

SOME MORPHOLOGICAL AND ANATOMICAL INVESTIGATIONS ON *Crocus pallasii* Goldb. subsp. *pallasii*

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ABSTRACT

Crocus pallasii Goldb. subsp. *pallasii* (Iridaceae) is a geophyte plant. Morphological and anatomical characteristics of *C.pallasii* subsp. *pallasii* were investigated. Cross sections of *C pallasii* subsp. *pallasii* root, stem, corm and leaf parts were examined and demonstrated by illustrations.

The corm is covered with finely reticulate-fibrous tunic and it has a poorly developed neck less than 2 cm. The perianth segments are pale to deep lilac- blue. These properties are characteristics for the investigated plant.

Differences such as shape of leaves' keel, branching of style have been determined by comparing the results obtained from this subspecies were compared with the results obtained from the other geophyte plants and species of *Iridaceae* in previous studies.

Keywords: *Crocus pallasii*, Morphology, Anatomy

Crocus pallasii Goldb. subsp. *pallasii* ÜZERİNDE BAZI MORFOLOJİK VE ANATOMİK ARAŞTIRMALAR

ÖZET

Crocus pallasii Goldb. subsp. *pallasii* (Iridaceae) geofit bir bitkidir. Bu çalışmada *C.pallasii* subsp. *pallasii*' in morfolojik ve anatomik özellikleri incelenmiştir. Anatomik çalışmalarda bitkinin kök, gövde, ve yaprak kısımlarından alınan enine kesitler incelenmiş ve elde edilen bulgular çizimlerle gösterilmiştir. Bitkinin korm örtüsü ağsı fibrilli bir yapıya sahip olup boğaz kısmı 2cm'den kısadır. Periant segmentleri açık - koyu mavimsi leylak renkleri arasında değişmektedir. Bu özellikler araştırılan bu bitki için karakteristiktir.

Bu çalışmada yaprak omurgasının şekli, sitilusun dallanması gibi farklılıklar, geofit bitkiler ve *Iridaceae*'nin diğer türleri üzerinde yapılan önceki çalışmalar ile karşılaştırılarak belirlenmiştir

Anahtar Kelimeler: *Crocus pallasii*, Morfoloji, Anatomi

1. INTRODUCTION

The *Crocus* genus is belong to *Iridaceae* a large and diverse family of about 92 genera and about 1800 species mainly distributed in the southern hemisphere [1]. The saffron *Crocus* (*C. sativus* L.) was the first *Crocus* to be cultivated and has been grown as an economic plant since very ancient times. After saffron cultivation the number of *Crocus* species brought into cultivation [2]. *Crocus* species have been used as a dye, perfume and medicament since 1600 B.C. Recently, the researchers reported that the extract of *Crocus* has antitumor, antimutagenic and cytotoxic activities and inhibits nucleic acid synthesis in human malignant cells [3-5]. Any study on *C. pallasii* subsp. *pallasii* that is the subject of this study has been found except main knowledge in "Flora of Turkey". The aim of this study is to examine the morphological and anatomical properties of the plant and to compare with the other *Crocus* and geophyte members.

2. MATERIALS AND METHODS

Plant samples were collected from natural population at :
B1 Manisa: Sipil Mountain, Atalanı area, 1200 m, 10.10. 2004, (Akyol 1475).

Taxonomical description of the plant was according to Davis [6]. For anatomical studies, plants specimens were fixed in 70% alcohol. The procedures were made by the followed methods described by Algan [7]. The tissues were infiltrated with paraffin before sectioning. The cross-sections were demonstrated by illustrations by using of Nikon ECLIPSE E400 microscope. Fresh samples were used in each case for experimental analysis. The plant was preserved in the herbarium Celal Bayar University (CBU).

3. RESULTS

3.1, Morphological Properties

The perianth segments are pale to deep lilac-blue. These segments are elliptic, obovate or oblanceolate in shape and 6-15 mm broad. Styles of the

plant is divided three into branches and they are red or orange. Corm has reticulate fibrous tunic and a poorly developed neck less than 2 cm. Leaves are usually 8 in number, 0.5 – 1.5 mm broad and absent at anthesis. They are pale green or green with a distinct median white stripe. The plant is autumn Crocus and flowering period is from September to November; distributed at 700 – 2000 m., distributed-sparsely in stony places trees and scrubs (Figure 1.A-C).

3. 2 Anatomical Properties

4.2.1Root: In cross section of the root; the epidermis is single layered. Cells of cortex are ovoid, parenchymatic with intercellular spaces. Endodermal cells are long cylindrical in form with thick wall. Pericycle is single layered. There are usually two metaxylems on the median part of vascular cylinder. Xylem strands on the periphery of the vascular cylinder are 4-5 which reach the pericycle (Figure 2, Table I).

4.2.2Stem: There is a cuticle layer on the epidermis. Epidermis is single layered and isomorphic. Cortical cells are ovoidal in shape. There are 5 big vascular bundles at the middle of stem. The small vascular bundles are 8-15 in number and located in the periphery part of the stem (Figure 3, Table I).

3.2.3 Leaf: The leaf has a central slightly square keel and two lateral arms with recurved towards the keel. There is a pale stripe lying axially along the center of the leaf formed by the parenchymatous cells achlorophyllous. The leaves have the cuticle except groove part. The epidermal cells have cuticle with papillae. Adaxial epidermis is thicker than abaxial epidermis. Stoma cells are present only on groove part of leaf and in sunken position between epidermis cells. Palisade parenchyma cells are single layered. Vascular bundles are located in one row in arms of keel and extending round abaxial margin of keel, but not across adaxial side. There are major bundles occur at angles of keel and towards arm margins (Figure 4, Table I).

5. DISCUSSION

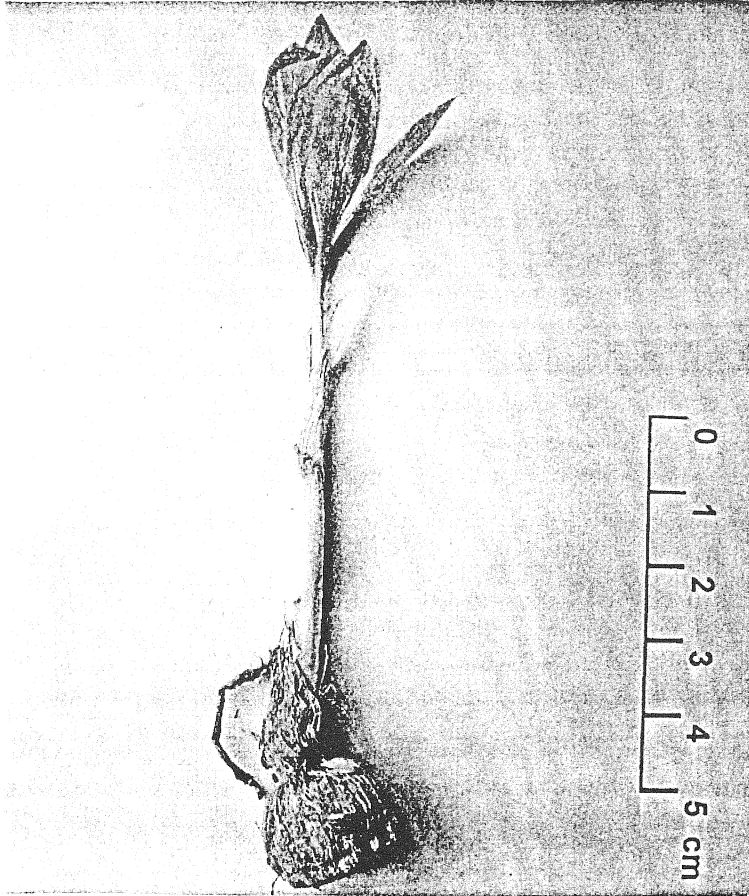
In this study, we have tried to demonstrate the characteristics of *C. pallasii* subsp. *pallasii* evaluating the results obtained from morphological and anatomical. In morphological studies we observed that structure of corm tunic, corm neck, color of perianth segment have taxonomical value. According to the results, there are 4-5 xylem strands. So, this protoxylem groups is said to be tetra or pentarch. A correlation exists between the

diameter of the vascular cylinder and the number of protoxylem groups and the presence or absence of a pith. If the diameter of vascular cylinder is large, usually there is a pith and there are many protoxylem groups [8]. In the present study, *C. pallasii* subsp. *pallasii* has a large vascular cylinder. The same feature was observed in the root of *Crocus danfordiae* Maw, *Gladiolus atroviolaceus* Boiss., *Lilium ciliatum* P.H. Davis [9-11]. These species have 4-8 protoxylem groups and their vascular cylinder is large. In the investigated plant the vascular bundles are located in central part of stem and also in periphery. The same feature was observed on the stem of *Crocus fleisheri*, *C. danfordiae*, *C. chrysanthus* (Herbert) Herbert, *Merendera attica* (Spruner) Boiss & Spruner and *Iris caucasica* Hoffm., but it was not observed on the stem of *Crocus pulchellus* Herbert [9,11,12]. In leaves of *C. pallasii* subsp. *pallasii* parenchymatous cells in the keel lack chloroplast and breakdown to form air space. Rudall has also pointed out that leaves of most *Crocus* species have distinctive shape in cross section [13]. The same researcher has pointed out that leaves of *Crocus* have a central a keel and two lateral arms. We also observed these characteristics on the investigated plant.



Fig.1A. General appearance of *Crocus pallasii* subsp. *pallasii* in natural habitat (Akyol 1476)

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B. General appearance of *Crocus pallasii* subsp. *pallasii* (Akyol 1475)

Fig. 1B. General appearance of *Crocus pallasii* subsp. *pallasii* (Akyol 1475)

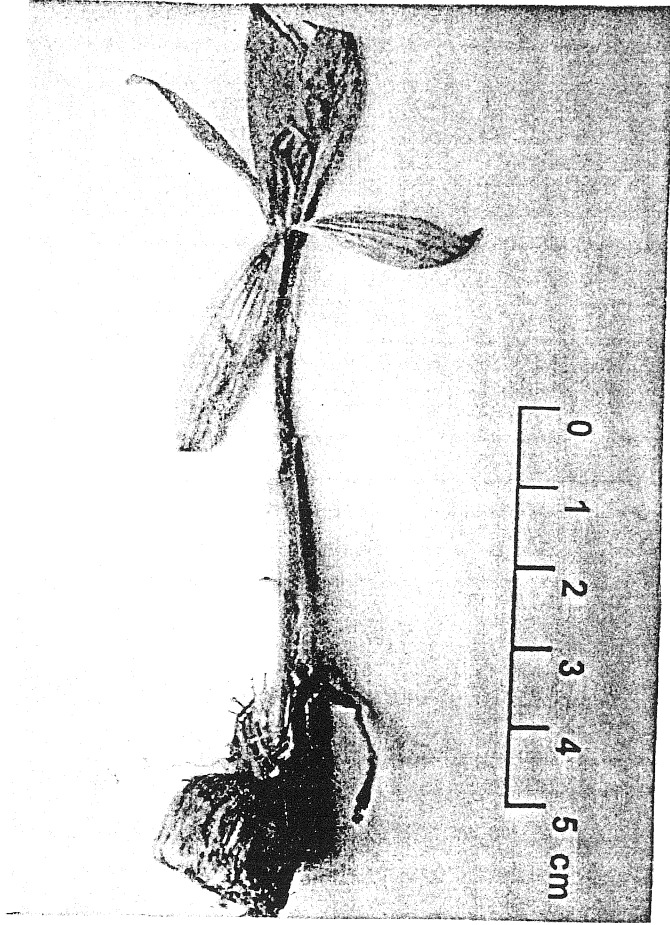


Fig.1C.General appearance of *Crocus pallasii* subsp. *pallasii* with stamen, pistil (Akyol 1475)

Fig.1C. General appearance of *Crocus pallasii* subsp. *pallasii* with stamen, pistil (Akyol 1475)

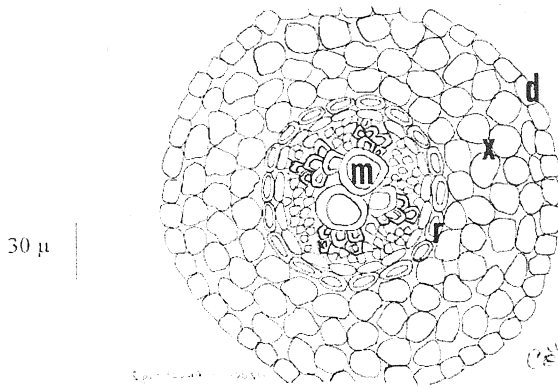


Fig. 2. Cross-section of root of *Crocus pallasii* subsp. *pallasii* (Akyol 1475)
 d. epidermis x. cortex r. endoderm m. metaxylem

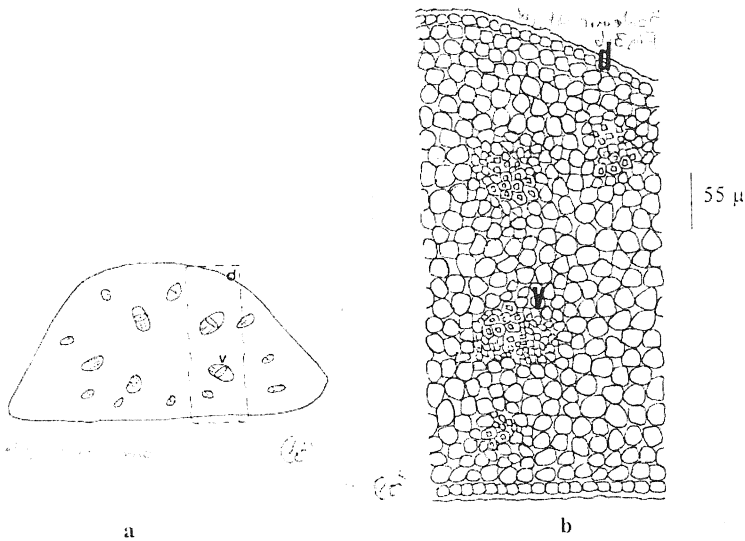
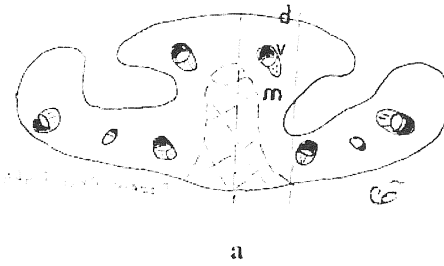


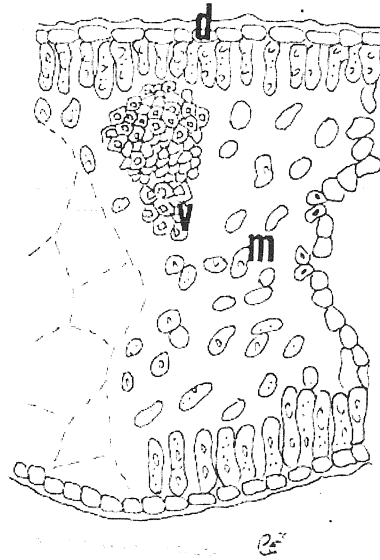
Fig. 3 a. Cross-section of stem of *Crocus pallasii* subsp. *pallasii*
 b. enlargement of the shown area of a.
 d. epidermis v. vascular bundle

Fig. 2. Cross-section of root of *Crocus pallasii* subsp. *pallasii* (Akyol 1475)
d: Epidermis, **x:** Cortex, **r:** Endoderm, **m:** Metaxylem

Fig. 3.a. Cross-section of stem of *Crocus pallasii* subsp. *pallasii*
b: Enlargement of the shown area of a.
d: Epiderm, **v:** Vascular bundle



a



b

Fig. 4 a. Cross-section of leaf of *Crocus pallasii* subsp. *pallasii*
 b. enlargement of the shown area of a.
 d. epidermis m. mesophyll v. vascular bundle

Fig. 4.a. Cross-section of leaf of *Crocus pallasii* subsp. *pallasii*
 b: Enlargement of the shown area of a.
 d: Epidermis m: Mesophyll v: Vascular bundle

Table I: Measurements of various tissue of *Crocus pallasii* subsp. *pallasii*

	Broad (μm) min max	Mean SD	Lenght (μm) min max	Mean SD
Root				
Pericycle	4 - 5	4.2 \pm 0.4		
Endodermis cell	5 - 13	9.0 \pm 1.1	4 - 8	9.8 \pm 1.7
Diameter of cortex cell	8 - 15	9.7 \pm 3.2		
Diameter of metaxylem	10 - 15	9.1 \pm 2.6		
Stem				
Epidermis cell	8 - 15	10 \pm 3.0	13 - 18	16 \pm 1.6
Diameter of cortex cell	8 - 26	16 \pm 7.2		
Leaf				
Abaxial cuticle	1 - 2	1.4 \pm 0.5		
Adaxial cuticle	1 - 5	2.2 \pm 1.6		
Abaxial epidermis cell	5 - 15	9.5 \pm 3.7	3 - 10	7.4 \pm 2.6
Adaxial epidermis cell	10 - 15	11 \pm 1.9	5 - 10	7.9 \pm 2.0
Palisade parenchyma cell	8 - 15	10 \pm 2.0	20 - 41	29 \pm 7.0

SD: Standart Deviation

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