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# Morphological and Anatomical Study on *Crocus chrysanthus* (Herbert) Herbert (Iridaceae)

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**ABSTRACT:** The study is based on anatomical and morphological investigations of *Crocus chrysanthus* (Herbert) Herbert (Iridaceae). Morphological and anatomical features of various organs of the plant such as root, stem, and leaf are given in detail and demonstrated by illustrations. It has been observed that corm are tunics coriaceus or membranous, splitting into rings at the base, style is dividing into 3 slender yellow to orange branches, anthers are long and pale yellow characteristics for *Crocus chrysanthus.*

**Keywords:** Anatomy, *Crocus chrysanthus*, morphology

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# *Crocus chrysanthus* (Herbert) Herbert (Iridaceae) Üzerinde Morfolojik ve Anatomik Bir Çalışma

**ÖZET:** Çalışma *Crocus chrysanthus* (Herbert) Herbert (Iridaceae).'ın morfolojik ve anatomik özellikleri üzerine dayanmaktadır. Çalışmada bitkinin kök, gövde ve yaprak kısımlarının morfolojik ve anatomik özellikleri şekiller ile detaylı bir şekilde verilmiştir. Bitkinin korm örtüsünün derimsi veya zarımsı, ve tabanda halkalı biçimde olduğu gözlenmiştir. Sitilusun 3 dallı oluşu ve anterlerinin uzun, soluk sarı renge sahip oluşu *Crocus chrysanthus* için karekteristik özelliklerdir.

**Anahtar kelimeler:** Anatomi, *Crocus chrysanthus,* morfoloji

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## INTRODUCTION

*Crocus chrysanthus* is a member of the Iridaceae family. *Crocus* genera have been represented by 36 species in Turkey (Güner et al., 1980). The family typically characterized by isobilateral equitant leaves and epigynous and flowers with three stamens (Rudall, 1984). Iridaceae family is grown in parks and gardens as ornemantal plants deu to its beautiful flower (Baytop, 1984).

Some *Crocus* species valued as a dye, perfume and medicament as long as 1600 B.C (Brıghton et al.,1980). The purpose of present work is to examine the morphological and anatomical structures of root, stem and leaf of *Crocus chrysanthus* that is the subject of this study hasn't been found except ecological, caryological and general morphological properties of *Crocus chrysanthus* (Brighton et al.,1973; Mathew, 1982; Davis, 1984; Jacobson et al.,1997; Kutbay et al., 2001; Çelik et al., 2004).

## MATERIAL AND METHODS

Plant samples were collected from natural population. Taxonomical description of the plants was according to Davis (Davis, 1984). Plant specimens were taken from: B1 Manisa: Maldan district in Yunt Mountain region, 450 m, Open hillsides in short turf, 08.02.2008, 01.03.2011.

Morphological illustrations were prepared to show the flowering stages of the plants. Measurements of all organs were done on fresh plants. For anatomical studies plants specimens were fixed in 70 % alcohol. The paraffin method was used for preparing a cross-section of root, stem and leaves (Algan, 1981). Anatomical measurements were realized with an ocular-micrometer.

## RESULTS

### Morphological Properties

Corm: Corm tunic is membranous or coriaceus splitting into rings at base. This rings are entire are toothed. Its color is brown or pale brown (Figure 1d).

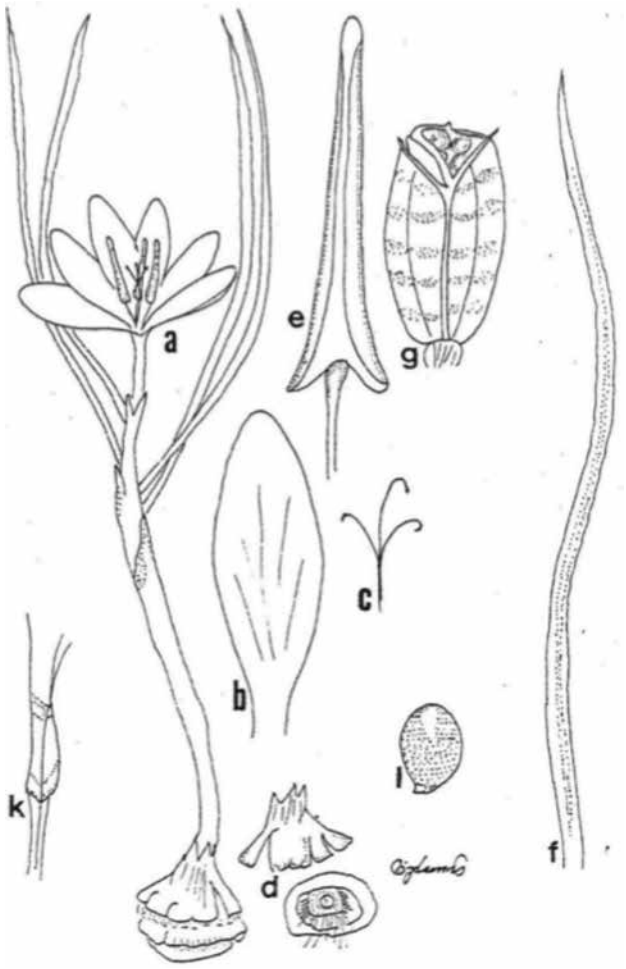


**Figure 1**. General appearance and details of *Crocus chrysanthus* Flower, b. Perianth segment, c. Style, d. Corm tunic, e. Stamen, f. Leaf, g. Fruit, ı. Seed, k. Ovary.

**Leaf:** Leaves of *Crocus chrysanthus* are generally 5-6 in number. Its size is 8-18 cm x 0.3-3 mm, synanthous, green with a distinct white median stripe and glabrous (Figure 1f).

**Flower:** Flowers are generally 1 in number. Perianth segments are colored as yellow to orange. Its size is 1.5 - 2.5 cm x 0.5- 1.3 cm. Throat of perianth is yellow in color. Stamens are 1.2 - 1.8 cm long, yellow in color. Anthers are is clearly longer than style. Style is divided into 3 branches (Figure 1, 2-c). Flowering period is February- March species distributed at sea level – 2200 m height, open hillsides in short turf, sparse, coniferous woods, scrub.

### Anatomical Properties

**Root**: Epidermis two layered on the outer surface of root. The shapes of these cell are usually tetragonal

and thin walled. Cortex is 5-10 layered and its cells are usually ovoidal, parenchymatic with intercellular spaces. Diameter of these cell is 7.5 - 37.5 µ. Endodermis cells are 7.5 - 12.5 x 2.5 - 5 µ with wall thickenings of the endodermal clear in cross-section. Pericycle is located under epidermis and its cells are thin walled.1 or 2 metaxylem is present on the median part of vascular cylinder (Figure 2, Table I).

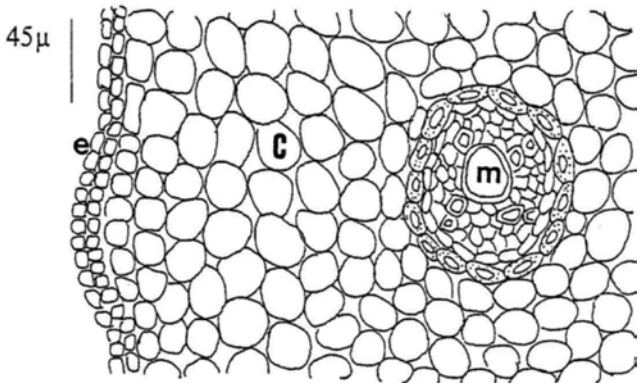


**Figure 2**. Cross-section of root of *C. Chrysanthus* e. epidermis, c. cortex, m. metaxylem

**Stem**: Epidermis is single layered and its cells are formed as nearly the same height and width. Cortex cells are 10 – 50 µ diameter and its cells ovoidal, parenchymatical, thin walled. This cells have intercellular spaces. Vascular bundles are present in periphery and central part of stem. There are 5 big vascular bundles at the middle of stem. The small vascular bundles are located in periphery part of stem (Figure 3a, b, Table I).

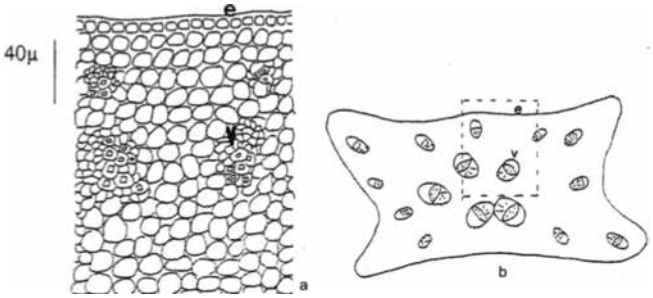


**Figure 3**. a. Cross-section of stem of *C. Chrysanthus* b. enlargement of the shown area a. e. epidermis, c. cortex, v. vascular bundle

**Leaf:** In cross-section of *Crocus chrysanthus* it observed that the leaves have a central rectangular keel and two lateral arm, with their margins recurved towards the keel. The characteristic pale stripe running axially along the centre of the leaf is caused by the parenchymatous cells in the kell which lack choloroplasts and break down to from an air space (Figure 4 a). Stoma cells are in sunken position between epidermis cells with papillae. Adaxial surface and abaxial outer edge of keel except grove part of these surfaces without stomata. Epidermal cells 4 sided and with straight walls except edge of groove part of abaxial surface. Epidermal cells on groove part of abaxial surface of leaf keel have walls with papillae. Vascular bundles are located in one

**Table 1.** Anatomical measurements of *Crocus chrysanthus*

| | **Broad (µm)** | | **Lenght (µm)** | |
|---|---|---|---|---|
| | Min- Max. | Mean± SD | Min- Max. | Mean± SD |
| **Root** | | | | |
| Epidermis cell | 7.5-15 | 10.5±3.67 | 7.5-17.5 | 9.5±4 |
| Endodermis cell | 7.5-12.5 | 10±2.5 | 2.5-5 | 3.25±1.14 |
| Diameter of trachea | 20-30 | 27±4.28 | | |
| Diameter of cortex cell | 7.5-37.5 | 28.5±10.67 | | |
| **Stem** | | | | |
| Epidermis cell | 5-25 | 11±9.16 | 7-20 | 9.3±4.26 |
| Diameter of cortex cell | 10-50 | 28.5±17.69 | | |
| Cuticle | 5-10 | 8±1.5 | | |
| **Leaf** | | | | |
| Cuticle | 2.5-5 | 3±1.06 | 2-10 | 3.4±2.53 |
| Upper epidermis cell | 5-20 | 12.5±6.02 | 5-20 | 7.5±4.47 |
| Lower epidermis cell | 15-30 | 17.25±4.39 | 30-40 | 32.5±3.31 |
| Palisade parenchyma cell | 10-15 | 11.6±2.10 | | |

SD: Standart Deviation

row in arms of keel and extending round abaxial margin of keel, but not across adaxial side. Major bundles occurring at angles of keel and towards arm margins (Figure 4b, Table I).

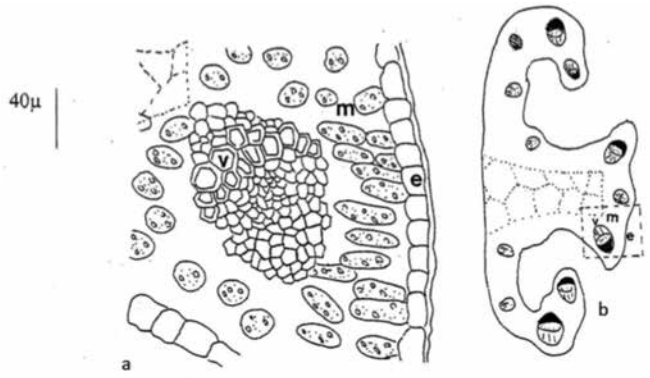


**Figure 4**. a. Cross-section of leaf of *C. Chrysanthus* b. enlargement of the shown area a e. abaxial epidermis, m. mesophyll, v. vascular bundle

**Corm:** Corm is surrounded scale leaves. Epidermis is two layered and this cells are formed as nearly the same height and widht. Cortex cells are parenchymatical. Vascular bundles inner part are bigger than the vascular bundles at the outer part of corm. Xylem is clearly seen in vascular bundles (Figure 5).

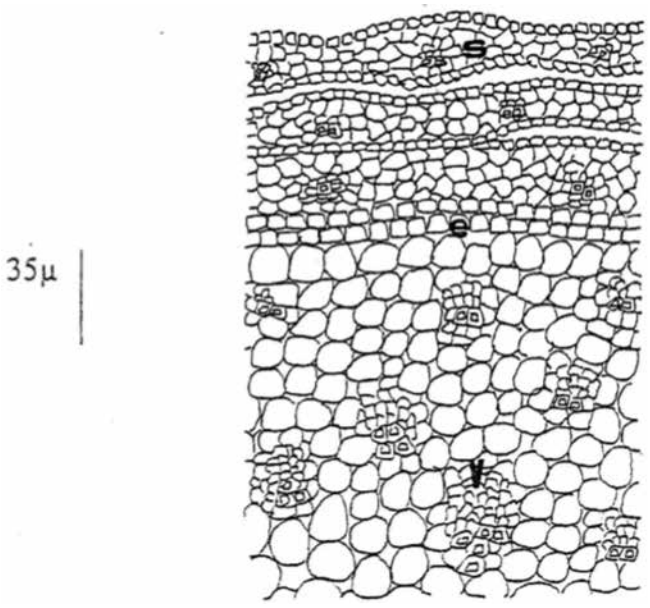


**Figure 5.** Cross-section of corm of *C. Chrysanthus* s. scale leaves, e. epidermis, v. vascular bundle

## DISCUSSION

In this study, we aimed to give detailed knowledge about morphology and anatomy of the species that has economical value. *Crocus chrysanthus* have some taxonomical characters such as yellow to orange – yellow perianth segments, long anthers. These properties are taxonomical characters that are used to determine the species. As regards results presented here, the morphological properties of *Crocus chrysanthus* showed some similarities and differences compared to other findings in Flora of Turkey (Davis, 1984). In this study, broad of leaf was determined respectively as 0.3 – 3 mm and size of perianth segments is 1.5 – 2.5 x 0.5 – 1.3 cm. While this measures were given as 0.5 - 2.5 and 1.5 - 3.5 x 0.5 – 1.1 cm in Flora of Turkey.

In anatomical studies it has been determined that the thickening are clear on the walls of endodermal cells of root of *Crocus chrysanthus*. The same results has been observed in root of *Crocus aerius* Herb., *Crocus fleischeri* Gay and *Crocus danfordiae* Maw (Özyurt, 1978; Özdemir et al., 2004). It has been emphasized that this type of endodermal cells are common in the roots of monocotyledons (Fahn, 1982).

The walls of root endodermal cells of *Crocus chrysanthus* have completely thickening. This feature it has also been observed that, in the cross-section of root *Lilium ciliatum* P.H Davis (Özdemir, 2003). The numbers of protoxylem groups are 4-5 in the root. So this protoxylem groups is said to be polyarc (Fahn, 1982). Kutbay et al. (2001), has shown the same feature on *Romulea columnae* Seb.& Mauri subsp. *columnae.* According to results in the present study vascular bundles are located in periphery and central parts of stem. The these bundles are in position ring. The same feature has been observed on the stem of *Crocus aerius*, *Crocus fleischeri*, *Crocus danfordiae* (Özdemir & Akyol, 2004; Özyurt, 1978). But it was observed that vascular bundles are located in position single rings at e-central stem of *Crocus pulchellus* Herbert (Özdemir and Akyol, 2004). The morphological and anatomical features of *Crocus chrysanthus* have been examined in this study. Morphological properties such as corm-tunic color of perianth segments, long of anther, style-branch characters and anatomical properties such as the location of stem and leaf vascular bundles are distinguishing features for *Crocus* species. Similar results have been observed in another study (Özdemir et al., 2010).

Finally anatomical structure for *Crocus chrysanthus* is much similar to the other Iridaceae members.

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