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# A study on the determination of the anatomical properties of the endemic *Gladiolus anatolicus* (Boiss.) Stapf

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***Abstract –*** The genus *Gladiolus* has approximately about 270 species worldwide, with the majority of these species being distributed in Africa. There are a total of 15 species, 10 of which can only be found in Türkiye. In the anatomical studies of *Gladiolus anatolicus*, Fast-green and safranin staining was utilized on cross-sections of the scape, and leaf. After that, permanent preparations were made of the samples, and pictures were taken. In scape, 5-8 layer cortex cells are not have collenchyma. There are 3-5 rows of sclerenchyma layers under the cortex. Both the upper and lower surfaces of and leaf have abundant glandular trichomes. The leaves are unifacial, with inverted bundles, but the presence of two marginal bundles and a prominent marginal Groove. The vascular bundle is surrounded by a sheath of parenchymatous cells.

*Keywords – Anatomy, Gladiolus, Iridaceae, Systematic, Türkiye*

## I. INTRODUCTION

*Gladiolus* L. is the largest genus in the family Iridaceae. It has about 270 species ([1], [2]), and it may be found in Africa, Madagascar, Mediterranean Europe, the Middle East, and even as far east as Afghanistan. According to [3], the southern African region is the epicenter of the genus. West Africa is home to ten species of *Gladiolus*, extending westward from Togo.

There are 15 species total, with 10 of them being endemic to Türkiye. Every species that belongs to the genus *Gladiolus* is a perennial herb that has corms, an aerial flowering stem that is either simple or sometimes branched, three sheathing cataphylls, and anywhere from one to eight foliage leaves. The flowers are placed in a spike that can be upright or angled, and each blossom is sessile and surrounded by a bract. The flower has 3 stamens, 3 filaments placed at the base of the widest part of the perianth tube, and a style with 3 stigmatic branches, making for 6 uneven tepals. The fruit has the shape of a capsule, and the seeds have broad wings [3].

A limited number of studies have been conducted on the anatomy of the gladiolus. In these study, Yetişen et al. examined in detail the morphological and anatomical characters of the vegetative organs such as roots, scapus and leaves of *Gladiolus antakiensis* A.P. Hamilton and *G. atroviolaceus* Boiss. and photographed them [4].

The purpose of this work was to give a reference for future research as well as to shed light on the stem and leaf characteristics of the endemic *G. anatolicus*, for which anatomical aspects had not been documented in the past.

## II. MATERIALS AND METHOD

In the context of this research, specimens of the species were gathered, accompanied by the documentation of their distribution ranges and habitat data, as well as the capture of photographic evidence (Figure 1). The plant specimens that were gathered were subjected to the conventional herbarium processes for drying. Subsequently, they were examined and identified using a binocular microscope, with the Flora of Türkiye [5], serving

as the major reference source. In the context of anatomical research, scape and leaf sections that were obtained during fieldwork were subjected to preservation in a solution of 70% alcohol. The investigation involved obtaining sections of 8 and 10 µm thickness using a microtome by the application of the paraffin embedding technique. The sections that were acquired underwent staining using the fastgreen-safranin staining procedure and were subsequently fixed using entellan, as described by Johansen [6]. The specimens that had been prepared were captured in photographs using a binocular light microscope and camera. In anatomical studies, the sample localite as C4 Mersin; Silifke-Çalıbaki road, open machy, 855 m, 07.06.2023 D. Ulukuş-2503 (KNYA) was used.

## III. RESULTS

Figure 1. General view of *G. anatolicus*

### Stem

The epidermis consists of single rows of thick-walled, small rectangular cells. Secondary walled parenchyma lies beneath the epidermis. Cortex consists of 5-8 rows of thick-walled cells. There are 3-5 rows of sclerenchyma layers under the cortex. The vascular bundles are of the closed collateral type and are scattered throughout the body. Their size increases towards the centre. Cortex parenchyma cells are thin-walled and hollow. The core is parenchymatic. The cells of pith are parenchymatic and have intercellularspaces. Pith cells are bigger than cortex cells (Figure 2).

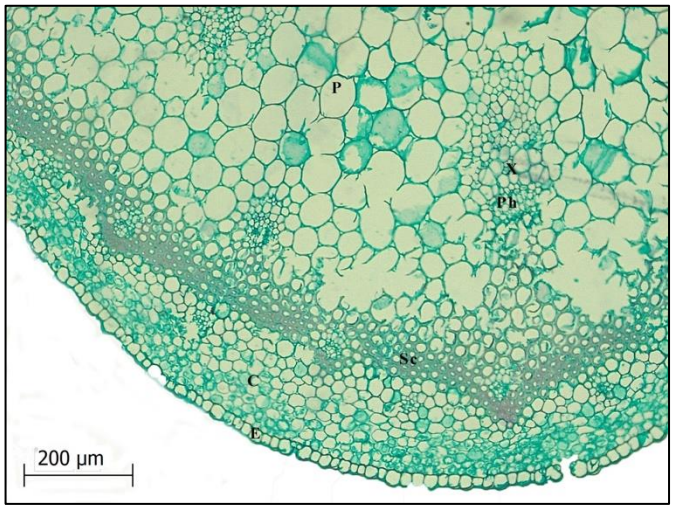


Figure 2. Cross section of scape *G. anatolicus*, C: cortex, E: epidermis, Ph: Phloem, Sc: Sclerenchyma, X: Xylem, P: Pith

### Leaves

The leaves are isolateral, which means that the structure of the abaxial and adaxial sides of the leaves is the same. However, the mesophyll does not differentiate between palisade and spongy parenchyma. The mesophyll is made up of very small, closely packed, elliptical cells that look like palisades but are aligned to the leaf surface. Between the blade's two big ribs, there are cells called parenchyma that store water. Inside mesophyll, idioblasts with prismatic crystals are spread out randomly. Major arterial bundles have bundle caps that stick out on the leaf surfaces and along the edges of the leaves. The major bundles run parallel, but the minor bundles, which are embedded in mesophll anastomoses and often connect to the major lack fibers and are surrounded by bundle sheath, make a tight structure (Figure 3).

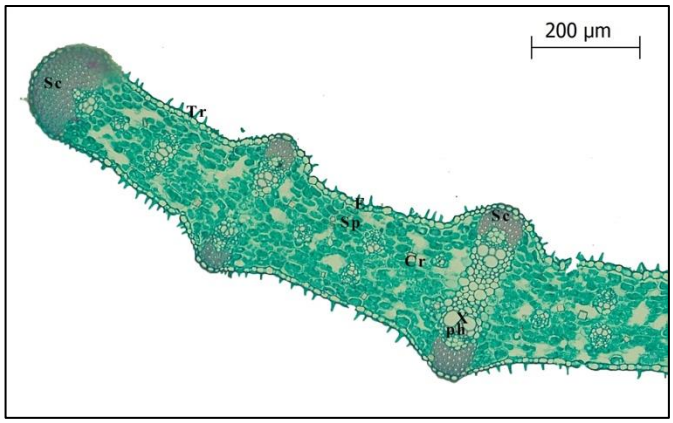


Figure 3. Cross section of leaves of *G. anatolicus*, E: Epidermis, Cr: Crystal, Ph: Phloem, Sc: Sclerenchyma, Sp: Spongy parenchyma, Tr: Trichomes

## IV. DISCUSSION

According to the literature, in anatomical studies of the genus *Gladiolus*, Yetişen et al. found that the epidermis only consists of one layer, while the cortex has anywhere from three to four layers of *Gladiolus* species [4]. On the other hand, our research revealed that the cortex layer has five to eight rows, and the sclerenchymatic layer has three to five rows. Yetişen et al. found that there was no differentiation between palizade and sponge parenchyma in *G. antakiensis* and *G. atroviolaceus* and that the mesophyll had 9-12 layers [4]. In our study also shows similar characteristics to this study.

## V. CONCLUSION

For the first time, anatomical traits of the *G. anatolicus* species were revealed in this investigation. We anticipate that the findings will help future anatomical investigations of the *Gladiolus* genus and add to systematic research.

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