



## The ethnobotanical and anatomical properties of *Polygonum cognatum* Meissn. (Polygonaceae)

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### Abstract

The ethnobotanical and anatomical properties of *Polygonum cognatum* Meissn. were investigated. *P. cognatum* is used as folk medicines and herbs. Druse crystals were found on stem, petiole and leaves of *P. cognatum*. There were epidermal cavities and oil cells in stem and leaves. Undulate walls were present on both adaxial and abaxial surface of epidermis of *P. cognatum*. This species had isobilateral type of leaves. Stomatas were anisocytic, anomocytic and diacytic.

**Key words:** Polygonaceae, *Polygonum cognatum*, anatomy, ethnobotany

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### *Polygonum cognatum* Meissn. (Polygonaceae) türünün etnobotanik ve anatomik özellikleri

### Özet

*Polygonum cognatum* Meissn. türünün anatomik ve etnobotanik özellikleri incelenmiştir. *P. cognatum* sebze ve tıbbi bitki olarak kullanılmaktadır. *P. cognatum* türünün gövde, petiyol ve yapraklarında druz kristalleri bulunmuştur. Gövde ve yapraklarda epidermal boşluklar ve yağ hücreleri vardır. *P. cognatum* türünde epidermin adaksiyal ve abaksiyal yüzeylerinde dalgalı çeper yapısı bulunmaktadır. Türün yaprakları izobilateral tiptir. Stomalar anizositik, anomositik ve diasitik tiptir.

**Anahtar kelimeler:** Polygonaceae, *Polygonum cognatum*, anatomi, etnobotanik

### 1. Introduction

Polygonaceae family consists of ten genera (*Atraphaxis* L., *Pteropyrum* L., *Calligonum* L., *Rheum* L., *Oxyria* Hill., *Polygonum* L., *Rumex* L. and *Emex* Campd. *Fagopyrum* Mill., *Fallopia* Adans.) in Turkey. *Polygonum* is a largest genus of the Polygonaceae family comprising about 40 species in Turkey (Keskin, 2012). *Polygonum* genus has been divided into four sections: *Aconogonon* Meissn., *Persicaria* (Miller) DC., *Polygonum* Meissn. and *Tiniaria* Meissn. *Polygonum cognatum* Meissn. belongs to section *Polygonum* (Coode and Cullen, 1967).

Several *Polygonum* species are used as folk medicines and herbs. *P. cognatum* is known as increasing urine and lowering blood glucose. The leaves, stems and petioles of this plant are eaten (Baytop, 1994; Başer, 1997; Asimgil, 2003; Özbucak et al., 2006; Yücel et al., 2010; Tugay et al., 2012). *P. plebejum* R. Br. is used medicinal plants in Pakistan (Hameed et al., 2010). *P. cognatum* is named as "Madımak" (Baytop, 1994).

Inamdar (1970) examined epidermal structure and development of stomata in some Polygonaceae. Metcalfe and Chalk (1979) studied on foliar anatomy of the Polygonaceae family. Lersten and Curtis (1992) investigated foliar anatomy of genus *Polygonum* and described numerous anatomical features of leaves for 153 species. Yıldırım et al. (2003) worked antioxidant and antimicrobial activities of *P. cognatum*. The systematic values of foliar anatomical properties of 13 *Polygonum* species (including *P. cognatum*) were determined by Yasmin et al. (2009a). Hameed et al. (2010) studied on anatomical features of some medicinal plants of family Polygonaceae. Bunawan et al. (2011)

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investigated foliar anatomy and micromorphology of *P. minus* Huds. The anatomical structure of Turkish *P. cognatum* examples has not been studied. Therefore, the purpose of this paper was to investigate the anatomical properties and ethnobotanical properties of *P. cognatum*.

## 2. Materials and methods

Plant materials were collected from different localities of northern Turkey. Voucher specimens were kept at the Herbarium of the Faculty of Art and Science of Ordu University. Taxonomical descriptions of the specimens were made according to Coode and Cullen (1967). Samples for anatomical studies were fixed in 70% alcohol. Cross and surface sections of root, stem, petiole and leaves were excised by hand and they were covered with glycerin-gelatin (Vardar, 1987). The photographs were taken with Nikon FDX-35 microscope. All measurements and observations were made using imaging software (Table 1). For ethnobotanical studies, local people (a hundred twenty people) were interviewed and noted data about usage of this plant.

## 3. Results

### 3.1. Ethnobotanical properties

**Local Names:** Madımak, madamak, badımak, çoban ekmeği, Kuş ekmeği.

**Usage for edible plant:** Fresh stem, petiole and leaves of plant are used vegetables. These plant parts are roasted with onion and meat and added yogurt.

**Usage for medicinal plant:** *P. cognatum* is used as increasing urine and lowering blood glucose. This plant stops bleeding with vasoconstrictive properties. Also it used to resolve for abdominal pain.

### 3.2. Anatomical properties

3.2.1. *Stem:* A transverse section taken from the middle part of the stem was observed (Figures 1-4). Epidermal cells consists of a single layer and orbicular or rectangular. Epidermis cells are 15-30 x 15-25 $\mu$ . Collenchyma is 1-2 layered and cells are 8-25 x 5-18  $\mu$ . Cortex cells are 13-18  $\mu$  and rounded. Endodermis is 1 layered and distinguishable. There are perivascular scleranchymatic ring. Xylem and phloem elements are clear. Vascular bundles are collateral. Druse crystals are clearly seen in the pith region Pith cells are large and cylindrical. There are large cavities and oil cells in the pith regions (Table 1).

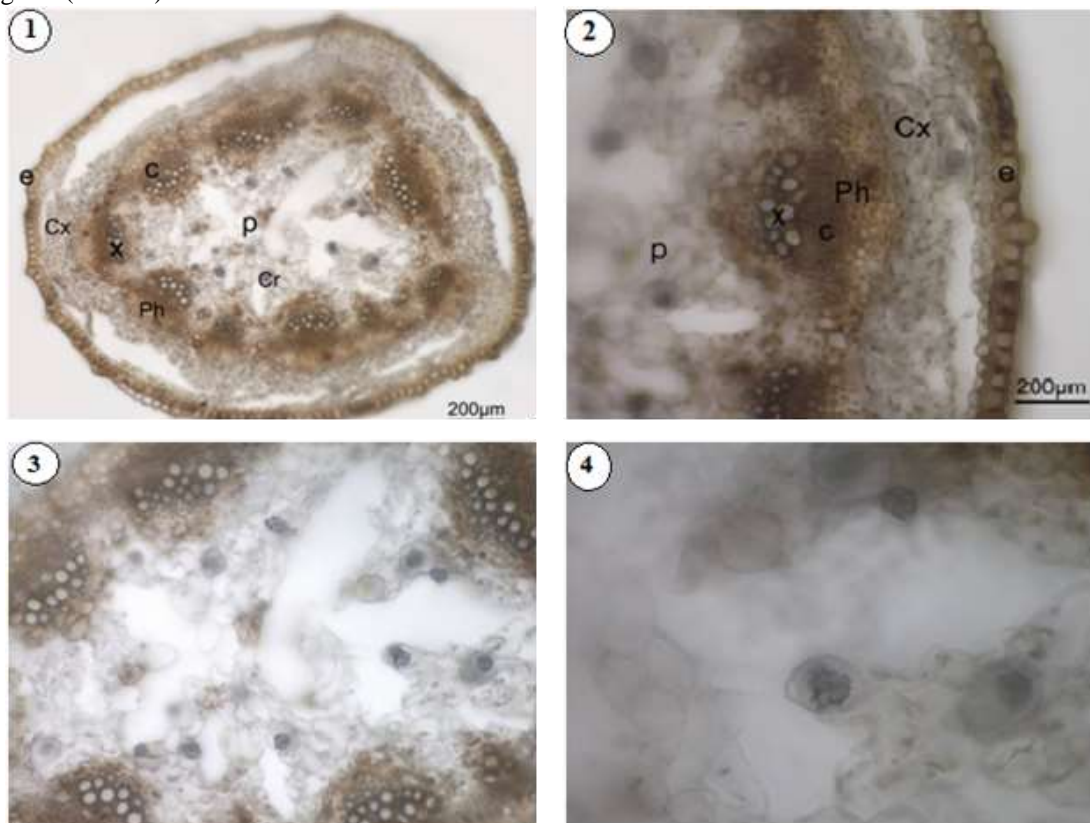


Figure 1- 4. Cross-section of stem. e) epidermis, cx) cortex, c) cambium, x) xylem, ph) phloem, p) pith.

3.2.2. *Petiole*: Petiole shape of this species is flat and obtusely adaxially sulcate. Both epidermises cells are single layered, small and rectangular or oval shaped. Epidermis cells are 28-35 x 13-30 $\mu$ . There is undulate cuticle on both abaxial and adaxial epidermises. Collenchyma is single layered in adaxial side and multilayered at the corners of the petiole. A big vascular bundle is seen in the median part of petiole and 2 smaller vascular bundles are seen at the corners. All vascular bundle are surrounded with bundle sheath. There are druse crystals and cavities in the petiole (Table 1- Figures 5-8).

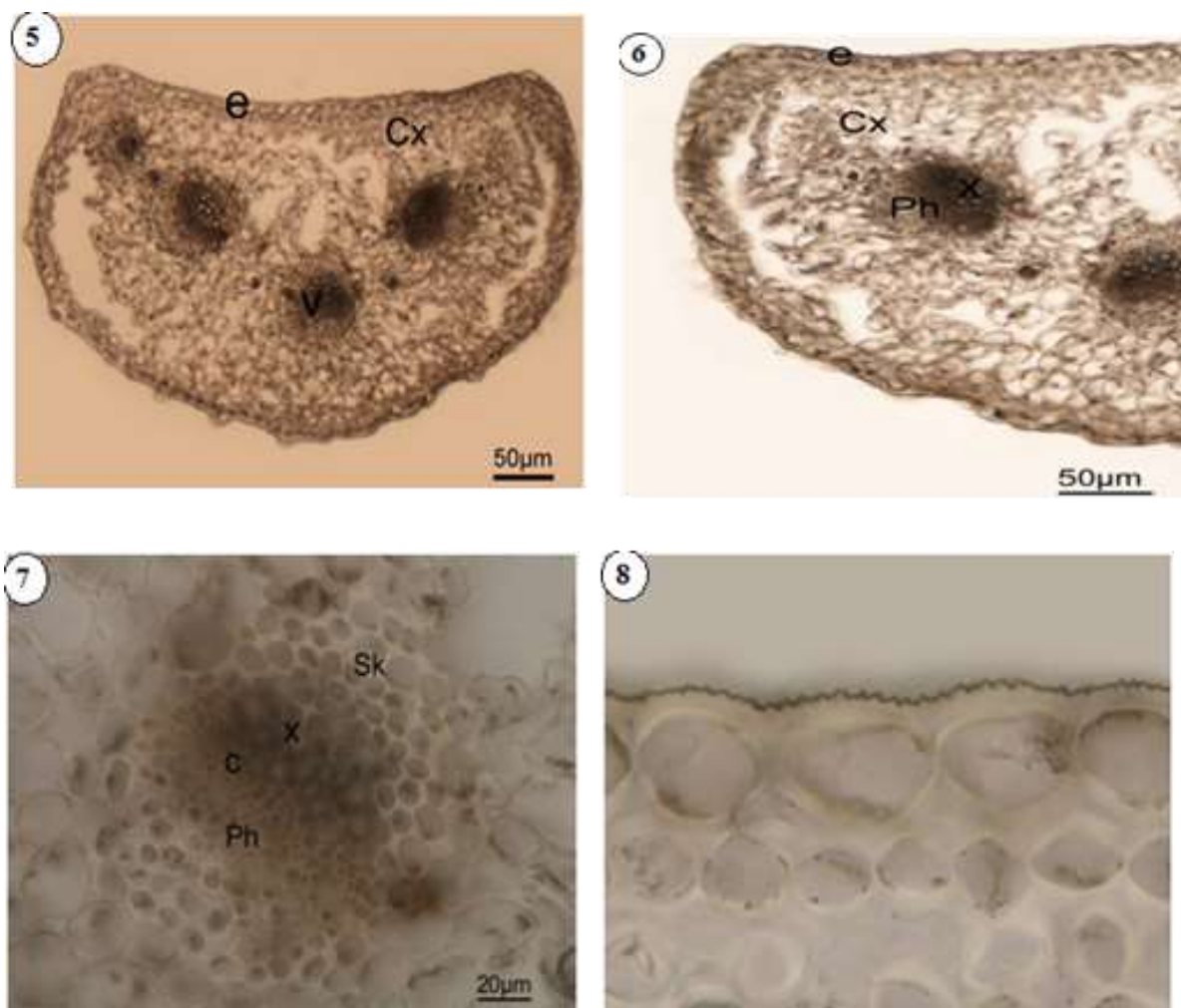


Figure 5- 8. Cross-section of petiole. e) epidermis, cx) cortex, x) xylem, ph) phloem, sk) sclerenchyma.

3.2.3. *Leaf*: In transverse section of the leaf, ecrivifacial leaf is observed (Figures 9- 13). Both epidermises are covered with thick cuticle. Upper epidermis cells are larger than lower cells. Oil cells are seen in the epidermis. Mesophyll consists of 2 layers of palisade parenchyma cells at the adaxial side, 1-2 layers palisade parenchyma at the abaxial side and 2-3 layers of spongy parenchyma cells. Palisade parenchyma cells are 15-23 x 65-100 $\mu$ . Druse crystals are present especially in the spongy parenchyma. Vascular bundles is solitary in the midrib and surrounded by a parenchymatic bundle sheath. Vascular bundles are collateral type. Stomata are diacytic, anisocytic and anomocytic. Stomata occur on the both surfaces (Table 1).

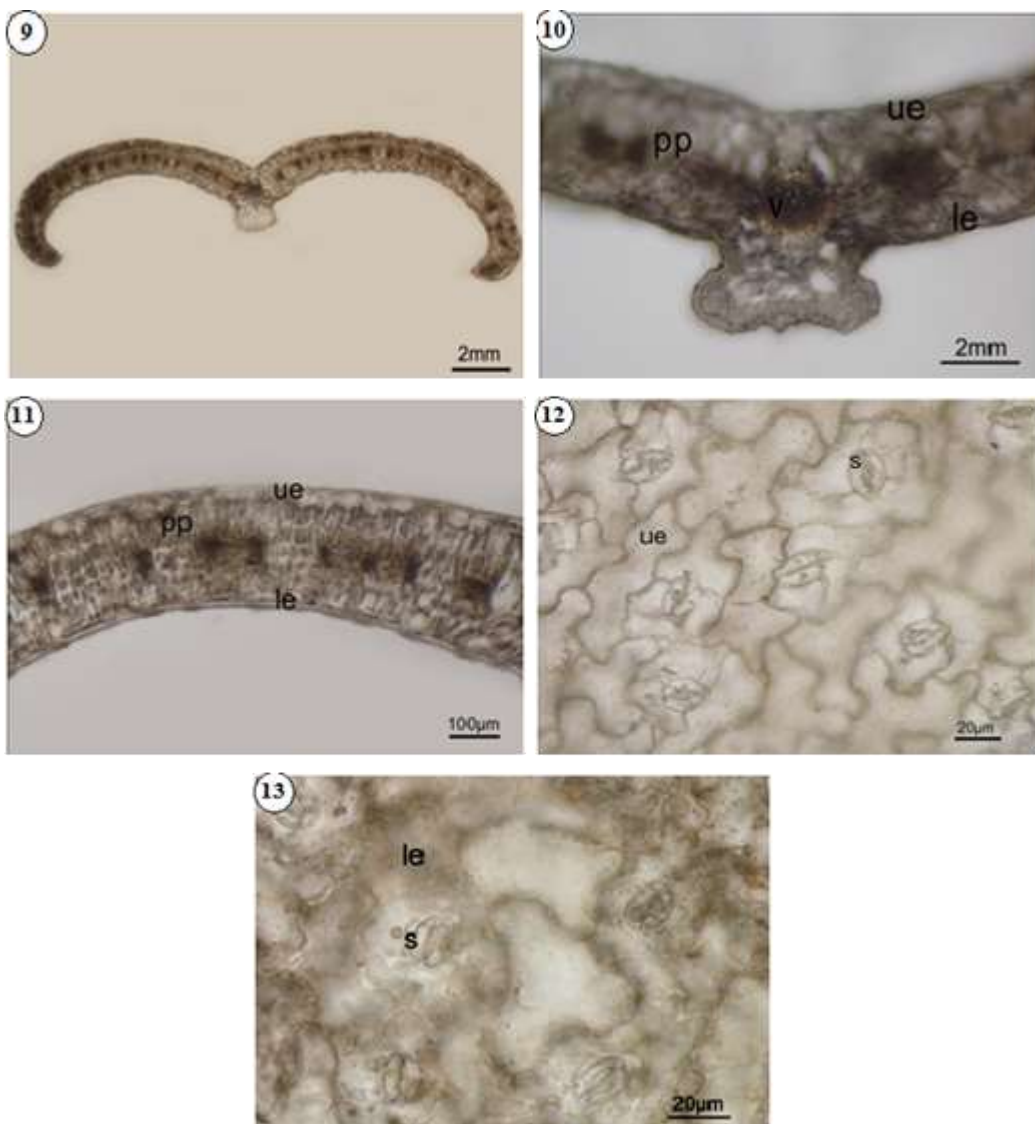


Figure 9-11. Cross-section of leaf and Figure 12-13. Upper and lower surface of leaf. ue) upper epidermis, pp) palisade parenchyma, le) lower epidermis, s) stomata.

Table 1. Anatomical measurement of *P. cognatum*

		Breadth (µ)		Length (µ)	
		Min.	Max.	Min.	Max.
Stem	Epidermis cells	15	30	15	25
	Collenchyma cells	7.5	25	5	17.5
	Parenchyma cells	12.5	37.5	10	30
	Scleranchyma cells	7.5	20	-	-
	Trachea	7.5	20	-	-
	Phloem	22.5	62.5	-	-
Petiole	Pith cells	17.5	65	-	-
	Epidermis cells	27.5	35	12.5	30
	Parenchyma cells	7.5	15	-	-
Leaf	Trachea	5	15	-	-
	Upper epidermis cells	32.5	67.5	27.5	47.5
	Palisade parenchyma cells	15	22.5	67.5	100
	Spongy parenchyma cells	20	42.5	20	35
	Lower epidermis cells	17.5	32.5	17.5	27.5



#### 4. Conclusions

*P. cognatum* are known as medicinal and edible plant (Özbucak et al., 2006, 2007; Tugay et al., 2012). Edible parts of this species were studied anatomically. Stem has single layered epidermis and 1-2 layered collenchma. Hameed et al. (2010) determined that two layered epidermis in *P. plebejum*. Scleranchymatic cells were present in *P. cognatum*. According to Hameed et al. (2010) stone cells were present in *P. plebejum*.

*P. cognatum* has petiole but *P. plebejum* has not petiole (Hameed et al., 2010). Undulate walls were present on both adaxial and abaxial surface of *P. cognatum*. Petiole shape of this species is flat and obtusely adaxially sulcate. Druse crystals were present in petiole.

According to Bunawan et al. (2011) in *P. minus*, epidermal cells of leaves are smooth-walled polygonal on adaxial surface and irregularly shaped with slightly undulating walls on abaxial surface. Yasmin et al. (2009a) determined irregular cells with pitted, thick and undulating walls on both leaf epidermises in some *Polygonum* species. Our specimens have undulating walls on both leaf epidermises. Stomatal pattern is variable in the family Polygonaceae. Inamdar (1970) determined that, the mature stomata are anisocytic, anomocytic and paracytic in *Polygonum* species. In this study, *P. cognatum* have diacytic, anisocytic and anomocytic stomata. It was also found that this species has stomata on both upper and lower surfaces. Metcalfe and Chalk (1979) recorded that there are anomocytic stomata in Polygonaceae family. Yasmin et al. (2009a,b) recorded four type of stomata in genus *Aconogonon* and genus *Polygonum*. Anisocytic stomata was the most prevalent type of stomata in the *Polygonum* genus (Yasmin et al., 2009a).

According to Inamdar (1970), epidermal cells of *Polygonum* species contain druses of calcium oxalate. Metcalfe and Chalk (1979) reported that crystalloids especially calcium oxalate crystals were present in the Polygonaceae family. Druses are common in several families including Polygonaceae (Özörgücü et al., 1991; Dickison, 2000; Bunawan et al., 2011). Bunawan et al. (2011) observed druse and prismatic crystals on leaves of *P. minus*. In our study, it was found that druse crystals were found on stem, petiole and leaves of *P. cognatum*. Bunawan et al. (2011) found epidermal cavities in both adaxial and abaxial sides. Our species has epidermal cavities and oil cells.

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