ANATOMICAL STUDIES OF MENTHA MOZAFFARIANII (LABIATAE) AND A RELATED SPECIES

D. Azizian


The leaf and stem anatomy of Mentha mozaffarianii was studied and compared with M. longifolia which differs from it morphological characters. Although the two species have many anatomical characters common within the genus Mentha they differ in several aspects of leaf anatomy such as trichomes and stem characters.

Dina Azizian, Department of Biology, Shahid Beheshti University, Tehran, Iran.

M. longifolia و Mentha mozaffarianii مطالعات تشريحي‌گونه‌هاي

دينا عزيزيان

گونه Mentha mozaffarianii Jamzad که اخیراً از جنوب ايران (بندرعباس) جمع‌آوری و به عنوان گونه جديد گزارش شده‌‌بود، از نظر آنتومي بررسی و با گونه M. longifolia (L.) Hudson که از نظر مورفولوژي متفاوت می‌باشد، مقایسه شد. نتایج حاصل از مطالعات تشريحي برگ و ساقه اين دو گونه را از يكديگر متمایز می‌نماید. خصوصيات آنتوميکي گونه M. mozaffarianii از جمله مروفیل برگ با يافته پارانشيم نرده‌ای فشرده در بيش از يك لایه كه تا انتهای پايه ادامه يافته است و وجود غلاف آندي اطراف رگبگه‌های فرعی همراه با خصوصيات ظاهری گياه، مشخصات گياهی گوزرفيت را نشان مي‌دهد.
INTRODUCTION

Despite the fairly intensive collecting that has taken place in various parts of Iran for many years, there are still some unknown species to describe such as *Mentha mozaffarianii* Jamzad. This was a new species from southern Iran, near Bandar Abbas, 40 km North of the Persian Gulf. According to Jamzad in 1987, *M. mozaffarianii* showed close affinities to *M. royleana* Benth. and differs from *M. longifolia* (L.) Hudson in various aspects of morphology. In this paper, anatomical investigation is made in collaboration with Mrs. Jamzad (1987) in order to discover; (a) whether *M. mozaffarianii* shows xeromorphic characteristics similar to some desert *Labiatae* (Bokhari & Hedge 1977) and (b) whether two mentioned species of *Mentha* could be distinguished by means of their leaf and stem anatomy.

Materials and Methods

Dried material was obtained from specimens in the herbarium of Research Institute of Forests & Rangelands (TARI), and the Herbarium of Shahid Beheshti University. Recently fresh material was kindly collected by Jamzad (1994) and Zehzad (1995), from its natural habitat in Bandar Abbas for further studies. 3 specimens of each two following species were examined:

Hormozgan: Geno, protected region, 850 m. March 1995. Zehzad, s.n.

2. *Mentha longifolia* (L.) Hudson 

Dried herbarium material was revived by boiling in water, cooled and fixed in FAA for more than 24 hours and hand sections were taken from the stem and leaf lamina. Epidermal preparations were obtained by maceration using Jeffrey's solution (equal parts of 10% chromic acid and 10% nitric acid). Epidermal peels and sections were stained with Bismark Brown or safranin and fast green, then mounted in glycerin jelly. Light microscope fitted with a camera Lucida was used. All anatomical drawings and slides are deposited in the Biology Department of Shahid Beheshti
Observation

Leaf surface. Epidermis cellular of both surfaces are almost similar, but abaxial cells are smaller and more variable in shape and are covered with a well-developed cuticle. Stomata are often present on both surfaces, but more abundant on abaxial surface. Stomata are anomocytic and diacytic type in Mentha mozaaffarianii, but anomocytic in Mentha longifolia. (Fig. 1).

Trichomes. Various kinds of hairs are present on both surfaces of the two species. In M. mozaffarianii, trichomes are short and abundant, they may be 1-3 celled, simple non-glandular hairs and the glandular hairs are usually short stalked with 4-8 cells head. Glandular hairs are sunken and frequently on the abaxial surface, while adaxial surface is covered only with short non-glandular hairs. In M. longifolia, glandular hairs are similar to M. mozaffarianii with 1-8 cells head but non-glandular hairs are long, curly and have more than 4 cells with narrow sharp tips. (Fig 2, a-g).

Mesophyll. Mesophyll in both species is clearly differentiated into palisade and spongy parenchyma tissue. But in M. mozaaffarianii mesophyll of lamina has a well-developed palisade of 2-layers, and spongy mesophyll cells are in 2-4 layers, with parenchymatous bundle sheath on small veins.

Midrib. Midrib is a single collateral bundle, having a group of collenchyma on the upper and lower side of vascular bundle in both species. (Fig. 3, B, D)

Stem. The stem in a transverse section is quadrangular similar to the other Mentha species. Epidermis covered of hairs the same as leaf surface in both species, there is a continuous ring of 2-3 layers of collenchyma below the epidermis, particularly distinct in the corner of M. longifolia. Pericyclic fiber occurs more or less in strands which are more developed opposite the angles in M. longifolia (Fig. 4, C-D). Vascularization of M. longifolia is different from M. mozaaffarianii, and there are four distinct vascular bundles around the homogenous pith, while it is a continuous cylinder of xylem and phloem in M. mozaaffarini with scattered pericyclic fiber. (Fig 4, A- B).

Discussion

Present study of M. mozaaffarianii and M.
Fig. 1. Epidermis in *Mentha mozafrariani* (upper) and *M. longifolia* (lower). -right: adaxial; left: abaxial (bar = 20 μm).
Fig. 2. Types of trichomes of *Mentha mozaffarianii* (a-d, bar=100 μm) and *M. longifolia* (e-g, bar= 20 μm).
Fig. 3. Leaf t. s. of *Mentha mozaffarianii* (A-B) and *M. longifolia* (C-D). -A. Part of leaf showing bundle sheath around small vein (x 320). -B. Midrib with collenchyma on the upper and lower sides of vascular bundle (x 200). -C. Trichomes on both sides of lamina (x 100). -D. Midrib and mesophyll (x 100).
Fig. 4. A-B, *Mentha mozaffarianii*. -A, t. s. of quadrangular stem (x 40). -B. Thick cuticle with glandular and non-glandular hairs (x 320). -C-D. *Mentha longifolia*. -C. t. s. of quadrangular stem covered with long hairs (x 40). -D. Collenchyma in the corner and subepidermal collenchyma in 2-3 layers (x 320).
longifolia showed that the two species have many characteristic features in the family Labiatae as described by Metcalfe & Chalk (1950).

Anatomically, M. mozaffarianii has several notable features which distinguish it from the related species M. longifolia, and showed several xeromorphic characters. These characters include the type of trichomes, the presence of parenchymatous bundle sheath on small veins and mesophyll of lamina with well-developed palisade in 2-layers (Fig 3, A- B). In both species there are also well-developed patch of collenchyma on the upper and lower side of the midrib.

The differences between the leaf anatomy of M. mozaffarianii and M. longifolia are striking in view of variation in vegetative morphology. M. mozaffarianii possess a number of xeromorphic feature such as small leaves with dense trichomes. The reduction of the external surface is often accompanied by certain changes in the internal structure as emphasized on some North African species of Salvia (Bokhari & Hedge 1977) and Brazilian species of Eriope and Hyptis (Rudall 1979, 1986).

Stomata of two kinds present anomocytic and diacytic in M. mozaffarianii, and only anomocytic stomata in M. longifolia, as recorded in other genera of Labiatae by Inamdar & Bhatt (1972).

Another striking feature which distinguishes M. mozaffarianii from M. longifolia is the type of trichomes. Glandular hairs short-stalked, sometimes very large, nonglandular hairs unbranched 1-2 cells long present in M. mozaffarianii. While large multicellular hairs with up to 4 cells long present on both sides of M. longifolia.

Two species have also a characteristic stem anatomy. In M. longifolia there is an interrupted phloem around the xylem cylinder with a characteristic continuous subepidermis ring of collenchyma while in M. mozaffarianii phloem and xylem form a continuous cylinder around the homogynous pith, with scattered precyclic fiber around the phloem.

Acknowledgments

I would like to thank Mrs. Z. Jamzad for suggesting the investigation of this anatomical study. I am grateful to Mr. B. Zehzad (Herbarium of Shahid Beheshti University) for access to his collection of
herbarium material and for supplying fresh material as well, and also to N. Keshavarz, A. Sonboli and J. Kasaian for their technical assistance.

References


