

ADAPTIVE SIGNS OF A LEAF OF SOME ENDEMIC SPECIES OF THE GENUS IRIS L. FROM DIFFERENT SECTIONS UNDER CONDITIONS OF INTRODUCTION IN UZBEKISTAN

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ABSTRACT: The anatomical structure of the leaf of 3 endemic species from different sections was studied: *Iris sogdiana* (*Limniris* Tausch), *Iris korolkowii* (*Hexapogon* (Bunge ex Alef.) Baker) and *Iris svetlanae* (*Juno* Tratt.) under the introduction of the Botanical Garden of the Academy of Sciences of the Republic of Uzbekistan. Structural diagnostic features of the leaf for the studied sections of the genus *Iris* were determined.

Keywords: Anatomy, Leaf, Introduction, Species of the genus *Iris*, Tashkent.

INTRODUCTION

At present, there is a rapid reduction in the range and complete disappearance of many plant species. Biological diversity is the basis for maintaining the ecological conditions of existence and economic development of human society, genetic resources are the main source of selection-important characteristics. In this connection, the problem of the conservation and reproduction of rare and endangered plant species both *in situ* and *ex situ* is urgent.

Iris - a fairly large family, which includes about 1800 species belonging to 75-80 genera. The range of this family is very large: it covers almost the entire land of the globe, excluding most of the Arctic, the extreme north of the taiga zone of Eurasia, and also some deserts and plots of tropic tropics with rain forests ([http://molbiol.ru/wiki/_\(Iridaceae\)](http://molbiol.ru/wiki/_(Iridaceae))). In the flora of Uzbekistan, this genus includes more than 30 species.

One of the last large-scale revisions of the genus *Iris* was conducted by P. Wendelbo in *Flora Iranica* (1975), where he combined all 3 genera into one and brought 45 species to this territory. Recent studies based on the study of DNA have confirmed the correctness of this concept (Ikinci, Hall, Lledo et al., 2011). These are given types from 3 sections: *Limniris* Tausch, *Hexapogon* (Bunge ex Alef.) Baker and *Juno* Tratt. Based on revisions of systems and lists of R.V. Kamelin (1973), P. Wendelbo (1975), as well as the revision of F.O. Hassanov & N.K. Rakhimova (2012, 2016). The anatomical structure of the leaf of 3 endemic species - *Iris sogdiana*, *Iris korolkowii* and *Iris svetlanae* has not been studied. This determines the relevance and novelty of our research.

MATERIALS AND METHODS

Species were collected under the conditions of the introduction of the Botanical Garden named after acad. F.N. Russanov (Institute of Botany and Zoology of the Academy of Sciences of Uzbekistan) are the endemics of Central Asia.

The leaves of some species *Iris* were fixed in 70⁰ ethanol for anatomical study. The leaves epidermis was studied on the paradermal and transverse sections. Transverse sections of the leaf are made through the middle. Each tissue was described, epidermis according to S.F. Zakharevich (1954). Prepared were stained with methylene blue followed by sealing with glycerin-gelatin (Barykina, Veselova, Devyatov et al., 2004). Photomicrographs are made with a computer microphotoset with a digital camera Samsung ES70 and microscope of Motic B1-220A - 3.

RESULTS AND DISCUSSION

Iris sogdiana (Bunge) Grubov - perennial bulbous plant of the family Iridaceae, Leaves simple, linear plate shape, xiphoid, sessile, apex acute, margin, smooth, wedge-shaped base, 1.5 cm wide, leaflet in regular shoot, basal - rosette.

The leaves of *Iris sogdiana* on the paradermal section of the circuit of the epidermal cells are rectilinear, the projection is polygonal. The cells of the adaxial epidermis are larger than the cells of the abaxial epidermis. The leaves are amphistomatic. The stomata are located transversely to the longitudinal axis of the leaf. The form of the stomata is rounded. Stomata most numerous on the abaxial side than on the adaxial side. The terminal cells of the stomata on both sides of the leaf are almost the same length. Stomata submerged, two types noted: anomocytic and pericytic (Figure 1a, b, g).

Mesophyll leaf on the transverse section of the isolaterally-palisadic (measlespermoid) type, which is represented by 2 rows of palisade cells on both sides of the leaf, an water-bearing parenchyma of different thicknesses between them and conducting beams (Butnik, Tursynbaeva, Duschanova, 2015) (Figure 1 c).

It is known that the epidermis of the assimilating organs is a very informative tissue. The parameters of the epidermis (types of stomata, the shape of epidermal cells) are used in plant taxonomy. The epidermis determines the belonging of the plant to a certain ecological group (xerophytes, mesophytes, halophytes) and, in combination with other features, reflects the evolutionary path of the taxon, the ecology of its origin. The epidermis is used for the diagnosis of plant material, the determination of the food base of animals, in forensic examination.

The epidermis is round-oval, represented by one row of cells with a thick-walled cuticle layer. The parasitic parenchyma is located under the epidermis, elongated, large-celled, consisting of 2 rows vertically, 2-3-horizontal, chlorophyllous (Figure 1 d, e, g).

On the periphery of the leaf mesophyll under the epidermis there are large and small vascular bundles alternating with each other. Large vascular bundles are issued on the adaxial and abaxial side of the sheet. Under the adaxial and abaxial epidermis and above the conducting beams, 8-9 row sclerenchyma is located, which shows a more highly sclerated vascular bundle.

Vascular bundles are closed, collateral, numerous, consisting of phloem and xylem, with 8-14 large and small vessels (Figure - 1 c, d, e).

In the center of the leaf's mesophyll there is a large cell and a small-celled water-bearing parenchyma, consisting of 3-4 rows (Figure 1 c, f).

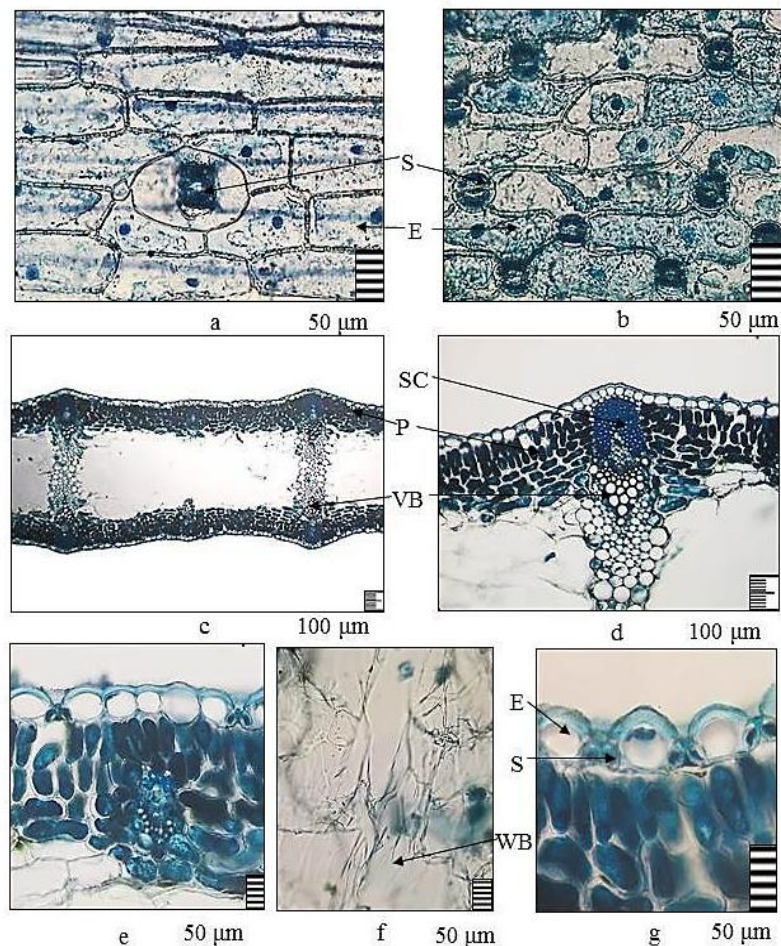


Figure 1. Structure of the epidermis and mesophyll of the leaf *Iris sogdiana* (section *Limniris* Tausch): a - adaxial epidermis; b - abaxial epidermis; c - leaf mesophyll; d - vascular bundle; e - chlorophyllous palisade

***Iris korolkowii* Regel** – is perennial grass, leaves simple, the shape of the plate is linear, sessile, the tip is sharp, the edge is smooth, the leaf in the shoot is regular, in the basal - rosette.

The leaves of *Iris korolkowii* on the paradermal section of the outline of the epidermal cells are rectilinear, the projection is polygonal. The cells of the adaxial epidermis are larger than the cells of the abaxial epidermis. The leaves are amphistomatic. The stomata are located transversely to the longitudinal axis of the leaf. The shape of the stomata is round-oval. Stomata most numerous on the abaxial side than on the adaxial side. The closing cells of stomata on both sides of leaf of almost the same length. Stomata immersed, anomocytic type (Figure 2a, b, g).

The leaf's mesophyll on the transverse section of an isolaterally- spongy type, which is represented by 5-6 rows of spongy cells on both sides of the leaf, water-bearing layer different thickness there between and vascular bundles (Figure -2, c, d).

The epidermis is round-oval, represented by one row of cells with a thin-walled cuticle layer. The spongy parenchyma is located under the epidermis, consisting of 5-6 rows of cells, chlorophyllous (Figure 2 c, d, e). On the periphery of the leaf's mesophyll under the epidermis there are large, medium and small conducting beams alternating with each other. Large and medium vascular bundles and issued on adaxial and abaxial side of leaf. Under the adaxial and abaxial epidermis and above the vascular bundles, there is an angular 4-5 row collenchyma.

Vascular bundles closed, collateral, numerous consisting of phloem and xylem, 6-7 large and small vessels (Figure - 2, d).

In the center of the leaf mesophyll there is a large-celled water-bearing parenchyma of various sizes, consisting of 5-6 rows (Figure 2 c, f).

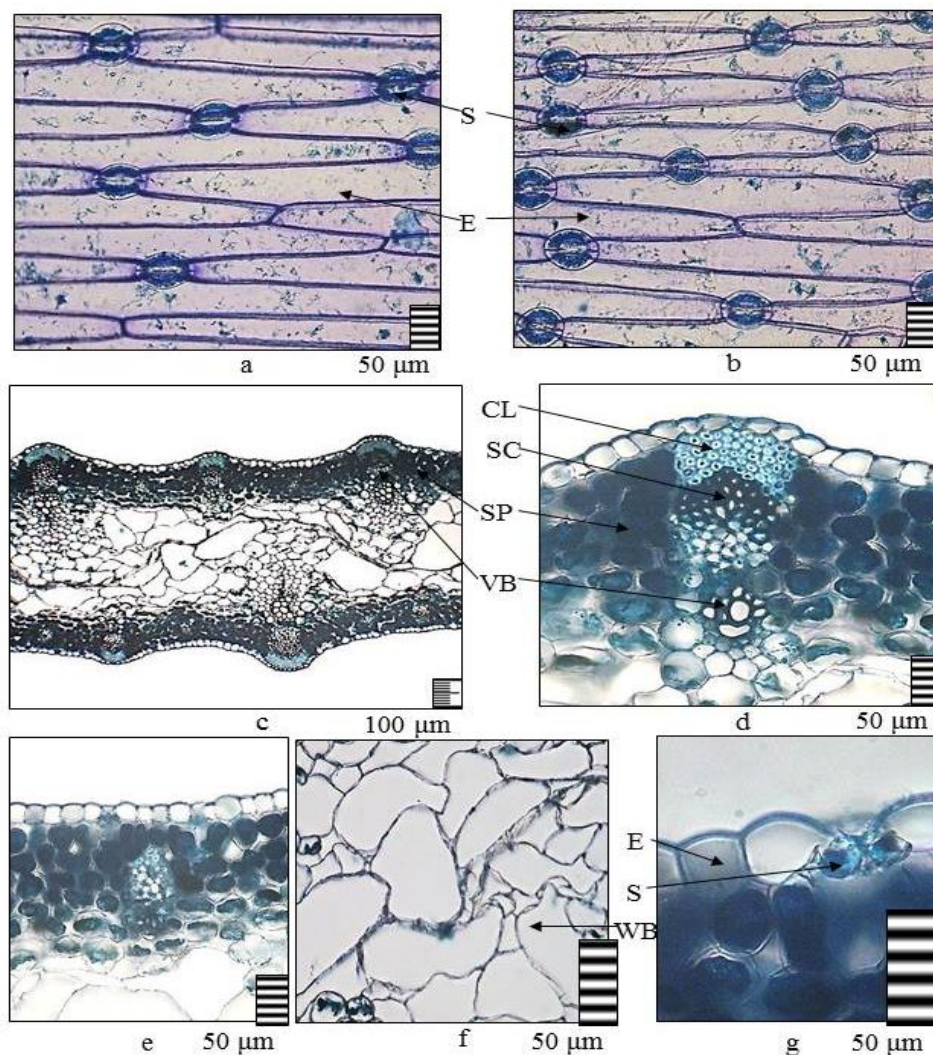


Figure 2. Structure of the epidermis and leaf's mesophyll of *Iris korolkowii* (section *Hexapogon* (Bunge ex Alef.)): a - adaxial epidermis; b- abaxial epidermis; c - mesophyll leaf; d - vascular bundle; e - chlorophyll spongy parenchyma; f - water-bearing parenchyma; g - submerged

***Iris svetlanæ* (Vved.) Khass.** Is a Red Book rare endemic of the Western Pamiroalay with status 2. A perennial plant from the family of Iridaceae (Red Data Book of the Republic of Uzbekistan, 2016).

Leaves of *Iris svetlanæ* 3-4 cm wide, falcate, smooth, white fringed along the edge, sharp. On paraderm cut contours of epidermal cells, rectilinear, polygonal projection. The cells of the adaxial epidermis are larger than the cells of the abaxial epidermis. Leaves are amphistomatic. The stomata are located transversely to the elongated axis of the leaf. The shape of the stomata is rounded. Stomata most numerous on the abaxial side, on the adaxial side - absent. The terminal cells of the stomata on both sides of the leaf are almost the same length. Stomata not submerged. Type of stomata is anomocytic (Figure - 3).

Leaf's mesophyll of in a cross section is isospongy type which contains the spongy cells on both sides of the leaf. The epidermis is represented by one row of cells with a thick-walled layer of cuticle. Adaxial epidermal cells are large, elongated than abaxial. Spongy parenchyma is rounded, chlorophylls, small-celled, consists of 9-10 rows (Figure - 3).

The main and lateral fibrils are issued on the abaxial side. Under the abaxial epidermis and on the conducting bundles, there is an angular 9-10 row collenchyma. The main fibrils vascular bundle includes 1. Vascular bundles are closed, collateral, numerous, consisting of phloem and xylem, with 9-10 large and small vessels (Figure - 3).

Based on the obtained results of the study, structural signs of the leaf for the studied sections of the genus *Iris* were revealed (Table).

Thus, the anatomical structure of the leaf of 3 species of *Iris* has been studied. Identified for each section of the diagnostic signs of the leaf. For the *Limniris Tausch* section: the leaf mesophyll type is isolaterally palisade; Stomata submerged, anomocytic and pericyte types, numerous on the abaxial side than on the adaxial; vascular bundles are located along the periphery of the leaf mesophyll, more sclerated by sclerenchymal cells and are connected by parenchymal cells.

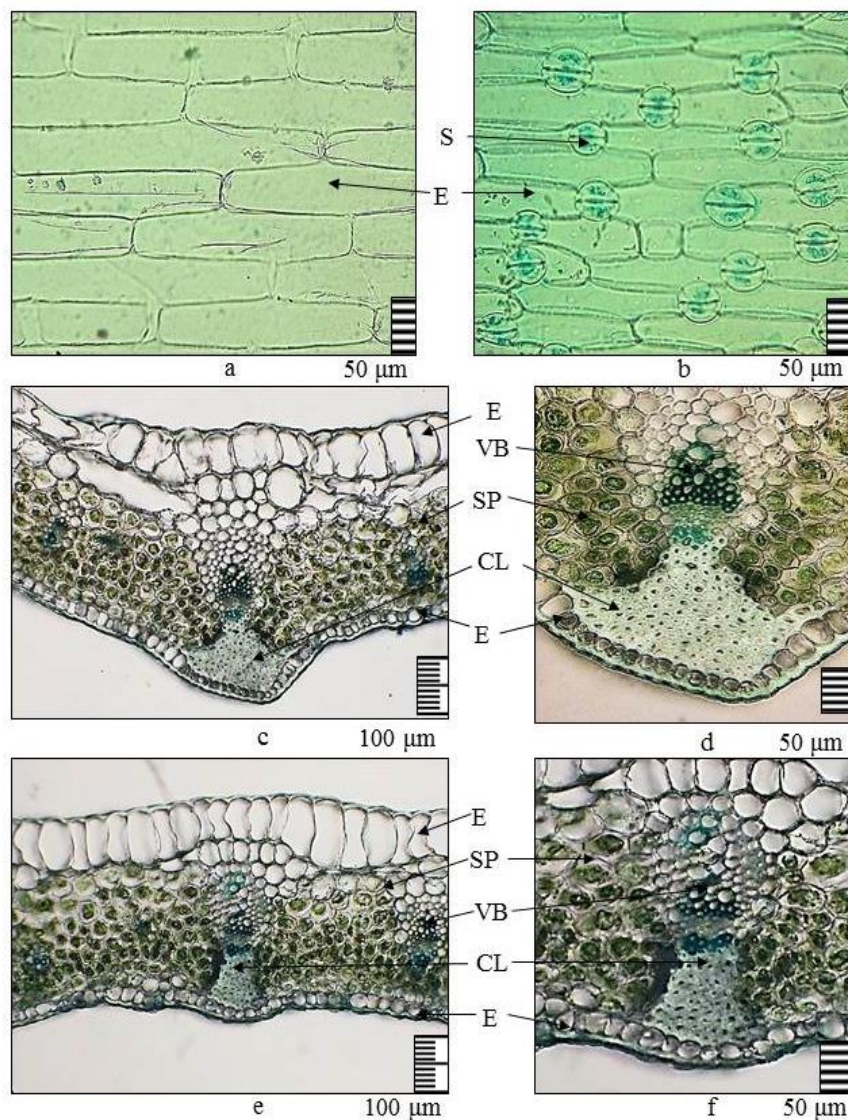


Figure 3. Structure of the epidermis and mesophyll leaf *Juno svetlanae* (section *Juno Tratt.*): a - adaxial epidermis; b - abaxial epidermis; c-e – leaf's mesophyll; d - main vascular bundles; f -

Table 1. Characteristic structural signs of the leaf for sections of the genus *Iris* L.

Signs	Sections		
	<i>Limniris</i> Tausch	<i>Hexapogon</i> (Bunge ex Alef.) Baker	<i>Juno</i> Tratt.
Leaf's mesophyll	isolaterally- palisade	isolaterally- spongy	iso spongy
Stomata	submerged	submerged	submerged and nosubmerged
Stomata's types	anomocytic and pericytic	anomocytic	anomocytic
Presence of stomata	on the adaxial and abaxial	on the adaxial and abaxial	on the adaxial
Vascular bundles	not allocated	not allocated	allocated to the main and lateral
Location of vascular bundles	on the periphery of the leaf	on the periphery of the leaf	on the center of the leaf

For the section ***Hexapogon* (Bunge ex Alef.) Baker**: type of leaf mesophyll is isolaterally-spongy; stomata submerged anomocytic, numerous on the abaxial side than on the adaxial; the vascular bundles are located along the periphery of the mesophyll of the leaf, are more sclerated at the expense of to collenchymal cells. For the section ***Juno* Tratt.**: type of leaf mesophyll is isospongy; stomata unloaded (in some species submerged) anomocytic type, their presence on the abaxial side and absence on the adaxial side; the presence of the main and lateral vascular bundles and their location in the central part of the mesophyll of the leaf and their more highly sclerated at the expense of to collenchymal cells. Identified in the course of the study signs are characteristic diagnostic for each section and can serve when identifying plant material.

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