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# Anatomy of Iranian species *Teucrium polium* (Lamiaceae)

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## ABSTRACT

*Teucrium* (Lamiaceae) is a large and polymorphic genus distributed mainly in the Europe, North Africa and in the temperate parts of Asia. In Iran, 12 species are native. In this study, the anatomical features of the leaf and stem *Teucrium polium* are investigated. *T. polium* belonging to sect. *Polium* is a perennial herb growing on Lorestan province. The anatomical studies on *T. polium* revealed that the stem shares the general characteristics of the Labiatae family. The leaves clearly exhibit xeromorphy due to features such as the thick cuticle layer, thick outer epidermal cell wall, a high density of trichomes and thick palisade layer of the mesophyll.

**Key words:** Teucrium polium, Labiatae, anatomy, Iran



## 1. INTRODUCTION

*Teucrium* is a large and polymorphic genus distributed mainly in Europe, North Africa and in the temperate parts of Asia. The genus *Teucrium* was represented with 12 species in Iran. The basic sectional arrangement of the genus is based mainly on the calyx and inflorescence types with varying characteristics (1). You can see this plant in Figure 1.

**Figure 1. *Teucrium polium* (Lamiaceae)**

However, the survey on the micromorphology of trichomes of 56 *Teucrium* L. species belonging to the 9 sections of the genus in the Mediterranean area demonstrated the taxonomic value of these micro-characters (2). *T. polium* belongs to sect. *Polium* (3). The objective of this work was to determine the anatomical features of *T. polium* growing in Iran.

## 2. MATERIALS AND METHODS

The aerial parts of *Teucrium* species used in this study were collected in the flowering season from the Irano-Turanian region of Iran. Plant samples of this species were collected from Aleshtar city in the province of Lorestan. The specimens were dried using standard herbarium techniques and stored at the Central Herbarium of Islamic

Azad University, Boroujerd Branch, Iran. Anatomical observations were performed using an average of 25 specimens fixed in F.A.A. Anatomical investigations were carried out on the cross-sections of the stems and the leaves. Cross-sections of stem and leaves were stained with carmine and fast green with some modifications. The photographs of the sections were taken using an Olympus CX-21 microscope.

## 3. RESULTS AND DISCUSSION

*3.1. Stem*

It is rectangle shaped. The epidermis consists of rectangular cells forming a single layer and is surrounded by a cuticle layer. Eglandular and glandular trichomes are seen on the entire epidermal surface. Underneath the epidermis, there are 6 layers of collenchyma in the corner of the stem. The cortex, consisting of 5 layered parenchymatous cells, is located under the collenchyma. The endodermis is indistinct. The pericycle is present below the endodermis and it is made up of 1–2 layered scleranchymatous cells encircling the vascular bundles from the outside. The vascular bundles at the corners are larger than the others. Cambium is indistinguishable. The phloem and the xylem members are clear. Protoxylem and metaxylem members are distinguishable. The tracheal elements of the Protoxylem are larger than those of the metaxylem. The pith is present at the middle of the stem, and is completely filled up with large orbicular parenchyma tic cells (Figure 2).

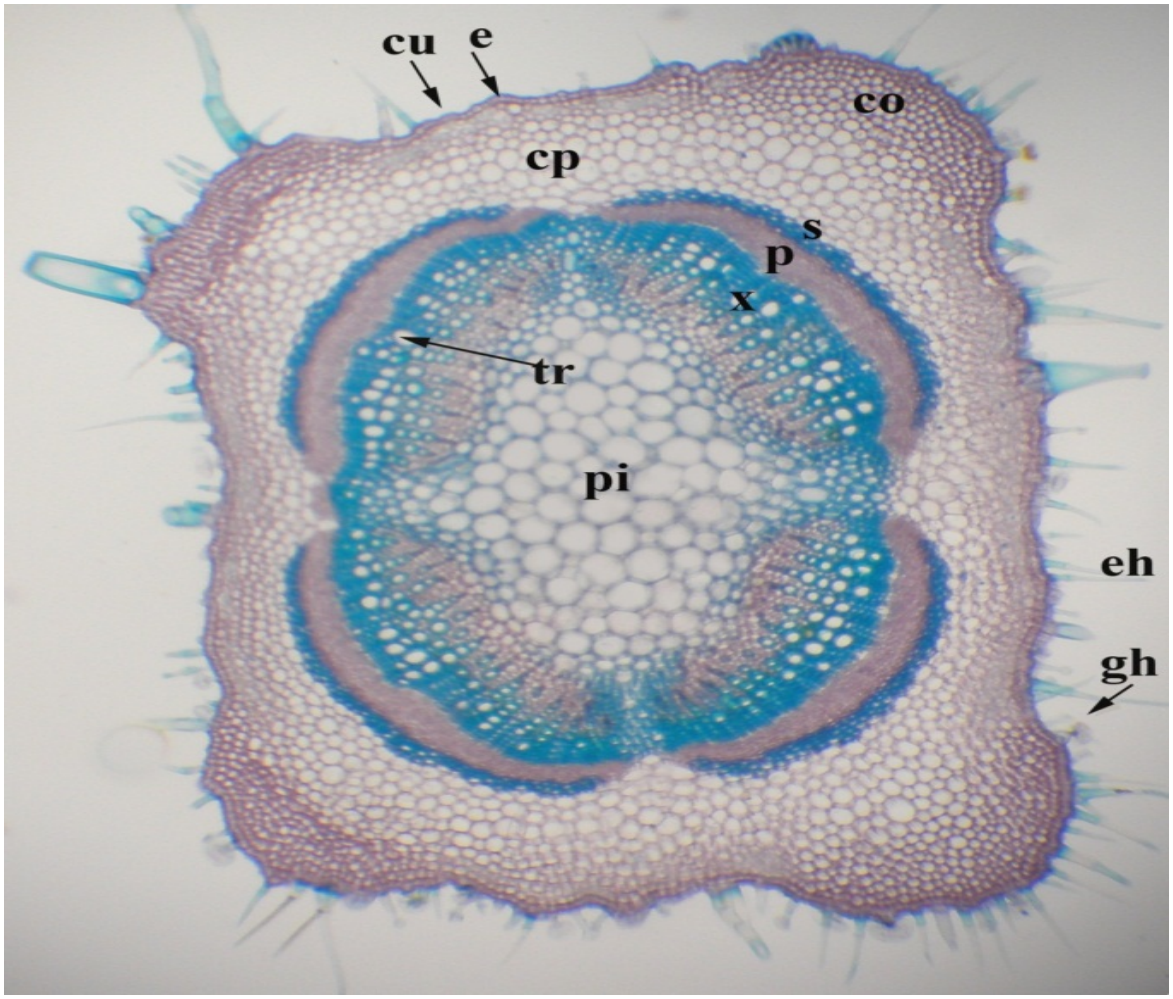


**Figure 2. *T. polium* – cross section of stem of anatomical properties. gh- glandular hair, eh- eglandular hair, cu- cuticle, e- epidermis, co- collenchyma, cp- cell parenchyma, s- scleranchyma, , p- phloem, tr- tracheid, x- xylem, pi- pith**

*3.2. Leaf*

The transverse section of the lamina and surface preparations of both epidermises revealed that the upper and lower epidermises comprise uniseriate, oblong cells. The upper epidermis cells are larger than the lower ones. Both epidermises are covered with a cuticle. The upper cuticle layer is equal with the lower one. There are Eglandular and glandular trichomes on the entire epidermal surface, but the trichomes density of the upper epidermis is not as high as that of the lower epidermis. Midrib is triangle shaped and has 4–6 layered collenchyma located above lower epidermis. Vascular bundles are collateral and surrounded by a parenchymatic bundle sheath. Leaves are bifacial (dorsiventral). Palisade parenchyma cells are 3-

layered under the upper epidermis. Spongy parenchyma cells are 2- layered under the lower epidermis. However, the palisade parenchyma occupies about almost of the mesophyll. Palisade parenchyma cells are 2-layered above the lower epidermis. Namely, the palisade tissue is about two times as thick as the spongy tissue (Figure 3, Figure 4, Figure 5, Figure 6).

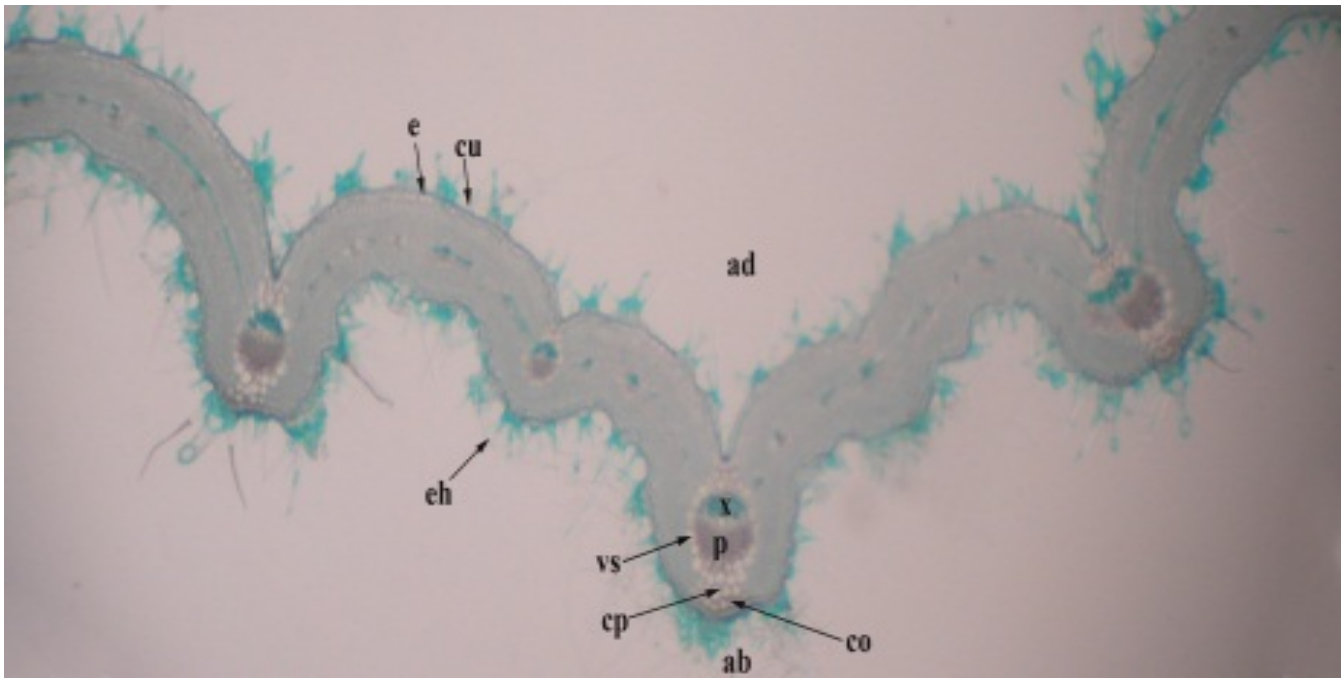


**Figure 3. Figure 2: *T. polium* – cross section of leaf blade. eh- eglandular hair, cu- cuticle, e- epidermis, ad- adaxial, ab- abaxial, co- collenchymas, cp- cell parenchyma, p, phloem, x- xylem, vs- vascular bundle**

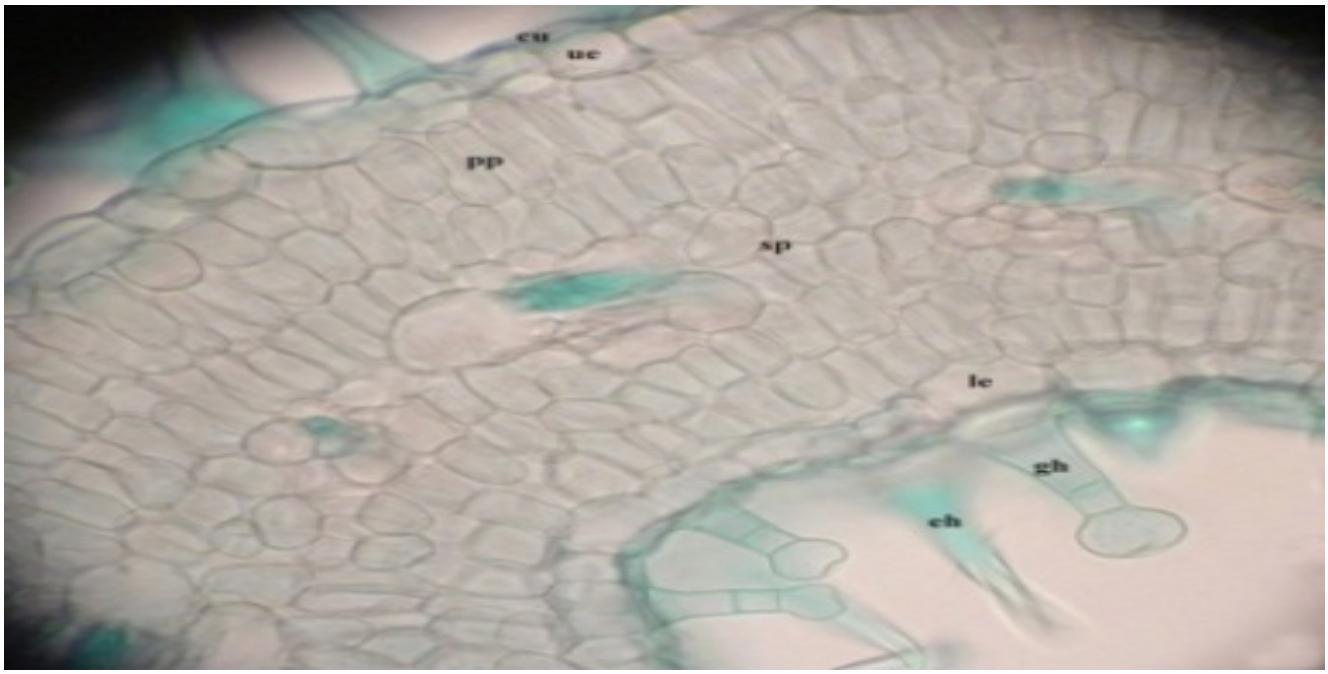


**Figure 4. *T. polium* - cross section of mesophyll. cu- cuticle, ue- upper epidermis, le- lower epidermis, pp- palisade parenchyma, sp- spongy parenchyma, eh- eglandular hair, gh- glandular hair**

**Figure 5.** ***T. polium*** **- glandular hair**

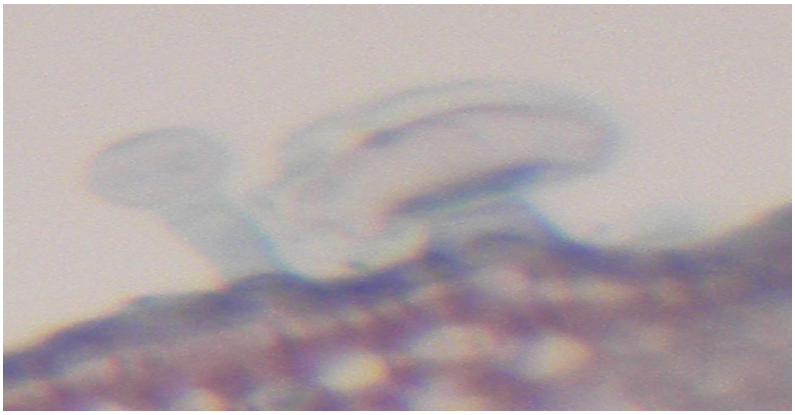

**Figure 6.** ***T. polium*** **- glandular hair**

In this study, detailed anatomical structure of the Iranian *Teucrium polium* is given. Metcalfe & Chalk (4) pointed out that the stems of the family Labiatae species are rectangular and the collenchymatic tissue covers a broad area at the corners and scleranchymatic tissue surrounds the vascular tissue. The anatomical studies on some of the family Labiatae species showed that they have the same anatomical characteristics (5-7). These characteristics are observed in *T. polium* as well. The characters, traditionally accepted as evidence that the plants possessing them are xerophytes, were recorded previously (4). The leaves of *T. polium* show many structural features that could be interpreted as typically xeromorphic, such as the epidermal cells in which the outer walls and overlying cuticle are thick, a high density of trichomes and thick palisade tissue of the meophyll. Therefore, *T. polium* is clearly a xerophytic species. However, the anatomical structures of the leaf of various *Teucrium* species differ significantly. Although Dinc et al (7) reported that the upper cuticle layer is fairly thicker than the lower one and midrib has 4–6 layered collenchyma located below both epidermises in *Teucrium sandrasicum*, we did not observe thicker upper cuticle and upper epidermis collenchymas.

## 4. CONCLUSION

In this study, the anatomical features of the leaf and stem *Teucrium polium* are investigated. *T. polium* belonging to sect. *Polium* is a perennial herb growing on Lorestan province. The anatomical studies on *T. polium* revealed that the stem shares the general characteristics of the Labiatae family. The leaves clearly exhibit xeromorphy due to features such as the thick cuticle layer, thick outer epidermal cell wall, a high density of trichomes and thick palisade layer of the mesophyll.

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## AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

## CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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