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COMPARISON OF ANATOMICAL CHARACTERISTICS OF LEAVES AND FLOWERS OF *CRATAEGUS* AND SOME SPECIES OF ROSACEAE FAMILY

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Abstract. The present work shows the results of microscopy of *Crataegus sanguinea* Pall. leaves with flowers (Crataegi flores cum folia), which is considered as a perspective form of medicinal raw material, and the hypothetical plant adulterants – *Amelanchier ovalis* Medik., *Prunus* subgen. *Cerasus* (Mill.) A. Gray, *Pyrus communis* L., *Aronia melanocarpa* (Michx.) Elliott (Rosaceae). Parts of leaves and flowers of stated plants were subjected to anatomical investigation and comparative studies. Microscopical characteristics of leaves and flowers, which make possible to distinguish *Crataegus* from other species, were detected. The obtained data can be applied for the development of pharmacopoeial article "Crataegi Flores cum folia" for the XII edition of the Russian State Pharmacopoeia.

Key words: *Crataegus*, leaves with flowers, identity, microscopy, trichomes, glandules, authenticity

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Introduction

Preparations produced from medicinal raw material of *Crataegus* are widely used in Russian and foreign cardiology practice (RSP 1990). Flowers and berries are permitted to medicinal usage and drug production according to the Russian State Pharmacopoeia XI (further – RSP XI) (RSP 1990). We have observed that the Russian manufacturers produce crude drug named "Flowers Crataegi", which is represented as a mixture of flowers with leaves. This form of raw material is concerned as substandard from the point of the RSP XI, but in many foreign countries this type of material is approved by regulatory documentation (BP 2009).

The aim of the work is a comparison of anatomical structure and identification of distinctive features of *Crataegus* leaf and flower and some representatives of the Rosaceae family.

Material and methods

Dried flowers and leaves of *Crataegus sanguinea* Pall., *Amelanchier ovalis* Medik., *Prunus* subgen. *Cerasus* (Mill.) A. Gray (*Prunus vulgaris* (Mill.) Schur), *Pyrus communis* L., *Aronia melanocarpa* (Michx.) Elliott were collected and prepared in Moscow region during mass-flowering period in May 2013. Micropreparations were prepared and analyzed according to the requirements of common article of the RSP XI (RSP 1990) under binocular microscope LOMO Micmed-1 with the binocular АУ-12 1,5× (ocular 10×, lenses 8×, 10×, 20×, 40×), binocular LOMO MCP-1.

Results and discussion

Petals

Epidermal cells of the *C. sanguinea* and other observed plants are polygonal and sinuous papillose cells. Some cells occur with thick sides.

An absence of trichomes on epidermis is a characteristic feature of the *C. sanguinea* petal. Unicellular trichomes on the margin and long waving unicellular fuzzes were found on central epidermis of *A. ovalis*. Unicellular thickwalled trichomes were detected on a central epidermis of *A. melanocarpa*. Vascular system of *A. melanocarpa* petals is associated with insertions with a reddish content. At the bottom of the *P. communis* petal single unicellular trichomes were disclosed.

Single druses of calcium oxalate in petal mesophyll were noticed as a character of *A. ovalis.*

Sepals

All samples of sepals have anomocytic type of stomatal apparatus. Long thin unicellular tapering trichomes surrounded by a rosette of 5 cells on lower epidermis of *C. sanguinea.* The sepal of *A. ovalis* and *A. melanocarpa* are densely pubescent with smooth thick unicellular hairs. Lower epidermis of *P. communis* sepals abundantly covered with simple smooth unicellular trichomes with reddish content.

There are large multicellular sedentary glandules with brown insertions on the margin of *C. sanguinea* sepal. Mesophyll of *A. ovalis* sepal contains vessels with brownish fluid. Groups of large glandules with multicellular head and multicellular stalk with reddish content occur on the margin of *P. communis* sepal. Large multicellular spherical glandules occur in sepal margin of *A. melanocarpa*.

Clusters of calcium oxalate are represented as druses and prismatic crystals associated with veins in *C. sanguinea.* There are numerous amounts of druses in mesophyll of *A. ovalis.* and *Prunus* subgen. *Cerasus* sepals. Druses in *A. ovalis* were also situated nearby large veins. Mesophyll of *P. communis* contains clusters of prismatic crystals of calcium oxalate.

Leaf blades

The leaves of observed species are found to have anomocytic type of stomatal apparatus and long striations of cuticle. Upper epidermis of *C. sanguinea* leaf blade consists of polygonal cells, and thick-walled tapering unicellular trichomes surrounded with rosette of 6-8 epidermal cells were seen close to veins. The margin and the lower epidermis of leaf blade are abundantly covered by long tapering unicellular hairs. The basement of the trichomes extend slightly above the level of the epidermis.

On the lower epidermis of *A. ovalis* leaf long single thick unicellular trichomes were detected. The leaf basement is more pubescent than the margin. *A. melanocarpa* is covered by short straight thick-walled hairs with brownish insertions on the lower epidermis. The margin of leaf is covered by long unicellular curved trichomes. *Prunus* subgen. *Cerasus* and *P. communis* leaves are covered with long unicellular trichomes on the lower epidermis.

Leaf blades of *C. sanguinea, A. melanocarpa* and *A. ovalis* contain brownish fluid in mesophyll associated with veins.

On the top of *A. ovalis* leaves large multicellular glandules were found. Multicellular sessile glandules are situated on denticles of *A. melanocarpa* leaf margin. Groups of glandules appear on margin of *P. communis* leaf.

The margin of *Prunus* subgen. *Cerasus* leaf is found to have red sedentary spherical glandules with multicellular head.

Calcium oxalate occurs as clusters of druses and prismatic crystals in *C. sanguinea* mesophyll. *A. ovalis, A. melanocarpa* and *Prunus* subgen. *Cerasus* contain only druses. Druses of *A. melanocarpa* leaf appear in sporadical manner, while druses of *Prunus* subgen. *Cerasus* form large clusters in mesophyll. Druses of *A. ovalis* are associated with veins. Numerous clusters of druses and prismatic crystals were found in mesophyll of *P. communis*.

Conclusions

Diagnostic anatomical characteristics of flowers and leaves of *Crataegus* and the hypothetical plant adulterants were detected. The pubescence character, the form, the size of trichomes and glandules and the form of calcium oxalate crystalls are the principal features, which make possible to distinguish these species.

Referenses

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BP 2009. British Pharmacopoeia. British Pharmacopoeia Commission, London.