

Morphological and Anatomical Properties of *Micromeria myrtifolia* Boiss. et Hohen.

Micromeria myrtifolia Boiss. et Hohen. 'nın Morfolojik ve Anatomik Özellikleri

Fehmiye Koca

Anadolu University, Faculty of Pharmacy, Department of Pharmaceutical Botany, 26470, Eskischir, Turkey

Abstract

Micromeria myrtifolia Boiss. et Hohen. grows naturally in Turkey and is used as a folk medicine. The plant is suffrutescens perennial herb, covered on all its parts with glandular and non-glandular hairs. Stems numerous, verticillasters globose-hemispherical and many flowered, calyx tubular, corolla mauve-pink. Leaves are dorsiventral and amphistomatic with diacytic stomata. Herbaceous stems have primary and secondary structures. Vascular system is composed of single large bundle in the corners of the stem but two or more small ones in the between corners. Pith consists of parenchymatous tissue with lignified walls. The anatomical structure of *M. myrtifolia* displays some xero-mesomorphic characteristics.

Key words: *Micromeria myrtifolia*, Labiatae, morphology, anatomy

Introduction

Micromeria myrtifolia is one of the many medicinal and aromatic plants of Labiatae family, mainly distributed in European Turkey, outer and Eastern (southern) Anatolia. The character of the habitat is rocky slopes (often limestone), open *Pinus brutia* forest, macchie and phrygana (Davis, 1982). According to Davis (1982) "it is the most common and most-collected Turkish *Micromeria*". It is locally known as "boğumlu çay, dağ çayı, kaya yarpuzu, sümbül çiçeği, viks çiçeği, keklik otu, altınbaş çayı, kaya kekiği, kekik, topuk çayı, haydar otu", in Southern Anatolia, the plant is used, in the form of tea, in folk medicine for its carminative, appetizer, stimulant and pain relieving properties in stomachache (Baytop, 1984; Baytop, 1991; Yeşilada *et al.*, 1993; Baytop, 1994; Kırmır and Başer, 1997). The ethnomedical use of *M. myrtifolia* as a digestive, nervous system regulator, for headache and in hepatic diseases (with *Ruta chalapensis*) in Israel is also reported (Kırmır and Başer, 1997). Moreover, it is one of the plants exported by the name of "kekik" (Özhatay *et al.*, 1997). Essential oil of aerial parts of *M. myrtifolia* was analyzed (Özek *et al.*, 1992); its infusion was also studied from toxicological and pharmacological points of view (Özek *et al.*, 1992). The present work comprises a study of morphological and anatomical characteristics of aerial parts of *M. myrtifolia*.

Material and Method

M. myrtifolia was collected from different localities. Voucher specimens are deposited at the Herbarium of the Faculty of Pharmacy of Anadolu University, Eskisehir, Turkey (ESSE). Permanent microscobic preparations were made of plant material fixed in % 70 alcohol. Cross and surface sections of the plant leaf, stem and floral parts were made by free hand and stained with Sartur solution (Baytop, 1972). Measurements of leaf and bract were made on middle zone of stems and inflorescence. A Wild M5A stereomicroscope with a drawing tube and a Leitz SM-LUX binocular light microscope with a drawing tube were used in the morphological and anatomical studies.

Morphological Results

Micromeria myrtifolia Boiss. et Hohen. suffrutescens perennial herb. Covered on all its parts with clothing and glandular hairs, clothing hairs pubescent to hirsut, recurved and straight, long and short. Flowering stems ascending or erect, 12-43,5(-64,5) cm. Leaves simple, short petiolate, 5,2-11 x 2,1-8,5 mm, ovate-rotundate to elliptic, usually acute at the top, usually rotundate at the base, margin narrowly revolute. Inflorescence long and usually lax, 4,5-25 cm, verticillasters densely globose-hemispherical, usually many flowered, equalling or shorter than floral leaves, cymules and flowers sessile. Bracteoles linear-subulate, 1,1-4,5 mm. Calyx tubular, 13 veined, 2,9-4,1 mm, 5 toothed, teeth 0,5-1,2 mm, subulate lower 2 teeth longer, throat bearded. Corolla bilabiate, pink-mauve, 4-5,7 mm, upper lip retuse, lower lip 3 lobed, stamens 4, didynamous. Nutlets 0,7-1 x 0,3-0,4 mm, brown, surface slightly striped, oblong-slightly trigonous, obtuse to apiculate (Fig. 1,2). Flowering time: April-July.

Specimens examined: A1 Balıkesir: Erdek, Ocaklar köyü, 20.6.1990, K. H. C. Başer, ESSE 8944! Erdek: Ocaklar köyü, 7.7.1991, K. H. C. Başer, ESSE 9435!, A2 Bilecik: Bozüyük-Bilecik 11. km, 15.6.1990, F. Koca, ESSE 9636! Gemlik: Narlı-Karacaali arası, 7.7.1993, H. Malyer, ESSE 12742!, B1 Bilecik: Kızıldağlar-Kurtköyü yolu, 16.6.1990, K. H. C. Başer, ESSE 8945! Bilecik civarı, 15.6.1990, K. H. C. Başer, ESSE 8979! Balıkesir: Avcılar köyüne 3 km kala, 4.7.1992, G. Tümen, ESSE 9690! Kazdağı etekleri, 12.7.1996, Z. Erdemgil, ESSE 12318! Manisa: Spil dağı, 24.5.1995, K. H. C. Başer, ESSE 11817!, B3 Eskişehir: Ilıca-Sarıcakaya, 4. km, 17.6.1989, K. H. C. Başer, ESSE 9008! Sakarı-ılıca köyü, 11.6.1991, K. H. C. Başer, A. Kaya, T. Özek, ESSE 9136! Aynı yer, 19.5.1991, K. H. C. Başer, A. Baytop, A. Kaya, ESSE 9574! Ilıca-Muttalip köyünü 1 km geçince, 11.6.1991, K. H. C. Başer, A. Kaya, ESSE 9915! Gökçekaya Barajı, 3.6.1994, K. H. C. Başer, A. Kaya, M. Koşar, ESSE 11122!, C1 Aydın: İncirliova, Dereağzı mev. Dağ eteği, G. Tümen, ESSE 12120!, C3 Antalya: Tekirova, 1.6.1989, K. H. C. Başer, N. Kurtar, ESSE 3122! Alanya yolu, Kurşunlu Şelalesi, 2.6.1989, K. H. C. Başer, N. Kurtar, ESSE 8693! Kemer Karayolu, ca. 15 km, 14.4.1991, K. H. C. Başer, ESSE 9439! Fasalış harabeleri, 9.5.1994, H. Malyer, ESSE 11010!, C4 Konya: Basmaklı köyü, G. Tümen, ESSE 10978!, C6 Gaziantep: Kilis, Çakmak köyü, 20.8.1995, G. Tümen, ESSE 11938!

Anatomical Results

Herbaceous Stem

It is quadrangular in cross-section. Epidermis composed of single layer, thick walled ovate or compressed cells. It has glandular and non-glandular hairs, covering hairs 1-5 celled,

uniseriate, usually recurved sometimes straight, walls thickened, cuticle with short striations, glandular hairs two types: 1-unicellular head and stalk, 2- Labiatae type (8 celled), the last being rare (Fig. 8 a, d). There are groups of collenchyma with over thickened walls and similar to sclerenchyma in the 4 angles. Cortex parenchymatous, usually crushed and contains chloroplast. Endodermis single layered with large cells. Vascular system composed of single large bundle in each corner of the stem and two-seven small ones between the corners. Phloem in the form of an interrupted narrow circle and surrounded by pericyclic sclerenchyma 1-4 layered. Cambium indefinite. Xylem forming a continuous cylinder owing to the development of interfascicular fibres between the xylem groups of contiguous bundles. Pith parenchymatous and cell walls lignified (Fig. 3).

Leaf

The leaves are dorsiventral. Epidermis single layered with compressed cells in cross-section, outer tangential walls over thickened, upper epidermal cells larger than lower ones. In surface section, lower epidermal cell walls more waved than those of the upper side (Fig. 4, C, D). Glandular and non glandular hairs both on the upper and lower side. Covering hairs 1-6 celled, similar to those of the stem. Glandular hairs three types: 1- Unicellular head and stalk, 2- Unicellular head and bicellular stalk, 3- Labiatae type restricted to lower surface (Fig. 7 a, d). Stomata on both surfaces, superficial or slightly raised, diacytic. Mesophyll differentiated into 1-layer palisade and 3-4 layers spongy parenchyma, radial walls of the palisade cells slightly sinuous. In surface view, palisade cells rounded, spongy cells irregular shaped. Midrib convex abaxially, vascular bundles collateral, surrounded by parenchymatous sheath with 1-layer, phloem supported by a large sclerenchymatous group. Thick walled hypodermal parenchyma present above and below of vascular bundle. In both sides of midvein 3-4 large bundles of fibres are found (Fig. 4).

Flower Parts

Calyx: Inner and outer surfaces of the calyx, in cross-section, covered with single layer epidermis. Outer epidermis cells compressed, whereas inner ones convexly arched outwards. In both epidermises lumens are highly reduced or disappeared since the walls are over thickened. But in the midvein area, inner epiderma cells compressed and thin walled. In the surface section, inner epidermis cells are long, sinuous walled, its lumens are full of lignified wall substance (Fig. 5 C).

Outer epidermis has glandular and non glandular hairs, covering hairs 1-5 celled, straight, recurved, glandular hairs two types: 1- Unicellular head and stalk, 2- Labiatae type (Fig. 7 a, d). Hairs in the calyx throat 1-5 celled and straight (Fig. 7 c). The vein regions composed of groups of sclerenchyma surrounded by 2-3 layer chlorenchyma. Interveinal area chlorenchymatous, usually crushed (Fig. 5).

Corolla: In surface sections which are taken from different parts of the corolla's inner and outer side, epidermis shows differences (Fig. 6 a-m). Covering hairs on the outer surface 1-3 celled, recurved or straight, inner ones 1 celled, straight or slightly irregular walled, acute or truncate (Fig. 7 b). Glandular hairs of Labiatae type occur outer surface. There is parenchyma tissue composed of armed cells with large intercellular spaces below both epidermises (Fig. 6 n).

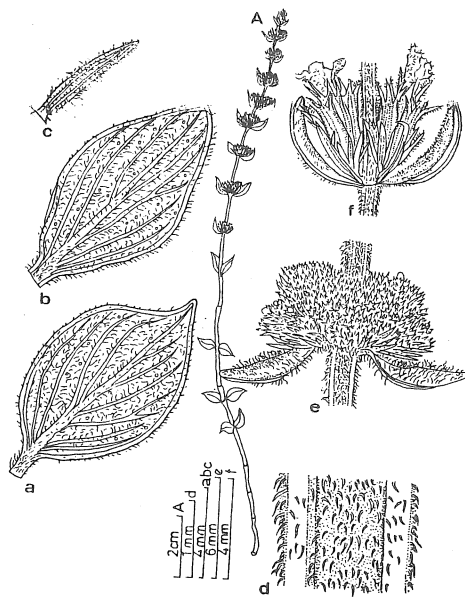


Fig.1. *M. myrtifolia* (ESSE 9639). A Flowered stem, a stem's leaf, b floral leaf, c outermost bracteole, d indumentum of the stem, e many flowered verticil, f few flowered verticil.

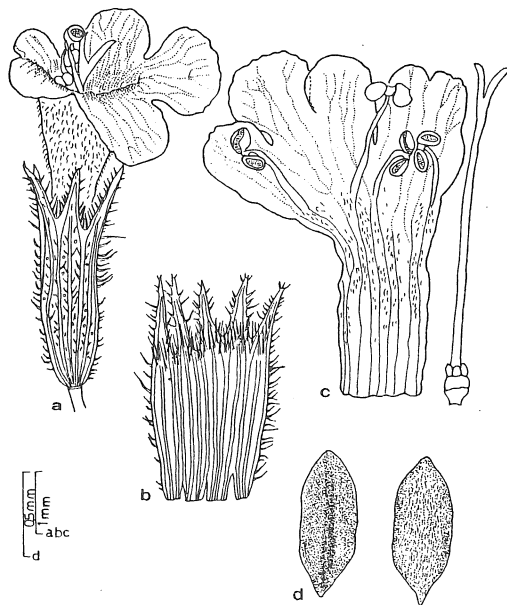


Fig. 2. *M. myrtifolia* (ESSE 9639). A flower, b inner surface of the calyx, c inner surface of the corolla, pistil and stamens, d nutlets.

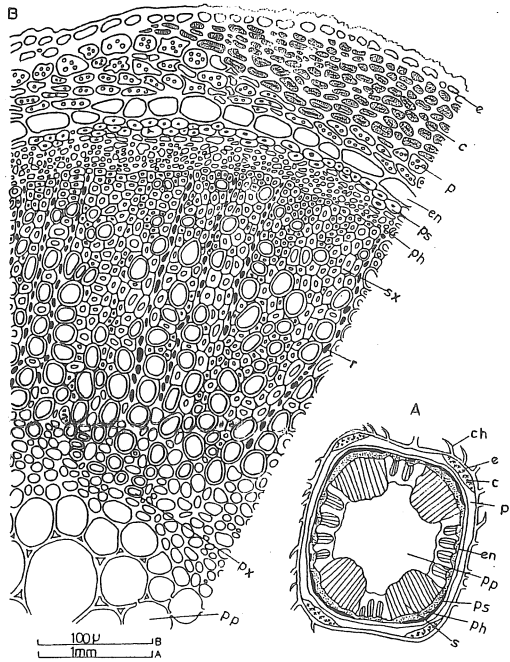


Fig. 3. *M. myrtifolia* (ESSE 9639). Cross-section of the herbaceous stem: A diagrammatic, B detail from A, e epidermis, c collenchyma with over thickened cell walls, p parenchyma, en endodermis, ps pericyclic sclerenchyma, ph phloem, sx secondary xylem, r ray, px primary xylem, pp parenchymatic pith, ch clothing hair.

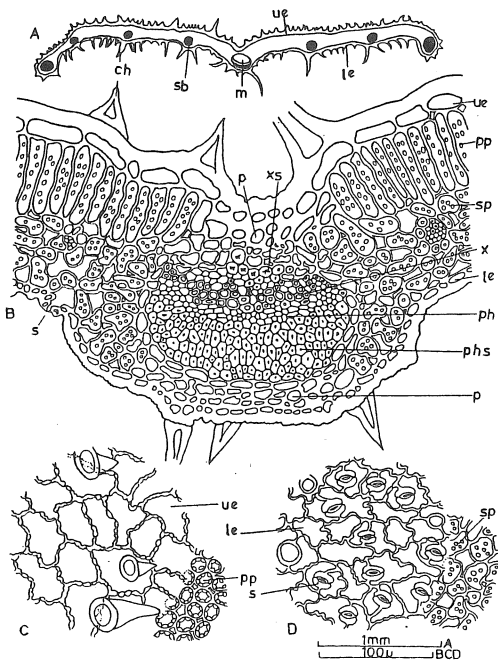


Fig. 4. *M. myrtifolia* (ESSE 11122). Cross-section of the leaf: A diagrammatic, B detail from midrib region, surface sections of the leaf: C upper side, D lower side, ue upper epidermis, le lower epidermis, m midrib, sb sclerenchyma bundle, ch clothing hair, pp palisade parenchyma, sp spongy parenchyma, x xylem, ph phloem, phs phloem sclerenchyma, s stoma, p parenchyma, xs xylem sclerenchyma

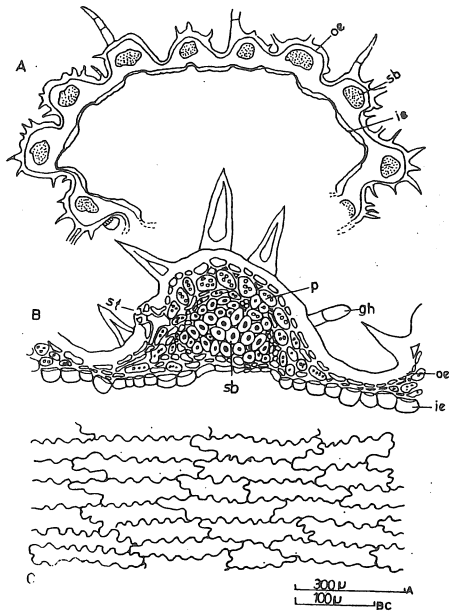


Fig. 5. *M. myrtifolia* (ESSE 9639). Cross-section of the calyx: A diagrammatic, B detail from vein region, C surface view of inner epidermis, oe outer epidermis, sb sclerenchyma bundle, ie inner epidermis, p parenchyma, st stoma, gh glandular hair.

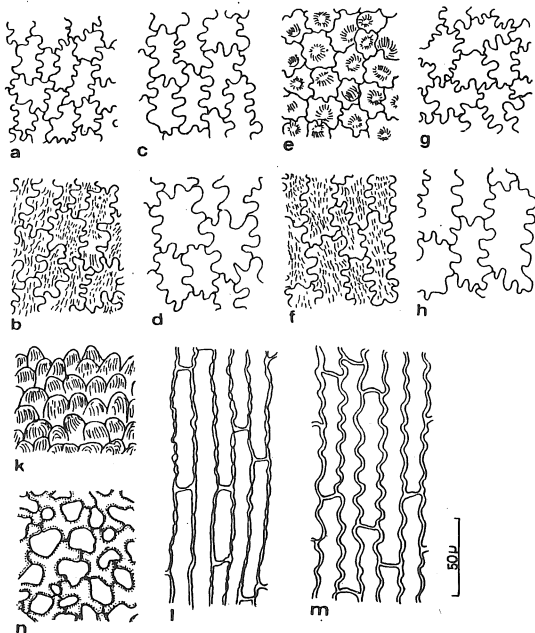


Fig. 6. *M. myrtifolia* (ESSE 9639). Surface sections of the corolla: in upper lip: middle (a) and base (b) regions of inner surface, middle (c) and base (d) regions of outer surface; in lower lip: middle (e) and base (f) regions of inner surface, middle (g) and base (h) regions of outer surface; k outer and inner margins of lips; inner (l) and outer (m) surfaces of corolla tube; n parenchyma beneath inner and outer epidermis

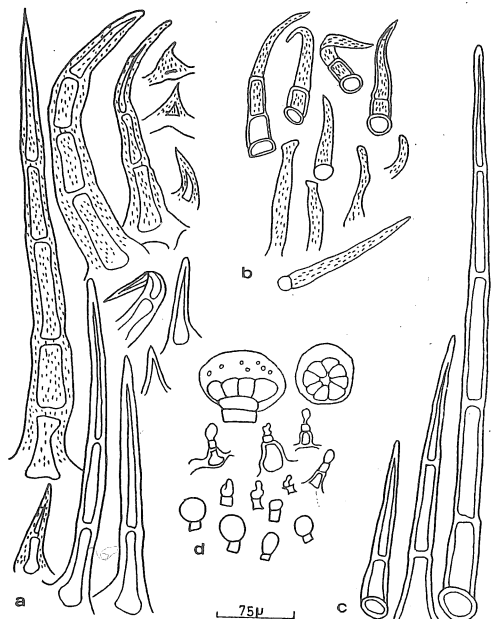


Fig. 7. *M. myrtifolia* (ESSE 9639).
Clothing hairs: a on stem, leaf and
outer surface of calyx, b on inner and
outer surfaces of corolla, c hairs of
calyx throat, d glandular hairs on stem,
leaf and calyx.

Discussion

M. myrtifolia is a plant which shows variation morphologically. In the samples of *M. myrtifolia*, which are collected from various localities, inflorescence are often composed of globose-hemispherical, intermittent verticils. Cymules in the verticils are many flowered and almost stalkless. Besides these samples, the weak forms which usually have short stems and few flowered cymules are observed. These variations are found in the same locality and sometimes in the different stems of the individual. Our morphological findings are generally in accordance with Davis's (1982) results. Samples collected from anatomically three localities (ESSE 9639, 11817, 11122) are examined and no difference is found. Anatomical structure of *M. myrtifolia* shows some xero-mesomorphic characteristics as follows.

Xeromorphic characteristics are:

- thick outer tangential walls and sinuous anticlinal epidermal cell walls.
- slightly sinuous radial cell walls of the palisade tissue.
- in mesophyll, vascular bundles of the veins accompanied by sclerenchyma, besides separate large bundles of fibres.

Characteristics of the mesomorphic structure are:

- dorsiventral organization of the leaf mesophyll.
- superficial or slightly raised stomata.

It is known that morphological and anatomical features of the plants often show a close correlation to the habitat type in which they normally occur.

According to our findings, anatomical structure of *M. myrtifolia* shows some differences and similarities with other representatives of the genus *Micromeria* (Koca, 1996, Metcalfe et Chalk, 1950).

Özet

Micromeria myrtifolia Boiss. et Hohen. başlıca Trakya, Anadolu'nun kıyı ve Güney-doğu bölgelerinde doğal olarak yetişir. Güney Anadolu'da toprak üstü kısımları iştah açıcı, gaz söktürücü, uyarıcı ve mide ağrılarına karşı halk ilacı olarak kullanılır. Bitki çok yıllık, yarıçalımsı, çok gövdeli, tüm yüzeyi örtü ve salgı tüyleri ile kaplı. Çiçek durumu uzun, vertisiller küresel veya yarı küresel, aralıklı, genellikle çok çiçekli, kaliks tubular, korolla pembemsi-mor, bilabiata. Yapraklar dorsiventral ve amfistomatik, stomalar diasitik. Otsu gövde primer ve sekonder yapıda, iletim sistemi köşelerde birer büyük, köşeler arasında 2-7 küçük demetten oluşmuş. Bitkinin anatomik yapısında bazı ksero-mezomorfik özellikler gözlenmiştir.

References

- Baytop, A. (1970). Bitkisel Drogaların Anatomik Yapısı, Baha Matbaası, İstanbul, pp. 26-27.
- Baytop, A. (1991). Türkiye'de Kullanılan Yabani ve Yetiştirilmiş Aromatik Bitkiler, *Tr. J. Pharmacy*, 1: 76-88.
- Baytop, T. (1984). Türkiye'de Bitkiler ile Tedavi, İst. Üniv. Yayın No: 3255, Ecz. Fak. Yayın No: 40, İstanbul, p. 340.
- Baytop, T. (1994). Türkçe Bitki Adları Sözlüğü, Türk Dil Kurumu Yayınları: 578, Ankara, p. 260.
- Davis, P.H. (1982). *Micromeria* in Flora of Turkey and the East Aegean Islands, (Davis, P.H., ed.) Edinburgh University Press, Edinburgh, Vol. 7, pp. 341-342.
- Koca, F. (1996). *Micromeria congesta* Boiss. et Hausskn. ex Boiss., Üzerinde Morfolojik ve Anatomik Araştırmalar, *Tr. J. Botany*, 20: 21-29.
- Kırımer, N., Başer, K.H.C. (1997). *Micromeria* Türlerinin Uçucu Yağları, XI. Bitkisel İlaç Hammaddeleri Toplantısı, Ankara, 22-24 Mayıs 1996 (M.Coşkun, ed.), Bildiri Kitabı, Ankara, pp. 130-138.
- Metcalfe, C. R., Chalk, L. (1950). Anatomy of the Dicotyledons, Oxford Univ. Press, London, Vol. 2, pp. 1041-1053.
- Özek, T., Kırımer, N., Başer, K.H.C. (1992). Composition of the Essential Oil of *Micromeria myrtifolia* Boiss. et Hohen., *J. Ess. Oil Res.*, 4: 79-80.
- Özek, T., Kırımer, N., Başer, K.H.C. (1992). IX. Bitkisel İlaç Hammaddeleri Toplantısı, Eskişehir, 16-19 Mayıs 1991 (K.H.C. Başer, ed.), Bildiriler, Eskişehir, 1992, pp. 298-306.
- Özhatay, N., Koyuncu, M., Atay, S., Byfield, A. (1997). Türkiye'nin Doğal Tıbbi Bitkilerinin Ticareti Hakkında Bir Çalışma, Doğal Hayatı Koruma Derneği, İstanbul, p. 35.
- Yeşilada, E., Honda, G., Sezik, E., Tabata, M., Goto, K. and Ikeshiro, Y. (1993). Traditional Medicine in Turkey IV. Folk Medicine in the Mediterranean Subdivision, *J. Ethnopharm.*, 39: 31-38.

Accepted : 1.11.2002