composed by the thin and thick layers cells. Separation of the bark is realized from the thin coated cellular area. The same tendency in the bark of *B.*

megrelica is revealed weak. The peridermal cells are monotonic and are characterized by linear order.

In the bark parenchyma of *B. litwinowii* and *B. megrelica* are differentiated massive areas of pericyclic fibbers and sclerreidal cells. The pericyclic fibbers of the both species are spot-cavity; stoned cells are coated with wide and multi-layered shell.

In the parenchyma and phloem of the bark of *B. megrelica* are occurred rhombic crystals and druses of the salt of Calcium oxalate.

Transitory systems of the both species are monocyclic. Conductive tissue diagnostic characteristics are: perixillary phloem, whole cambium and cylinder of the xylem with the annual rounds.

Conductive vessels in the xylem of the *B. litwinowii* are symmetric. The shells of the conductive vessels are porous or spiral. Radial rays are stacked in 1, 2 or 3 rows.

The xylem of *B. megrelica* is scatter-vascular; Shel of the conductive vessels are porous or radial-spiral. Radial rays are stacked in 1 or 2 rows.

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