

Morphological and Anatomical Investigations on Rare Endemic *Aethionema turcicum* (Brassicaceae)

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ABSTRACT

In this study, Macromorphological, micromorphological and anatomical properties of *Aethionema turcicum* which belongs to Brassicaceae were presented. In macromorphological studies, obtained data from the measures of vegetative and generative organs such as stem, leaf, flower and fruits were used for improve the description of taxon. In micromorphological investigations, fruit ornamentation of studied species is identifies as scabrous. Also the micromorphological seed characteristics are determinated as important features for discrimination of taxa. In anatomical studies, the structural characteristics of the cross sections of root, stem and leaf of species was identified.

Keywords: *Aethionema turcicum*, Anatomy, Micromorphology, Morphology

INTRODUCTION

Most members of the Brassicaceae family exist in the northern temperate zone. It is represented by approximately 3700 species belonging to more than 338 genera in the world. In our country, there are 88 genus and 539 species (210 endemic species) in the Brassicaceae family (Erik & Tarıkahya 2004). There are 43 taxa belonging to 40 species in the genus *Aethionema* R. Br. (kayagülü) which have high endemism rate in this family. 20 of them are endemic. Endemism rate of the genus is 50% (Davis 1965-1985, Davis et al. 1988, Ertuğrul 2012). *Aethionema* is one of the most difficult taxonomic genus of the Brassicaceae family in Turkey. Most of the herbarium materials could not be identified because the majority of the species required fruit and flowering material for identification (Hedge 1965). Difficulties in the identification of the genus have limited the studies on the genus. The Turkish kayagülü (*Aethionema turcicum*) were discovered in 1990. It is known from two weak populations from Polatlı and Ayaş regions. It is an endemic species at the border of extinction. Turkish kayagülü is a perennial herbaceous plant that can grow up to 40 cm, has radially branched, can withstand erosion, and has a thick and firm root, pink flowers. Flowers in May. This species is also intermittently represented by a small number of individuals in gypsum soils at Polatlı-Acıkır locality (Eker et al. 2015, Atçeken et al. 2016).

In the literature studies Atçeken et al. (2016) the macromorphological, micromorphological, anatomical and palynological properties of some *Aethionema* species (*Ae. arabicum*, *Ae. cordatum*, *Ae. armenum* and *Ae. karamanicum*) which belong to Brassicaceae family were exhibited. Eker et al. (2015) in the study titled “The vascular plant diversity and taxa of Ankara (Turkey) which has priority for conservation” *Aethionema turcicum* was included as IUCN code CR (Endemic) from conservation priority taxa in Ankara. In this study, morphological and anatomical features of *Aethionema turcicum* H.Duman & Aytaç were investigated and description of the species was developed. We believe that the data put forward will shed light on future scientific studies.

MATERIALS AND METHODS

Plant material collected from natural population: B3 Eskişehir, Sivrihisar, Balıkdamı, step fields, 1120 m, 27.05.2018 (Fig. 1a-c).

In order to ensure a systematic study of the material obtained, herbarium samples were prepared and these samples were protected as herbarium samples at the Eskişehir Osmangazi University Herbarium (OUFE). Fresh plant samples were used for morphological measurements. For the anatomical study; the root, stem and leaves were fixed in 70% alcohol and then kept in the same solution until the acquisition of cross-sections. We also obtained lower and upper cross-sections from the fresh materials. From the Herbarium sample, the species' detailed morphological characteristics were established for the designated species. For the anatomical investigations, samples were taken from the alcohol by hand and scalpel. Anatomical sections of the plants were taken from its root, stem and leaves. The Prior marker was investigated under light microscope and microscope photographs were taken with a Spot In-SIGHT Colour Digital camera and an Olympus type microscope. A variety of foundation anatomical books and conducted studies were used as sources for identification of the plants (Esau 1967, Fahn 1982, Metcalfe & Chalk 1983, Yentür 1995).

RESULTS AND DISCUSSION

During anatomic observations of transverse cross-sections of the upper root, it can be seen from the composition of the cortex structure and rhizoderm that secondary growth is a result of the plant's long-existence. This point has been stressed in literature related to the subject. The plant profits in terms of protection, durability, and resistance against external effects from the ring-shaped vascular bundles of the surrounding scleranchyma. The character of the element xylem along with their fullness, make up the lignified cell wall. This event is the result of the development of secondary growth (Fig. 2). In the stem; under the epidermis are 5-6 cortex cells layers, and below these in the 2-3 layers of the dense cell wall are situated in the chloranchyma (Fig. 3). It is important for the plant that there is the existence of chloranchyma as a typical response to the photosynthetic property of the stem. In this way, the effect of photosynthesis on the leaf and also the stem is increased. After the chloranchyma, a layer of bulk cells and a ring shaped starch sheath are situated. The root of the starch sheath constructs a homologue endodermis and encompasses the surrounding vascular system like a belt. Beneath the starch sheaf, schlerancymatic cell clusters can be seen in patches. In the stems of the species studied, mechanisms for resistance and support against external effects are available. Hardly any selective phloem can be found between the schlerancymatic cell clusters and the xylem. Forming the xylem are trache, tracheids, and the parenchyma and between these, in the insular space, there are scattered scleranchyma clusters. Here in the scleranchyma, support against external effects to the stem is supplied. In the pith, covering a wide area, is situated the parencymatic cells (Fig. 3).

In the leaf anatomy, there is an external dense cuticle, and on the underside of this is a layer of epidermis. The dense cuticle of the epidermis is positioned alongside the plant's water loss management and this condition is a characteristic peculiar to xerophytic plants. Epidermis cells can be observed at different sizes with larger epidermis cells occurring on the underside. The contour of the palisade and spongy parenchyma cells cannot easily be distinguished in the mesophyll tissue. The leaves are bifacial. There are amaryllis and anisocytic type stomas on both surfaces of the leaf. Thus, the leaf is amphistomatic. In the transportation bunch of the central vein, 1-2 cell levels occur on the outside of the phloem above the xylem, and the interior of the xylem covers a wider space. 1-2 layers of schlerancymatic cells can be seen in the xylem, as well as under the parencymatic cells. The bundle encloses a control from the parencymatic cells (Fig. 4) (Fahn 1982, Metcalfe & Chalk 1983, Yentür 1995).

We believe that the important results concluded from the study of anatomy and morphology will lead to a better understanding of the species and provide a contribution to any future studies.



Fig. 1. a) General appearance of *Aethionema turcicum*; b) Dissection of Flower; c) Fruit

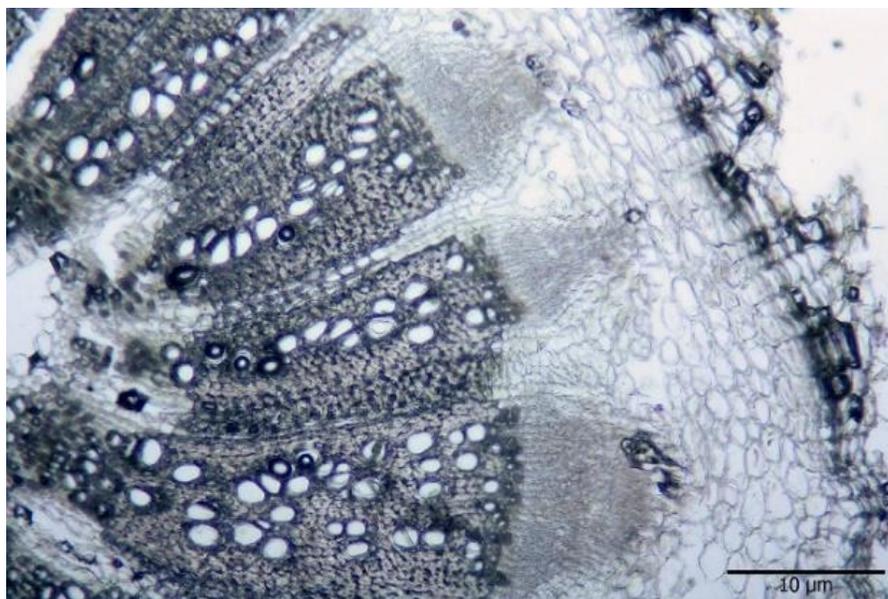


Fig. 2. Root transverse section of *Aethionema turcicum*

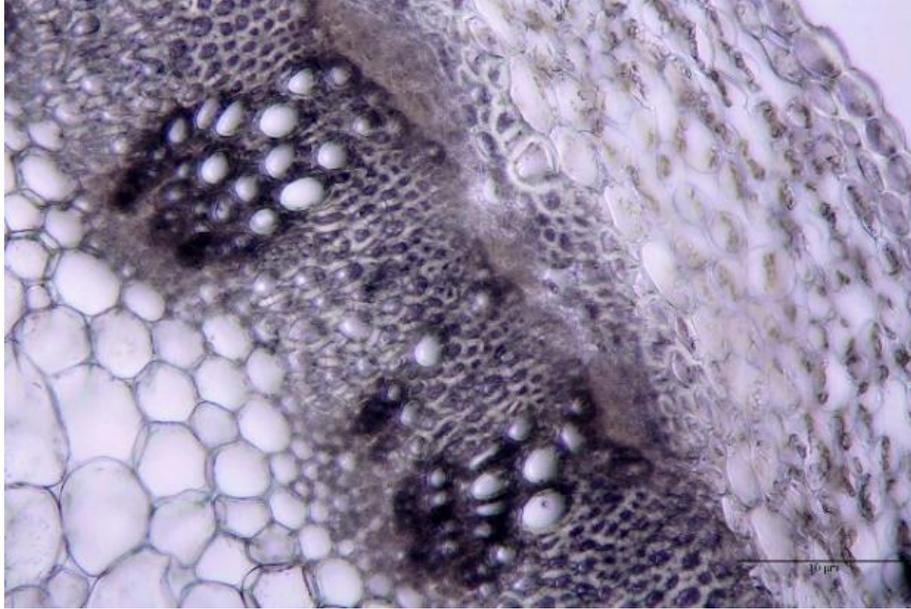


Fig. 3. Stem transverse section of *Aethionema turcicum*

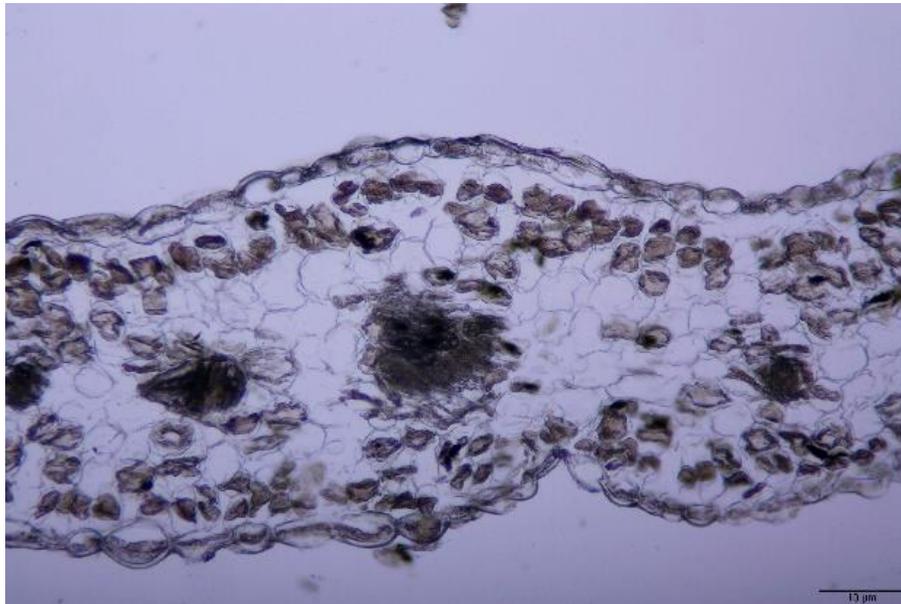


Fig. 4. Leaf transverse section of *Aethionema turcicum*

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