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ANATOMICAL PROPERTIES OF ENDEMIC LILIUM CARNIOLICUM BERNH. EX W.KOCH VAR. ARTVINENSE (MISCZ.) DAVIS & HENDERSON (LILIACEAE) IN TURKEY

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ABSTRACT

In this study, anatomical properties of an endemic taxon of *Lilium carniolicum* Bernh. ex W. Koch var. *artvinense* (Miscz.) Davis & Henderson were investigated. The cross sections taken from the stem, bulb and leaf of the investigated taxon were examined. Results were presented by drawings and tables and compared with the other *Liliaceae* members.

Keywords: Liliaceae, Lilium carniolicum var. artvinense, anatomy, endemic, Turkey

TÜRKİYE'DE YAYILIŞ GÖSTEREN ENDEMİK LILIUM CARNIOLICUM BERNH. EX W.KOCH VAR. ARTVINENSE (MISCZ.) DAVIS & HENDERSON (LILIACEAE)'NİN ANATOMİK ÖZELLİKLERİ

ÖZET

Bu çalışmada, endemik *Lilium carniolicum* Bernh. ex W. Koch var. *artvinense* (Miscz.) Davis & Henderson taksonunun anatomik özellikleri araştırıldı. Araştırılan taksonun gövde, soğan ve yaprağından alınan enine kesitler incelendi. Sonuçlar çizim ve tablolar ile gösterilerek diğer *Liliaceae* üyeleri ile karşılaştırma yapıldı.

Anahtar kelimeler: Liliaceae, Lilium carniolicum var. artvinense, anatomi, endemik, Türkiye

MATERIAL AND METHODS

Plant samples were collected from natural population at the following location and the plant samples were stored in alcohol (%70) for anatomical work:

A8: Between Artvin- Borçka, among volcanic rocks, 800m, 20.08.1996

Taxonomical description of the plant followed to Davis [4]. The cross-sections of the plant organs were taken from its stem, leaves and bulb. The samples were kept in a mixture of alcohol %70 and glycerol (1:1) and dyed in sartur reactive [2]. Anatomical measurements were taken using ocular-micrometer.

INTRODUCTION

The family *Liliaceae* is worldwide represented by 250 genera and 3500 species. This family is represented by 35 genera and more than 400 species [17]. The genus *Lilium* L. is represented by 7 taxa in Turkey [4; 5]. Species of *Lilium* are bulbous and perennial. Many species of the family *Liliaceae* are grown in parks and gardens as ornamental plants due to its beautiful flower [8]. Some of the *Lilium* species are aromatic and used in perfumery and industry [6]. Some *Lilium* species which have effective substance, are used in the preparation of drugs for the treatment of skin disease, abscess, pimple [3]. In addition, some species of *Lilium* are used as adhesive and paint [13].

There is no detailed anatomical information about *Lilium carniolicum* var. *artvinense* to be found except for the knowledge published in "Flora of Turkey" [4] and the study on the molecular phylogeny and systematics of *Lilium carniolicum* group in European flora based on nuclear ITS sequences [16] and another study on the origin of European lilies, phylogenetic

analysis of *Lilium* section *Liriotypus* using sequences of the nuclear ribosomal transcribed spacers [7]. Recently, the effects of some calcium inhibitors on the pollen grain germination and growth of pollen tubes of *Lilium davidii* Duch. var. *unicolor* has been determined [18] and a study on the growth and development of *Lilium longiflorum* Thunb. during bulb production under controlled environments have been recorded in the literature [10]. We aimed to give knowledge about some antomical characteristics of the taxon and compare it with the other members of the family *Liliaceae*.

RESULTS

Anatomical Properties

Stem: Cuticle was thick on outer part of epidermis cells. Epidermis was single layered and consisted of cubical cell 10.7-32.1 x 9.6-26.8µm. Cortex located under epidermis were 3-5 layered with no intercellular spaces. There were sclerenchymatous ring 5-6 layered under cortex, 10.7-42.8µm in thickness. Cortex under sclerenchymatous ring were 8-10 layered and had no intercellular spaces and consisted of ovoid, parenchymatous cells. Vascular bundles were bigger in the centre region than the other (Table 1.; Fig. 1B).

Leaf: Epidermis was single layered on the upper and lower surface of leaf. Cuticle was present on both upper and lower epidermis. The cuticle on the lower epidermis was thicker than the upper cuticle. It was difficult to distinguish the cells of palisade parenchyma from the cells of spongy parenchyma in mesophyll of leaf. Mesophyll cells were more or less uniform in shape. Large lobes were present on the mesophyll cells, which therefore appeared branched. Some of these cells were leaning to one side. Stoma cells were present only on the lower epidermis. The vascular bundles different in size were present in the median part of mesophyll. The walls of upper epidermis cells were clearly sinuous in the surface sections of leaf. There were glandular hairs with tall stalk on the upper epidermis cells. In addition, there were capitate glandular hairs which have single head cell at the ends of the leaf cross-sections (Table 1.; Fig. 1C-D).

Bulb: Epidermis was single layered and consisted of cubical shaped cells. Cuticle was present on epidermis cells. Cortex was multilayered and parenchymatous with cells hexagonal or ovoidal. There were a lot of starch grains in parenchymatous cells. The vascular bundles were scattered in the cortex. Xylem was clearly seen in vascular bundles (Table 1.; Fig. 1A).

DISCUSSION

In this study, we aimed to demonstrate the characteristics of *Lilium carniolicum* Bernh. ex W. Koch var. *artvinense* by evaluating the results obtained from anatomical investigations. In anatomical studies, it has been determined that there were sclerenchymatic ring in the cortex of stem. The same sclerenchymatic ring has been reported in the stem of *Gagea bulbifera* (Pall.). Roem. Et. Schult., *Fritillaria erzurumica* Kasaplıgil, *Gladiolus atroviolaceus* Boiss., *Lilium ciliatum* P.H. Davis, *Scilla peruviana* L. and *Scilla verna* Hudson, *Tulipa armena* Boiss. var. *lycica* (Baker) Marais [15; 1; 14; 12] while it has not been observed in the stem of *Tulipa aleppensis* Boiss.

ex. Regel, *Asphodeline damascene* (Boiss.) Baker subsp. *gigantea* and *Scilla mesopotamica* Speta [17], which belong to the family *Liliaceae*. The cortex of the investigated taxon is composed of thin walled parenchyma cells with chloroplasts in the subepidermal layer. The first vascular bundles are formed inside the sclerenchyma cylinder. The large ones are usually present under of sclerenchyma ring and scattered regularly. The pith was composed of large, loosely arranged, thin-walled parenchymatous cells. The same features has been observed in the stem of *Scilla verna* Huds. and *Scilla peruviana* L. and *Lilium ciliatum* P.D. Davis, *Tulipa armena* Boiss. var. *lycica* (Backer) Marais [1; 14; 12]. The palisade and spongy parenchyma cells were not distinguishable in the leaf of *Leucojum aestivum* L., *Pancratum maritimum* L., *Lilium ciliatum*, *Scilla obtisifolia* Poirect, *Tulipa armena* var. *lycica* [11; 9; 1; 14; 12]. In the present study, we found the same characteristics. Finally, the investigated taxon had very similar anatomical characteristics with the other members of the family *Liliaceae*. However it could be distinguished by some characteristics such as mesophyll structure being differentiated into palisade and spongy parenchyma or uniform in leaf and a sclerenchymatous ring in stem. In addition, *Lilium carniolicum* var. *artvinense* had distinctively capitate glandular hairs on the both ends of the leaf cross-section. But that feature has not been encountered in the literature so far, thus providing us another distinguishing feature.

Table 1. Some anatomical measurements of *Lilium carniolicum* var. *artvinense*

	Width (μm) min max	**Length (μm) min max**
Bulb (Fig. 1A).		
Epidermis cell	80-160	133-186
Diameter of cortex cell	160-480	
Stem (Fig. 1B).		
Cuticle	5.4-10.7	
Epidermis cell	10.7-32.1	9.6-26.8
Diameter of cortex cell	32.1-160.7	
Diameter of trachea	10.7-53.6	
Diameter of sclerenchyma cell	10.7-42.8	
Leaf (Fig. 1C-D).		
Adaxial cuticle	5.4-10.7	
Abaxial cuticle	5.4-16.1	
Adaxial epidermis cell	21.4-42.8	16.1-53.6
Abaxial epidermis cell	32.1-74.97	32.1-53.6
Diameter of Trachea cell	5.4-21.4	

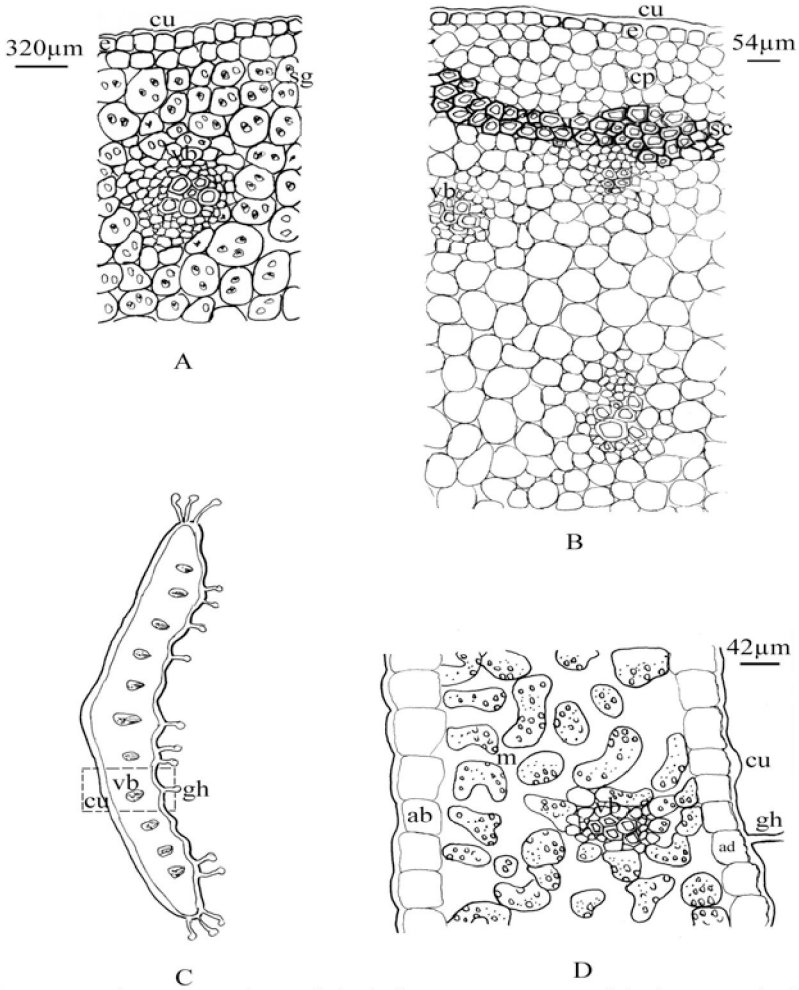

Figure 1. The cross-sections of the bulb (A), stem (B) and leaf (C-D) of Lilium carniolicum Bernh. Ex W.Koch var. artvinense (Miscz.) Davis& Henderson cu. cuticle vb. vascular bundle gh. glandular hair ab. Abaxial epidermis ad. adaxial epidermis m. mesophyll e. epidermis sg. starch grain cp. cortex parenchyma

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