J. Fac. Pharm. Ankara / Ankara Ecz. Fak. Derg., 47(3): 1053-1057, 2023
Doi: 10.33483/jfpau.1340128

ORIGINAL ARTICLE / ÖZGÜN MAKALE

ANATOMY OF THE ENDEMIC *ALYSSUM PATERI* SUBSP. *PATERI*

ENDEMİK ALYSSUM PATERI SUBSP. PATERI'NİN ANATOMİSİ

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ABSTRACT

Objective: *Alyssum pateri Nyár. subsp. pateri is an endemic plant known as "kanatlı kevke" in Türkiye. The plant is perennial and in semi-shrub form. The plant is traditionally used externally in the treatment of rheumatism in Bingöl (Türkiye). Microscopic analysis of the anatomical structures of plants can provide useful information for taxonomic classification. Light microscopy analysis is a widely used and effective method for the identification of medicinal plants. In this study, the anatomical features of the A. pateri subsp. pateri were examined.*

Material and Method: *The plant material was collected from Ankara (Türkiye). The samples were protected in 70% alcohol. The cross and surface sections were cut by hand with a razor blade into microscopic preparation form. A Leica DM 4000B microscope was used for anatomical analysis and micro photographs.*

Result and Discussion: *The anatomical characters of the leaf, petiole and stem of the Alyssum pateri subsp. pateri were revealed. The leaf is dorsiventral and contains 1-2 rows of palisade parenchyma. Cruciferous stomata and stellate hairs are located on the lower epidermis. The petiole cross-section is sulcate and stellate hairs are observed in the epidermal layer. The main vein is arc-shaped and is accompanied by lateral veins. The stem is disc-shaped. Stem epidermis contains stellate hairs. The interfascicular tissue between the xylem strands of the vascular bundles is composed lignified cells. Vascular bundles are surrounded by a pericyclic sclerenchymatous cap.*

Keywords: *Alyssum pateri subsp. pateri, Brassicaceae, medicinal plants, pharmaceutical botany, plant anatomy*

ÖZ

Amaç: *Alyssum pateri Nyár. subsp. pateri Türkiye'de "kanatlı kevke" olarak bilinen endemik bir bitkidir. Bitki çok yıllık ve yarı çalı formundadır. Bitki geleneksel olarak Bingöl (Türkiye)'de romatizma tedavisinde haricen kullanılmaktadır. Bitkilerin anatomik yapılarının mikroskobik analizi, taksonomik sınıflandırma için yararlı bilgiler sağlayabilir. Işık mikroskobu analizi, tıbbi*

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Submitted / Gönderilme : 09.08.2023
Accepted / Kabul : 05.09.2023
Published / Yayınlanma : 20.09.2023

bitkilerin tanımlanmasında yaygın olarak kullanılan ve etkili bir yöntemdir. Bu çalışmada A. pateri subsp. pateri'nin anatomik yapıları incelenmiştir.
Gereç ve Yöntem: *Bitki materyali Ankara (Türkiye)'dan toplandı. Numuneler %70 alkol içinde korunmuştur. Enine ve yüzey kesitleri jilet yardımıyla elle kesilerek mikroskobik preparat formuna getirildi. Anatomik analiz ve mikro fotoğraflar için Leica DM 4000B mikroskop kullanıldı.*
Sonuç ve Tartışma: *Alyssum pateri subsp. pateri'nin yaprak, yaprak sapı ve gövdesinin anatomik karakterleri ortaya konulmuştur. Yaprak dorsiventraldir ve 1-2 sıra palizat parankiması içerir. Crucifer tip stomalar ve stellat tüyler alt epidermiste bulunur. Yaprak sapının enine kesiti sulkattır ve epidermal tabakada stellat tüyler görülür. Ana damar yay şeklindedir ve buna yan damarlar eşlik eder. Gövde disk şeklindedir. Gövde epidermisi stellat tüyler içerir. İletim demetlerinin ksilem şeritleri arasındaki interfasiküler doku odunlaşmış hücrelerden oluşur. İletim demetleri, perisiklik bir sklerenkimatik başlık ile sarılıdır.*
Anahtar Kelimeler: *Alyssum pateri subsp. pateri, bitki anatomisi, Brassicaceae, farmasötik botanik, tıbbi bitkiler*

INTRODUCTION

Brassicaceae Burnett consists of herbaceous and rarely small shrubs with 346 accepted genera in the world. The leaves are alternate, rarely opposite and without stipule. The flowers are usually hermaphrodite and hypogynous. Sepals and petals 4 and free. Stamens are usually 6 and tetradynamous. Ovary is syncarpous and fruit is a capsule. The *Alyssum* L. has a wide native range from North Africa to temperate Eurasia. The genus contains 113 species worldwide, annual, biennial or perennial plants. The Genus is characterized by stellate indumentum and simple, entire leaves. The petals are yellow or sometimes whitish [1-2]. Many members of the Brassicaceae contain mustard oil glycosides, and the seeds often contain mucilage and fixed oil [3]. The family plants show antimicrobial, anticancer, antimutagenic, anti-inflammatory, neuroprotective and antioxidant activities [4].

Alyssum pateri Nyár. subsp. *pateri* is an endemic plant known as "*kanatlı kevke*" in Türkiye [5]. The plant is perennial and in semi-shrub form. Leaves are obovate or oblanceolate. Petals bright yellow, fruits with stellate hairs and seeds narrowly winged [1]. In recent studies, the taxonomic update of *A. pateri* has been made and "*Alyssum pateri* Nyár." is used as a synonym for "*Odontarrhena pateri* (Nyár.) Španiel, Al-Shehbaz, D.A.German & Marhold". The plant is traditionally used externally in the treatment of rheumatism in Bingöl (Türkiye) [6].

Türkiye is one of the richest countries in the world in terms of plant diversity, and 30% of its approximately 10.500 plant species are endemic [7]. This extraordinarily rich vegetation has traditionally developed a folk medicine culture in the society [6-7]. The majority of the people living in rural areas traditionally use plants in the treatment of diseases. As in other countries of the world, plants traditionally used for therapeutic purposes in recent years attract the attention of researchers [6,8]. It is very important to fully identify the plants that are candidates for herbal medicine and continue to be used in traditional folk medicine. Microscopic analysis of the anatomical structures of plants can provide useful information for taxonomic classification. Light microscope analysis is a widely used and effective method for the identification of medicinal plants [9-12].

In this study, the anatomical features of the *Alyssum pateri* Nyár. subsp. *pateri* were examined with a light microscope and micro-photographs were taken. The results obtained are important in the long term due to the increasing demand for herbal medicines.

MATERIAL AND METHOD

The plant material was collected from Ankara (Türkiye) (*mh23005*) (Figure 1). The samples were protected in 70% alcohol. The cross and surface sections were cut by hand with a razor blade into microscopic preparation form. The Sartur solution [13] was used in microscopic examinations. A Leica DM 4000B microscope was used for anatomical analysis and micro photographs.

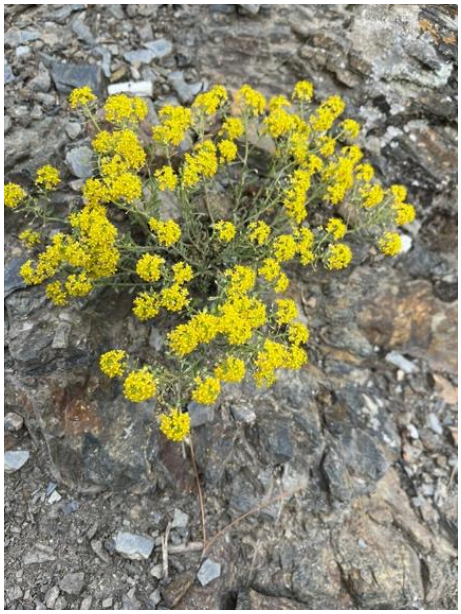

Figure 1. *Alyssum pateri* subsp. *pateri*

RESULT AND DISCUSSION

Leaf

The leaf is dorsiventral. The upper epidermis is composed of square-rectangular cells. The lower epidermis cells are square, sometimes oval, and smaller than the upper epidermis cells. The mesophyll consists of 1-2 rows of palisade parenchyma and 4-7 rows of spongy parenchyma. The bundle sheath surrounds the vascular bundles. The stomata and hairs are found only on the lower surface. The stomata are cruciferous, surrounded by 3 subsidiary cells and the hairs are stellate (Figure 2).

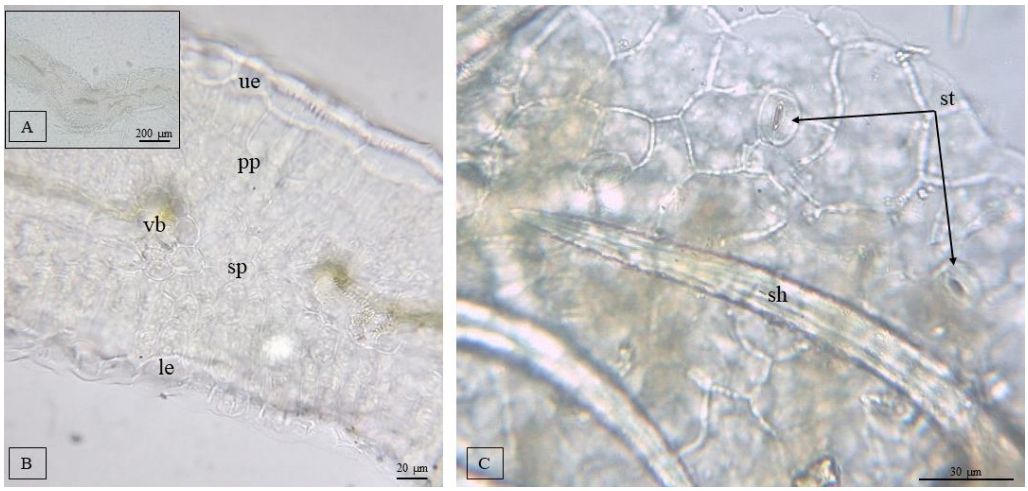

Figure 2. Leaf anatomical features (A: general view, B: lamina cross-section, C: lamina lower surface-section); le: lower epidermis, pp: palisade parenchyma, sh: stellate hair, sp: spongy parenchyma, st: stomata, ue: upper epidermis, vb: vascular bundle

Petiole

The cross-section of the petiole is sulcate and the abaxial side is protruding. The epidermal cells of the adaxial side are oval shaped, and the cells of the abaxial side are square and smaller. The petiole has a main vein and is arc-shaped. Also, lateral veins are also present. The main vein embedded in thin-walled, oval parenchymatous cells is clearly surrounded by bundle sheath. Numerous stellate hairs are found on the epidermal layer of the petiole (Figure 3).

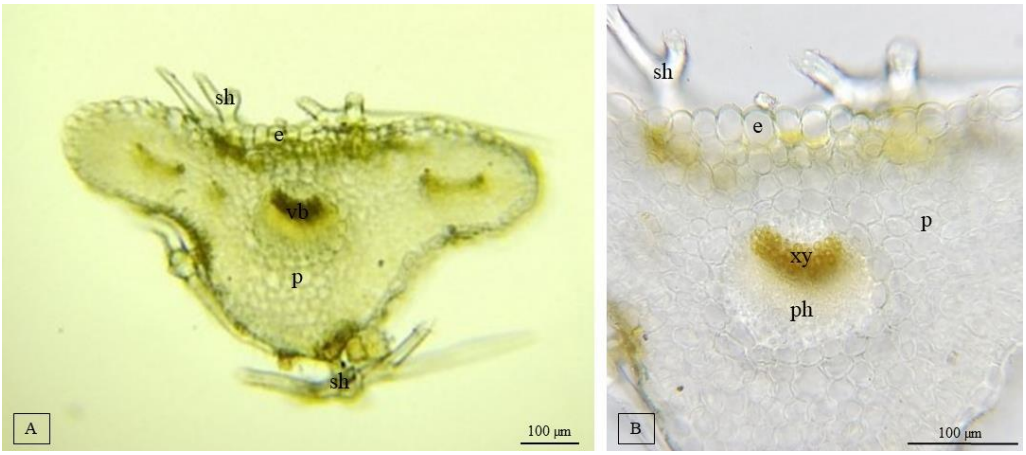

Figure 3. Petiole anatomical features (A: general view, B: detailed view); e: epidermis, p: parenchyma, ph: phloem, sh: stellate hair, vb: vascular bundle, xy: xylem

Stem

The stem cross-section is disc-shaped. The epidermis layer consists of a single row of epidermal cells and covered with stellate hairs. The cortex parenchyma cells are in 8-10 rows. The endodermis consists of a single row of regularly arranged cells. The interfascicular tissue between the xylem strands of the vascular bundles is composed lignified cells. Vascular bundles are surrounded by a pericyclic sclerenchymatous cap. The pith is composed of thin-walled parenchymatous cells with large intercellular spaces (Figure 4).

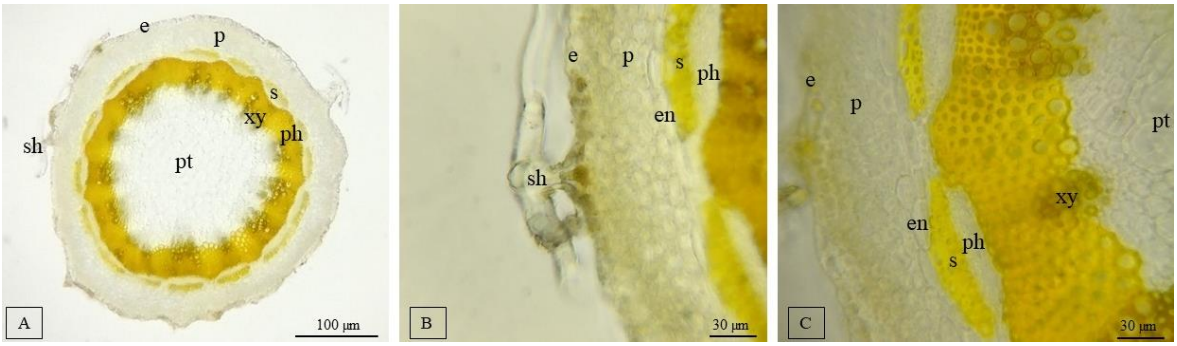

Figure 4. Stem cross-section (A: general view, B-C: detailed view); e: epidermis, en: endodermis, sh: stellate hair, p: cortex parenchyma, ph: phloem, pt: pith, s: sclerenchyma, xy: xylem

In previous studies on the anatomical structures of the family, it has been reported that the leaves are monofacial or bifacial, the palisade parenchyma has 1-3 rows, different forms of cover hairs, cruciferous type stomata and the stem contains a closed cylindrical xylem [14]. In this study, the anatomical characters of the leaf, petiole and stem of the *Alyssum pateri* subsp. *pateri* were revealed.

The leaf is dorsiventral and contains 1-2 rows of palisade parenchyma. Cruciferous stomata and stellate hairs are located in the lower epidermis. The petiole cross-section is sulcate and stellate hairs are observed on the epidermal layer. The main vein is arc-shaped and is accompanied by lateral veins. The stem is disc-shaped. Stem epidermis contains stellate hairs. The interfascicular tissue between the xylem strands of the vascular bundles is composed lignified cells. Vascular bundles are surrounded by a pericyclic sclerenchymatous cap.

ACKNOWLEDGEMENTS

Şeyda Yayla thanks the financial support from the Scientific and Technological Research Council of Türkiye (TUBITAK) under the BIDEB/2211-A Ph.D.

AUTHOR CONTRIBUTIONS

Concept: Ş.Y., M.M.H.; Design: Ş.Y., M.M.H.; Control: Ş.Y., M.M.H.; Sources: Ş.Y., M.M.H.; Materials: Ş.Y., M.M.H.; Data Collection and/or Processing: Ş.Y., M.M.H.; Analysis and/or Interpretation: Ş.Y., M.M.H.; Literature Review: Ş.Y., M.M.H.; Manuscript Writing: M.M.H.; Critical Review: M.M.H.; Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The authors declare that the ethics committee approval is not required for this study.

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