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## Morphological, Anatomical and Ecological Studies on Medicinal and Edible Plant *Malva neglecta* Wallr. (Malvaceae)

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**Abstract:** *Malva neglecta* Wallr. (Malvaceae) is economically important. It is used as food and folk medicines. Edible plant parts were examined morphologically and anatomically. Soil properties were determined. There are eglandular and glandular hairs on the stem, petiole and leaf. Leaf is dorsoventral. Crystals are seen in the leaf and stem. Stomata type is anomocytic. Stomata index is 19.5 for the upper epidermis and 20.7 for the lower epidermis. This plant generally prefers clayey and clayey-loamy soils.

**Key words:** Malvaceae, *Malva neglecta*, morphology, anatomy, ecology

### INTRODUCTION

Genus *Malva* L. is represented by 9 taxa in Turkey. *Malva neglecta* Wallr. is an annual plant (Davis, 1966). *Malva* species contain mucilage, malvin, tanen and glucose. The leaves and flowers of *M. neglecta* and some *Malva* species are used in traditional phytotherapy. They are used in the treatment of cough, respiratory system and digestive system problems (Baytop, 1963; Asımgil, 1993). Aerial parts of *M. neglecta* have anti-ulcerogenic activity (Gürbüz *et al.*, 2005). And also this species is showed antioxidant properties (Mavi *et al.*, 2004). The branches with leaves and the other aboveground parts of *M. neglecta* and *M. sylvestris* L. are consumed as vegetables in the Turkey (Baytop, 1994; Doan *et al.*, 2004). Its local names are Ebe gümesi, Develik, Gaba gömeç, Kazankarası, Küçük ebe gümesi etc. (Baytop, 1994).

Studies on the anatomy of this genus are limited. Metcalfe and Chalk (1979), Watson and Dallwitz (1991) explained the characteristic properties of the family Malvaceae. Byrne (1973) studied lateral root development of *M. sylvestris*. There have been some chemical studies on *M. neglecta* and some *Malva* species (Takeda *et al.*, 1989; Billeter *et al.*, 1991; Redzic *et al.*, 2005; Cutillo, 2006). Dülger and Gönüz (2004) investigated antimicrobial activity of *M. neglecta*. The ecological success of a species depends that how it adapt to a particular physical environment and establish biological relations with other species (Pirdal, 1989).

This plant is commonly used as vegetables and medicinal plants in Turkey. Therefore, *M. neglecta* is an

important plant. Detailed anatomical and ecological properties of *M. neglecta* have not been studied. Therefore, the purpose of this article is to investigate the anatomical and ecological features of eaten and used parts of *M. neglecta*.

### MATERIALS AND METHODS

Plant and soil samples of *M. neglecta* were collected from different localities in the West and Central Black Sea regions in the A4-A6 squares.

The taxonomical description of the plants was carried out according to Davis (1966). Samples were fixed in 70% alcohol for anatomical studies. The stem, petiole and leaf of *M. neglecta* were used for anatomical investigation. Their photographs were taken with a Nikon FDX-35 microscope. The length and width of the stoma were measured with an ocular micrometer using the surface section from the upper and lower parts of the leaf epidermis. The stomatal index was calculated according to the method described by Meinder and Mansfield (1968). Soil analysis were made to Öztürk *et al.* (1997).

### RESULTS

#### Morphological properties

***Malva neglecta* Wallr.:** This plant is annual. Stems ascending to erect, pilose with simple setae. Leaves very shallowly lobed, crenate, pilose. Flowers borne in fascicles in the leaf axils. Epicalyx segments linear. Sepals triangular, 2-4.5 mm. Petals pink to white, 8-15 mm. Mericarps pilose, smooth (Fig. 1).



Fig. 1: *M. neglecta*. General appearance (Bar: 2 cm)

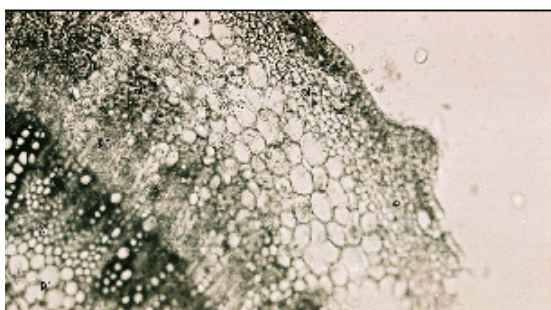


Fig. 2: *M. neglecta*. Cross-section of stem: e) epidermis, ch) chloronchyma cl) collenchyma, p) parenchyma, sc) sclerenchyma, ph) phloem, X) xylem, pr) pith region (Bar: 80  $\mu$ )

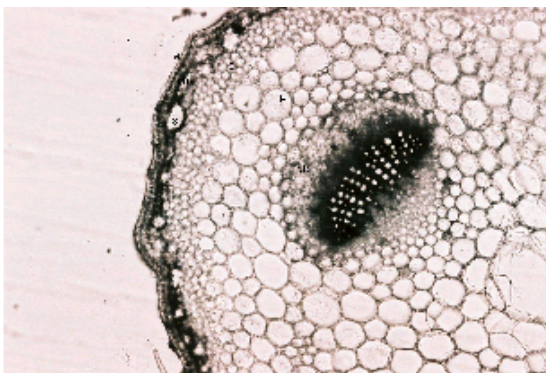


Fig. 3: *M. neglecta*. Cross-section of petiole: e) epidermis, ch) chloronchyma cl) collenchyma, p) parenchyma, vb) vascular bundle, s) secretory cavity (Bar: 65  $\mu$ )

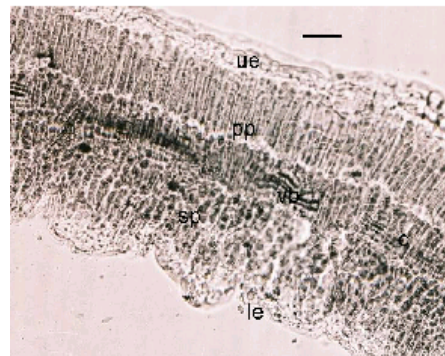


Fig. 4: *M. neglecta*. Cross-section of leaf: ue) upper epidermis, pp) palisade parenchyma, sp) spongy parenchyma, v) vascular bundle, le) lower epidermis, c) crystal (Bar: 40  $\mu$ )

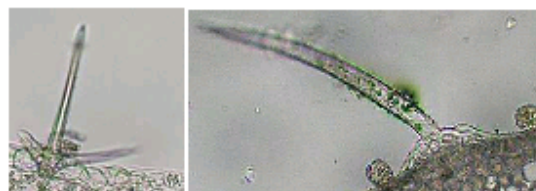


Fig. 5: Glandular and eglandular hair of stem, petiole and leaf

Table 1: Anatomical measurements of *M. neglecta*

		Breadth ( $\mu$ )		Length ( $\mu$ )	
		Min	Max	Min	Max
Stem	Epidermis cells	15	30	12.5	22.5
	Collenchyma cells	10	27.5	5	27.5
	Parenchyma cells	37.5	90	25	80
	Diameter of trachea	5	35		
	Diameter of pith cells	22.5	92.5		
Petiole	Epidermis cells	12.5	22.5	10	27.5
	Chloronchyma cells	22.5	35	12.5	25
	Collenchyma cells	7.5	20	7.5	17.5
	Parenchyma cells	12.5	75		
	(Diameter)				
Leaf	Diameter of trachea	7.5	17.5		
	Upper epidermis cells	10	20	15	25
	Lower epidermis cells	5	12.5	7.5	15
	Palisade paren. Cells	7.5	15	50	65
	Spongy paren. Cells	7.5	12.5	12.5	17.5

Table 2: Stoma features on the upper and lower epidermis of *M. neglecta*

	Upper surface of leaf	Lower surface of leaf
Number of stomata (1 mm <sup>2</sup> )	45 $\pm$ 2	55 $\pm$ 2
Number of epidermis cells (1 mm <sup>2</sup> )	185 $\pm$ 3	210 $\pm$ 2
Stoma index	19.5	20.7
Stoma length	20-25 $\mu$	20-25 $\mu$
Stoma width	15-20 $\mu$	12-15 $\mu$

Table 3: Analysis results of the soil samples

Localities	Water saturation (%)	Total salt (%)	pH	P <sub>2</sub> O <sub>5</sub> (ppm)	K <sub>2</sub> O	Organic matter (%)
Loc. 1	45	0.03	7.18	10.179	234	4.16
	Clayey	Saltless	Slight alkali	High	High	High
Loc. 2	63	0.08	7.96	14.427	237	2.02
	Clayey-loamy	Saltless	Slight alkali	High	High	High
Loc. 3	67	0.05	7.30	15.647	238	5.02
	Clayey-Loamy	Saltless	Slight alkali	High	High	High
Mean±SE	58.33±8.37	0.053±0.018	7.48±0.327	13.41±2.03	236.33±1.49	3.73±1.04

### Anatomical properties

**Stem:** The epidermis is composed of a single layer of rectangular cells. The glandular and eglandular hairs are present on the epidermis. There are 1-2 layer chloronchymatic cell zone and secretory cavities with mucilage under the epidermis. 4-7 layer collenchyma are present under the chloronchyma. Parenchymatic cells are 38-90×25-85 μ, 5-6 layered and with chloroplast. There are scleranchymatic zone on the vascular bundles. Druse crystals are seen in the cortex. The vascular tissues are collateral type. Primary rays 1-4 layered. The pith consists of large parenchymatic cells (Fig. 2, 5 and Table 1).

**Petiole:** Epidermis is single layered. There are many glandular and eglandular (commonly stellate) hairs on the epidermis. Chloronchymatic zone and secretory cavities with mucilage are located under the epidermis. Collenchyma is 3-5 layered. Cortex consists of large parenchymatic cells. Parenchymatic cells are 13-30×8-28 μ. There are 4 large and a small vascular bundle in the median region of the petiole. Vascular bundles are surrounded by a parenchymatic bundle sheath (Fig. 3, 5 and Table 1).

**Leaf:** There are eglandular and glandular hairs on the upper and lower epidermis. There is a thick cuticle. Epidermis cells are isodiametric and oval and present mucilaginous epidermis cell. Leaf is dorsoventral. Palisade parenchyma cells are 2 layered. Spongy parenchyma cells are 2 (3) layered. Crystals are seen in the mesophyll. Stomata type is anomocytic. The number of stomata is 45±2 on the upper epidermis and 55±2 on the lower epidermis of the leaf (1 mm<sup>2</sup>). The number of epidermis cells are 185±3 on the upper epidermis and 210±2 on the lower epidermis of the leaf (1 mm<sup>2</sup>). Stomata index is 19.5 for the upper epidermis and 20.7 for the lower epidermis (Fig. 4, 5 and Table 1-2).

**Soil properties:** *M. neglecta* occurs on clayey and clayey-loamy soils. pH values were 0.053±0.018, water saturation, total salt, phosphoric acid, potassium and organic matter values were 58.33±8.37, 0.053±0.018, 13.41±2.03, 236.33±1049 and 3.73±1.04, respectively (Table 3).

### DISCUSSION

In this study, the morphological and anatomical features of used parts of *M. neglecta* and soil characters were examined. This plant is edible and medicinal plant, so it has an economic value. Our morphological results generally agree with the description in the Flora of Turkey (Davis, 1966).

The anatomical properties of these plants have the general features of Dicotyledons (Esau, 1977). Metcalfe and Chalk (1979), Watson and Dallwitz (1991) gave information about the general anatomical characteristics of the family *Malvaceae*. In stem and petiole, there are 1-2 layer chloronchymatic cell zone, secretory cavities with mucilage and collenchyma under the epidermis. Musilage presence is very important. It is comprised usually of protein, polysaccharides and uranides. Musilage is used in medicine as an emollient and a demulcent. There are few plant with contain mucilage. Crystals are seen in the stem and petiole. There are 4 large and a small vascular bundle in the median region of the petiole. Petiole anatomy is generally specific each species and used in taxonomy. There are complex hairs commonly stellate and glandular hairs in the stem, petiole and leaf. Watson and Dallwitz (1991) pointed out that family *Apiaceae* have complex hair in the leaf and dorsoventral lamina. And also they stated that mucilaginous epidermis cells are present in the leaf (Watson and Dallwitz, 1991). In this study, leaf is dorsoventral. They are mucilaginous epidermis cells in the leaf. *M. neglecta* has anomocytic stomata. Metcalfe and Chalk (1979) reported that there were anomocytic and rarely helicocytic stomata in the family *Malvaceae*. *M. neglecta* occurs on clayey and clayey-loamy soils. pH values of soils were 0.053±0.018, water saturation, total salt, phosphoric acid, potassium and organic matter values were 58.33±8.37, 7.48±0.327, 13.41±2.03, 236.33±1049 and 3.73±1.04, respectively. P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O values were high levels. pH values were slight alkali. This species occurs on the soils that have high organic matter. This situation may related to much annual precipitation and soil temperature. However, soil organic matter content has been affected by plant density (Kılınç *et al.*, 2005). The salt concentration was very low.

Plants are valuable sources of food because they are widely available, easily procured. It is important to be able to recognize the wild edible plants. The studies of plants which are edible and medicinal would provide benefit from these plants. So, it has been aimed that study of anatomical and morphological properties of edible and used parts of *M. neglecta* and soil characters of distributed areas.

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