

MORPHOLOGICAL AND ANATOMICAL STUDIES ON *THYMBRA SPICATA* L.

THYMBRA SPICATA L. ÜZERİNDE MORFOLOJİK VE ANATOMİK ARAŞTIRMALAR

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Thymbra spicata L. is represented by two varieties in the Flora of Turkey. Materials collected from different locations of Turkey were studied anatomically and morphologically. Macroscopical and microscopical features of the stem, leaf and flower were illustrated.

Thymbra spicata L. Türkiye Florasında iki variyete ile temsil edilmektedir. Türkiyenin farklı bölgelerinden toplanan materyaller anatomik ve morfolojik olarak çalışılmıştır. Gövde, yaprak ve çiçeğin makroskopik ve mikroskopik şekilleri tanımlanmıştır.

Key words: Labiatae; *Thymbra*; Morphology; Anatomy

Anahtar kelimeler: Labiatae; *Thymbra*; Morfoloji; Anatomi

Introduction

Thymbra L. (Labiatae) is represented in Turkey by two species and four taxa (1) and is found in areas where the Mediterranean climate reigns (2). In South Eastern Anatolia it is known as Sater or Zater and due to its flavour akin to thyme and oregano, it is used as a commercial replacement for these spices. Dried herbal parts of *T.spicata* are used as carminative and antiseptic and also in diabetes, stomach aches and herpes infection in the form of tea. Its' essential oil is used in flu and for stomach upset. It has several local names as (in Turkish) karakik, delikekik, karabaş kekigi and eşek kekigi (2-6).

Essential oils of *Thymbra spicata* var. *spicata* collected from fourteen locations yielded carvacrol (56-77 %) as the main constituent. Carvacrol was also the main component (49-71 %) in the oils from seven samples of *T.spicata* var. *intricata* collected from different regions of Turkey. However, oil in one sample yielded thymol (51 %) as the main constituent with only 9 % carvacrol (7). The oil composition of *Thymbra* is therefore quite similar to those of other oregano plants in Turkey as *Origanum*, *Coridothymus* and *Satureja*.

Materials and method

Materials were collected from various localities and voucher specimens were deposited at the Herbarium of the Faculty of Pharmacy, Anadolu University, Eskişehir, Turkey (ESSE). Accession numbers are indicated following each locality.

Specimens taken from the herbarium materials were preserved in 70% ethanol and were used to describe the morphological features. A distribution map of *Thymbra* taxa is given in figure 1. Cross sections of leaf, stem and calyx and surface sections of upper and lower epidermis of the leaf were taken manually for anatomical studies. Wild MS Stereomicroscope and Leitz SMLUX binocular light microscope with drawing tubes were used.

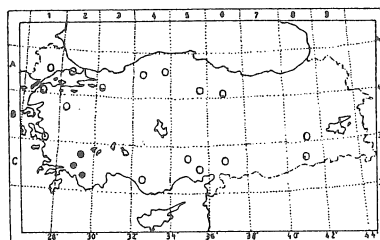


Fig. 1. Distribution of *T. spicata* L.

- *T. spicata* var. *spicata*
- *T. spicata* var. *intricata*

Study materials

Thymbra spicata var. *spicata* Syn: *T. verticillata* 1. Sp. Pl. 569 (1753). *T. abigua* E.D. Clarke, Travels 239 (1813). Ic. Sibth. & Sm., Fl. Graeca 6: t. 546 (1827); Reichb., Ic. Fl. Germ. 18: t. 1270 (1857). A4 Kastamonu: Eskipazar-Karabük road. Roadsides, roadside slopes 15.6.1994 500m. H. Malyer, M. Koşar, N. Ermin, ESSE 10631. B3 Eskişehir: Ellezler (upper Kınık) Elmacılar between Sarıcakaya and Göynük. Start of pine forest 17.9.1987, 1075 m., K.H.C. Başer, M. Ögütveren, Y. İ. Akyol, ESSE 8278. B3 Balıkesir: 3 Km. to Kazdağ-Avcılar village 4.7.1992, N. Ermin ESSE 5666.

Thymbra spicata var. *intricata* P.H. Davis in Kew Bull. 1949: 424 (1949). C2 Denizli: Olukbaşı-Geyran plateau 8.5 km. 11.7.1999, 1580 m. K.H.C. Başer, H. Duman, A. Altıntaş ESSE, 12846. C2 Muğla: Around Köyceğiz bridge, left lower lands of the bridge entrance from Muğla. 19.6.1995, 75 m., K.H.C. Başer, H. Duman, A. Altıntaş ESSE, 11401. C2 Antalya: Kaş 32 Km., road sides and slopes, 20.6.1995, 150 m., K.H.C. Başer, H. Duman, A. Altıntaş ESSE, 11360. Endemic.

Morphological observations

Thymbra spicata L., Sp. Pl. 569 (1753). Perennial herbs, shrubs. Stem erect, ascending woody at base, hairy 16-36 cm. Trichomes sparse at base,

dense on top. Leaves linear, linear-lanceolate, decussate 3-15x1-3 mm, obtuse, margin entire. Central vein indefinite on upper face, more prominent on lower face. The both sides of the leaf short hirsute, sparsely pilose at the base, conduplicate at least when young. Glandular hairs reddish, embedded in leaf, dense, sparse towards base. Inflorescence ovate, oblong verticillasters. The distance between the verticillasters are 2-8 mm, the number of verticillasters was 6-10. Bracts purplish, lanceolate, 7.5-12x1.5-3 mm, acute, entire, short hirsute on both faces. Leaf margins with short or long hairs. Glandular hairs (Labiatae type) sparse. Peduncles 1 mm, densely hirsute. Calyx 5-7x2-3 mm, bilabiate, tubulate-campanulate with brown, 5 triangular teeth. Upper lip with 3 short ovate-triangular teeth (teeth 1-2 mm), lower lip with 2 lanceolate teeth (teeth 2-3 mm), ciliate and acute. Calyx tube 3-4 mm, dorsally compressed, with glandular hairs embedded on the surface and with covering trichomes, glabrous inside. Calyx throat and inner surface of teeth-long haired. Bottom part of the calyx tube glabrous. Corolla purplish pink, 8-15 mm, bilabiate, with reddish, glandular hairs and covering trichomes. Upper lip retuse, lower lip with equal 3 lobes, lower stamen pairs not exceeding the upper lip. Anthers 0.5 mm, filaments 2-4 mm, glabrous, yellow. Ovary 4 lobed, style pink, bifid at the top as unequal pair. Nutlets 2-2.5 x 1.2-1.7 mm ovoid, papillose (Figs 2-5).

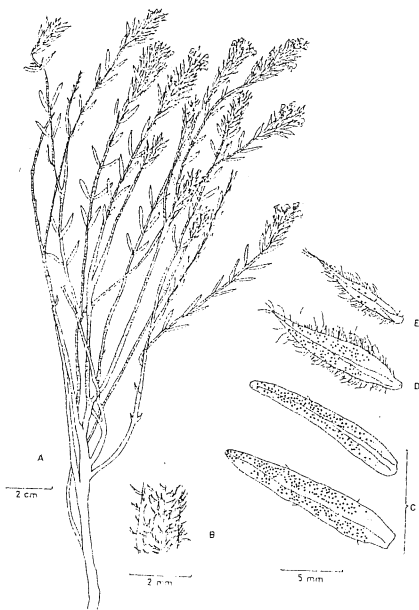


Fig. 2. *T. spicata* var. *spicata* A. Plant, B. Stem, C. Leaves, D. Bract, E. Bracteol.

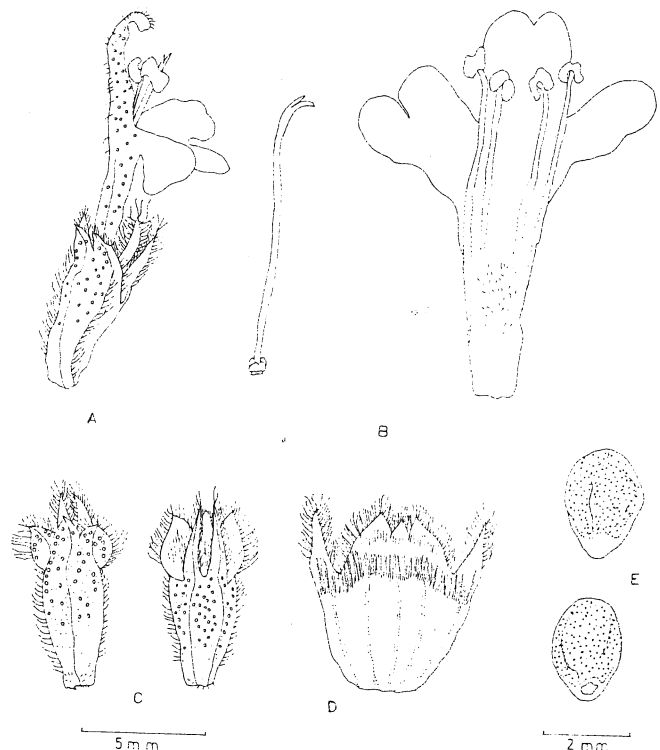


Fig. 3. *T. spicata* var. *spicata* A. Flower, B. Dissected Corolla, Pistil and Stamens, C. Calyx, D. Dissected Calyx, E. Nutlets..

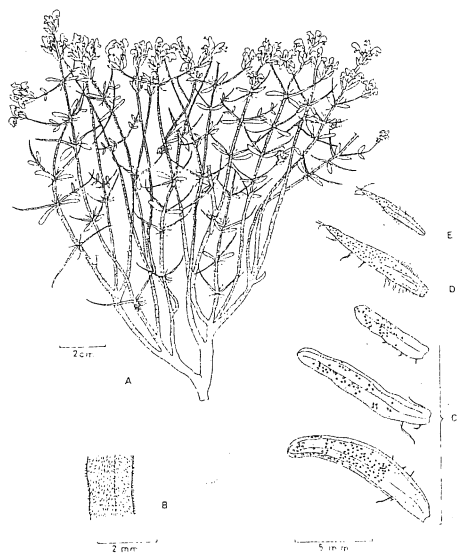


Fig. 4. *T. spicata* var. *intricata* A. Plant, B. Stem, C. Leaves, D. Bract, E. Bracteol.

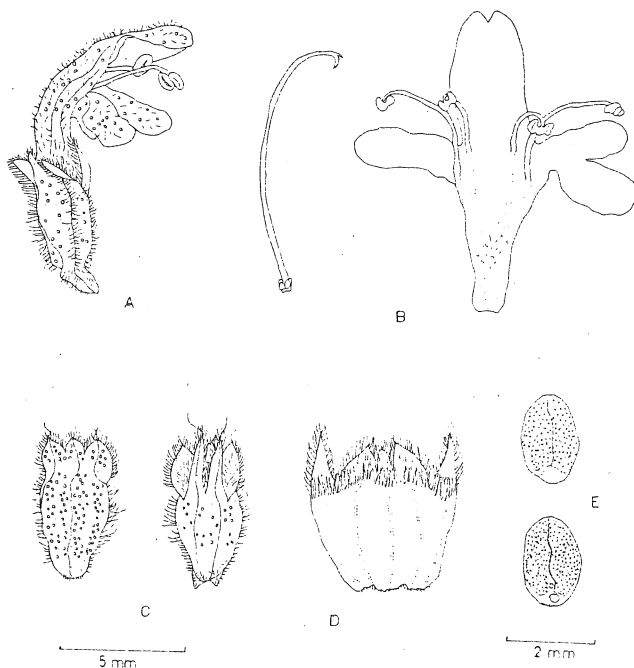


Fig. 5. *T. spicata* var. *intricata* A. Flower, B. Dissected corolla, pistil and stamens, C. Calyx, D. Dissected calyx, E. Nutlets.

Anatomical observations

Herbaceous stem: Epidermis and peridermis were observed in cross-sections. The epidermis in the young stem is composed of a single layer of rectangular or compressed cells. They are covered with a thin cuticle. Covering trichomes 1-4 celled, simple and thick walled.

Peridermis was observed in mature stems. Cork is composed of 2-4 layers of cells. When peridermis is developed the epiderma cells get crushed. The collenchyma tissues consisting of 5-6 layers of rectangular cells and irregular in shape are located under the epidermis or peridermis. The 3-4 layered compressed parenchyma tissue is located under collenchyma. Lyzigenous cavities are located in the parenchyma tissue. Endodermis is composed of a single layer of ovoid cells. Pericycle is obscure. Phloem ring is composed of 4-5 layers of compressed cells. Cambium is also obscure. Secondary xylem covers a large area with frequent parenchymatous rays. In the younger stems the pith section is much wider (Fig.6).

Woody stem: Cells of peridermis cover a large area. Cork cells with 8-10 layers. Primer cortex and endodermis squashed. Secondary phloem composed of 7-8 layers of cells. Cambium squashed.

Leaf: Cross-sections taken from the midrib section reveal that the epidermis consists of oval and rectangular cells. Upper walls are thicker than the lower and the radiating walls. The epiderma is covered with a thin cuticle. On surface sections the epi-

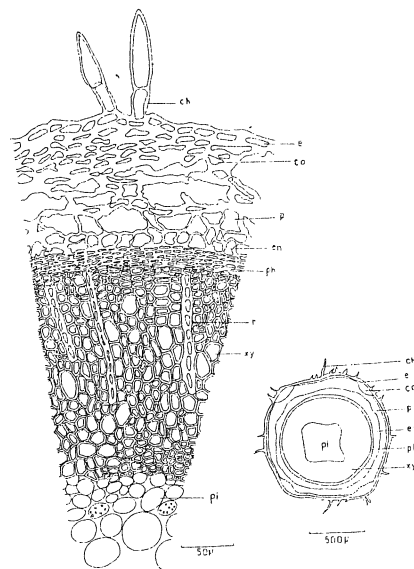


Fig. 6. *T. spicata* var. *intricata*. Transection of the stem, ch. Clothing hair, e. Epidermis, co. Collenchyma, p. Parenchyma, en. Endodermis, r. Ray, ph. Phloem, xy. Xylem, pi. Pith.

dermis has flat walls on both faces. (Figs 7,8). Covering trichomes 1,2 celled. 1-celled hairs are conical in shape. Peltate trichomes dense on both sides (Figs 10B, D). Stomata hygromorphic and diasitic (Figs 8A,B,C).

In cross-section, vascular bundle is surrounded by a parenchymatous sheath. 1,2 layered collenchyma tissue under the upper epiderma and 2-5 layered collenchyma tissue under the lower epiderma can be seen (Figs 7,8A).

Calyx: In cross-sections taken from the calyx, the outer epidermis is composed of compressed cells which are ovoid on the veins. The upper and the lower walls are thicker compared to the radiating walls. Cuticle is a thin layer. The inner epidermis cells are long and cylindrical. The cell wall is thickened and the cell lumen narrow. These cells facing the inner sides of calyx contain crystals. Cuticle is thicker in inner epidermis compared to the outer epidermis (Fig. 9). The outer epidermis is hairy while the inner epidermis is glabrous. The veins on both sides of calyx contain covering trichomes. Glandular hairs are with unicellular head and 2-3 celled stalk. There are also peltate glandular hairs. The hairs at the calyx throat are multicellular (Fig. 10). 2-3 layers of ovoid parenchyma cells are placed under the outer epidermis (Fig. 9).

Results and Discussion

Thymbra spicata is a subshrub and represented by two varieties in The Flora of Turkey (1). No previous morphological and anatomical studies have been encountered during literature survey. A morphological comparison of *Thymbra spicata* with *Thymus capitatus* has been published (8).

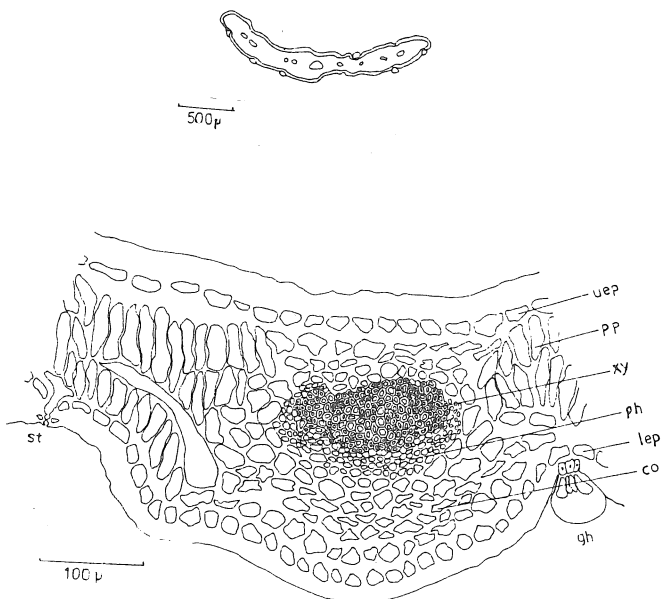


Fig. 7. *T. spicata* var. *spicata*. Transection of the leaf, uep. Upper epidermis, co. Collenchyma, pp. Palisade parenchyma, xy. Xylem, ph. Phloem, lep. Lower epidermis, gh. Glandular hair, st. Stoma.

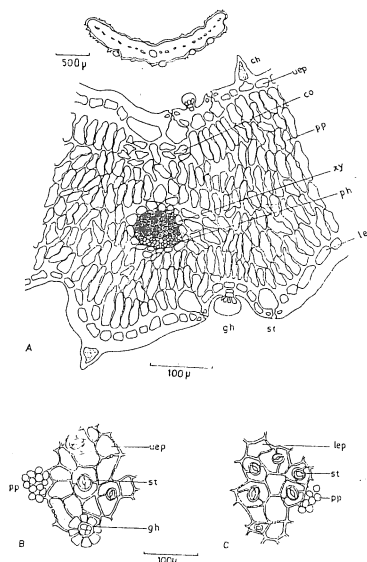


Fig. 8. *T. spicata* var. *intricata*. Transection of the leaf (A) Surface views of the upper (B) and lower (C) Epidermis. Nep. Upper epidermis, co. collenchyma, pp. Palisade parenchyma, xy. Xylem, ph. Phloem, lep. Lower epidermis, gh. Glandular hair, st. Stoma, ch. Clothing hair.

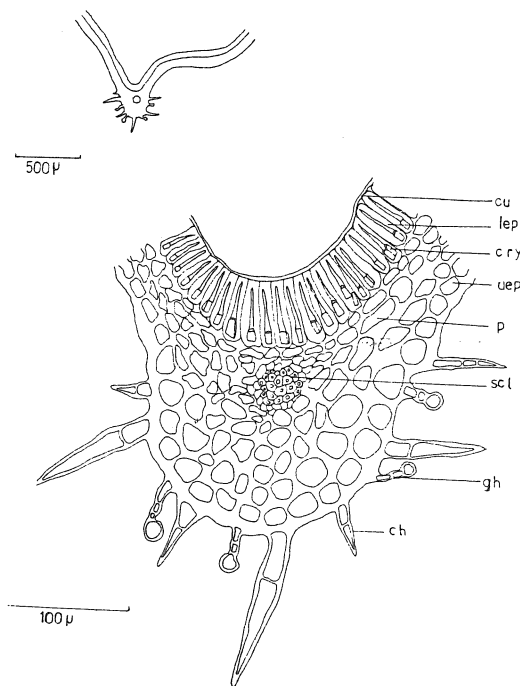


Fig. 9. *T. spicata* var. *intricata*. Transection of the calyx. cu. Cuticle, lep. Lower epidermis, cry. Crystal, uep. Upper epidermis, p. Parenchyma, scl. Scleranchyma, gh. Glandular hair, ch. Clothing hair.

Table. Comparative morphology of *T. spicata* var. *spicata* and *T. spicata* var. *intricata*.

	<i>T. spicata</i> var. <i>spicata</i>	<i>T. spicata</i> var. <i>intricata</i>
Stem	White recurved hirsute, leafy flowering shoots simple	White short hirsute, leafy flowering shoots divaricately branched
Bract	11-12 x 2-3 mm	7.5-10 x 1.5-2 mm
Bracteol	6.5-9 x 2.5-3 mm	4-9 x 1-1.5 mm
	Margins longly ciliate	Margins shortly ciliate
Flower	Verticillasters with 6 subsessile flowers	Verticillasters with 10 subsessile flowers

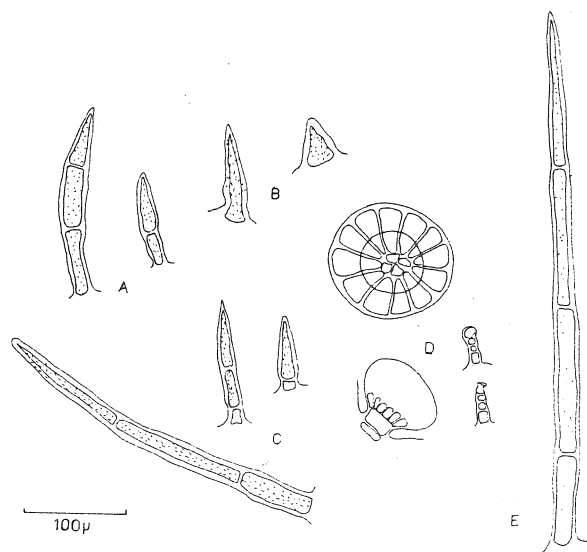


Fig. 10 *T. spicata*. Clothing hairs of the: A. Stem, B. Leaf, C. Calyx, D. Glandular hairs of the calyx and leaf, E. Throat hair of the calyx.

Samples of both varieties collected from different regions in Turkey were investigated and compared morphologically and anatomically.

The most significant morphological difference between the two varieties is divaricate branching of var. *intricata* which is even more visible on the field. The number of subsessile flowers on verticillasters is another important character for differentiating the two varieties. The other differences indicated in the table are clear proofs for keeping the status of these varieties as separate taxa.

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