ANATOMO-DIAGNOSTIC ANALYSES OF THE OVERGROUND PART OF THE SALSOLA COLLINA L.

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Summary: microscopic investigation of the overground part of the Salsola Collina has been carried out. For the identification of the raw material some diagnostic features have been outlined.

Key words: Salsola collina, overground part, microscopic investigation, diagnostic features.

Lead-in.

Salsola collina is a one-year herbaceous plant from a monogynopaedium Mirage (Chenopodiaceae) which is spread in European part of Russia, Western Siberia (semideserted and steppe areas), Eastern Siberia, Far East, as well as in Mongolia, North Korea, in China.

Pharmacological action of Salsola collina is conditioned by a complex of biologically active substances, the most important from which is betaine, phytosterols, flavonoids, carotenoids, glycosides, alkaloids of isoquinoline origin, inulins, saponins, ketodin-carbon acids, about two scores of micro- and macroelements: iron, phosphorus, potassium, calcium, magnesium, zinc, silicon, copper and other [7,8,10,11].

One this plant’s characteristics is very high content of higher fatty acids, in particular polyunsaturated gamma-linolenic acid which is the predecessor of prostaglandins and energy substrate in the process of intracellular breathing[5].

In folk and traditional medicine Salsola collina is used in diseases for treating the deseases of stomach, intestines, pancreas, diabetes, as a means of prevention and treatment of coronary heart disease, neurotic depression, atherosclerosis. In China, the infusion of herbs was used as an antihypertensive preparation, in Tibetan medicine - as wound healing preparation [1,4,8-10].
Particular attention should be given to hepatoprotective effect of Salsola collina extract which is caused by the transition of glicinbetaine, alkaloids, salts phenolketodicarboxylic acids, sterine glycosides, saponins and flavonoids to the extract [2,3].

**Materials and methods.** To determine the microscopic diagnostic features fresh and fixed in a mixture of ethyl alcohol of 96%–glycerine-water (1:1:1) plant material has been used. The anatomical structure has been studied by widely-known methods [6] using a microscope "Biolam C-12" with increasing effect 20x8, 20x20, 20x40. The photos taken by a digital camera «Olympys FE-140" were followed by computer processing of the images.

**Results and discussions.** A stem on the transversal cut is cylindrical-crimped, with a few ribs (pic. 1,2).

Pic. 1. Pic. 2.

The cells of epidermis in intercostal areas are parenchymal on the surface (pic. 3), varying from izodiametrical to tangentially-extended, 4-6- angled, with right lines, sometimes slightly curved, with slightly thickened membrane. Often the cells are located consistently along an organ and form more or less curved chains. The sizes of cells vary. The stomata are frequent, located perpendicularly or under a corner to the stem axis, surrounded by 3-5 (up to 6) near-stoma cells. 1-2 near-stoma cells are smaller in size, sometimes can have a kidney-like form. The stoma apparatus is of tetracital, rarely anomocital type. The cells that are close to the ribs are greater and somehow extended. The cells of epidermis above the ribs are prosenchymal, narrow, with upright walls, without any stomata on surface.

Pic. 3.

The cuticle is not visible at all or short-hatched and ill-defined. The indumentum is absent.

On a transverse section of the stem the cells of the epidermis over the ribs are smaller, parenchymal, the outer membrane is thickened and coated with a thin
layer of cuticle. The intercostal cells of epidermis are larger and tangentially extended.

Under the epidermis in the ribs are the strands of lamellar-angular or angular collenchyme. The primary bark of intercostal areas comprises subepidermal layer of narrow-cellular, thin-sided, columnar chlorenchyma; the layer of tightly-packed, vertically extended cells with slightly sinuous or curved membranes and 2-3-rowed barky parenchyma consisting from large cells with wavy, slightly thickened membrane, and some of them contain large druses (Fig. 4). Endoderm cells are smaller than the cells of bark’s parenchyma.

Pic. 4.

The type of structure of axial cylinder is fascicularless (pic. 1,4). The area of phloem is narrow, its cells are small, some of them contain parts of light substance. On outer part of a phloem there sometimes can be found single rounded cells with thickened barkened membrane and large cavity.

The secondary xylem is represented mainly by barky fibers, porous tracheids, and also stair-like and porous vessels, located separately or in groups. In the bottom part of the xylem ring the areas of primary xylem with prevailing, larger in diameter, spiral vessels are located. The areas of the thin-walled phloem can be located or partly destroyed above some areas of primary xylem.

The core is represented by the large, round, thin-walled, porous cells separated by small intercellular spaces. In the cores of some cells cores whole or destroyed druses can be observed. On the outer epidermis of the leaf (pic. 5) wide and narrow extended areas can be seen. On the wide areas the cells are 4-6-angled, from izodiametrical to extended, with right, slightly thickened walls, often located consistently along an organ and form more or less long chains. The sizes of cells vary. The stomata are frequent, located athwart or under a corner to the longitudinal axis of the leaf. The near-stoma cells are mainly 4-, sometimes 5-walled, as a rule small. The predominant type of stoma complex is tetracital. The narrow areas consist of extended and prosenchymal of right-walled cells.
The indumentum on the surface is represented by single short bristle- or papilla-like villi, with thickened membrane and pointed or truncated surface (pic. 6).

A lower epidermis consists of smaller cells with more thickened membranes, the stomata are rare and single.

The edge is thin-membraned, transparent, and consists of extended and prosenchymal narrow cells. On the edge short one-celled, often cone-shaped, sometimes papilli-like, acroscopik villi are scatteredly located. Their length varies.

An apex is aristate, formed by narrow sclerified cells.

Numerical, mainly large druses are typical for mesophile.

The structure of external epidermis of bractal scales above photosynthesizing areas is similar to the structure of epidermis of a leaf, differs through more thickened cell membranes and absence of villi. The cells of pellicle transparent edge are more extended and narrow, have lines or arcuated, thickened, in some areas have porous membranes. The cells of epidermis of aristate apex are parenchymal, insignificantly thickened, tight or lose.

The cells of internal epidermis of bractal scales are mainly extended and prosenchymal on the surface, have lines or are poorly arcuated, have considerably thickened sclerified porous membranes. The cells have more thickened membranes on the edge and above sclerified traces. The stomata and indumentum are not present.

The fruit is nut-shaped. The cells of epidermis of perianth that are sometimes kept at a fruit are extended, thin-walled, filled with small, mainly diamond-shaped or square crystals (pic. 7). In the cells of wing-shaped edge crystals are not present. In the bottom part of perianth crystals are bigger and can be better seen. From two crests located in the middle of perianth or a bit higher the presence of numerical druses is typical. Separate cells of epidermis can contain some brown substance.
Outwardly, the indumentum consisting of long one-celled thin-walled band-shaped curved villi there is from the very long, one-celled, thin-walled can be seen.

Pic. 7.

Pellicle pericarp, its structure depends on the ripeness of the fruit. The cells of external epidermis of the pericarp of a ripe fruit are mainly extended and prosenchymal; they can contain some grainy substance. On the surface idioblastal cells can be seen containing some umber or brown substance, and also on the internal side of the pericarp there are groups or single cells which as the ones in the leaves of perianth contain single crystals concentrated mainly in upper part of the fruit (pic. 8).

Pic. 8.

On the bottom of the fruit there can be seen some groups of sclereids with a wide cavity and in internal fabrics – druses.

**Conclusions.** As a result of the research carried out the following micro-diagnostic features have been determined:

- cells of epidermis of the stem in intercostal areas, leaves and bractal scales are right-walled, mainly parenchymal; the stomata are located athwart or under an angle to the longitudinal axis of organ; the predominant type of stomata apparatus – tetracital; the indumentum is presented by single short one-celled villi on the surface and on the pellicle edge of leaves; the cuticle is poorly visible, short-stroke;

- the type of structure of a stem’s axial cylinder is fascicularless; in the primary bark there are subepidermal strands of angular or plate-angular collenchymes, on outside of the phloem sometimes there are separate cells with sclerified thickened membrane;

- in the secondary xylem of the stem there are vessels as well as porous tracheids;

- in all the organs examined some druses are present, there are more of them in a barky parenchima of the stem, leaves mesophyll, in scales, in the humps of
leaves perianth; in the cells of leaves perianth at the fruit and pericarp numeral small, mainly rectangular and rhombic crystals can be seen.

**Bibliography.**


Pic. 1. The transverse section of the stem.
Pic. 2. A fragment primary bark of the stem.
Pic. 3. The epidermis of the stem in intercostal areas.
Pic. 4. A fragment of the stem on transverse section.
Pic. 5. The upper epidermis of the leaf.
Pic. 6. The villus of upper epidermis of the leaf.
Pic. 7. Single crystals in the cells of epidermis of leaves perianth.
Pic. 8. The epidermis of the pericarp of a ripe fruit.