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Anatomy and Pollen Morphology of *Eranthis hyemalis* (L.) Salisb.

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Abstract
In this study, anatomical and polynological features of *Eranthis hyemalis* (L.) Salisb. were investigated. For palynological analysis of plant materials, pollen preparations of each taxon were prepared for light microscopy research according to the Wodehouse and Erdtman methods and measurement of the morphological characters of pollen were carried out. For anatomical investigation, transverse sections of root, stem and leaf have been taken from *E. hyemalis* by scapel. All sections examined by light microscope. In the cross sections of the root, the pith was completely covered by xylem cells. In contrast to this, the pith of the stems is hollow. Leaves have amaryllis type of stomata. They are mesomorphic. The results of the light microscope investigation revealed that the pollen grains of *E. hyemalis* are tricolpate and exine scabrate. We believe that findings of this study will make contributions to the biodiversity and taxonomy in future.
Keywords: *Eranthis hyemalis* (L.) Salisb. (Ranunculaceae), Anatomy, Pollen Morphology.

INTRODUCTION

Ranunculaceae, the buttercup family (order Ranunculales), comprising about 2.252 species in 62 genera of flowering plants, mostly herbs, which are widely distributed in all temperate and subtropical regions. In the tropics they occur mostly at high elevations.

Eranthis (winter aconite) is a genus of flowering plants in the buttercup family Ranunculaceae, native to southern Europe and east across Asia to Japan. The common name comes from the early flowering time and the resemblance of the leaves to those of the related genus *Aconitum*, the true aconite. This genus has 9 species native to Europe and Asia, but in Turkey it is represented only by *Eranthis hyemalis* (L.) Salisb. (winter aconite). In this study, morpho-anatomical and polynological features of *Eranthis hyemalis* (L.) Salisb. were investigated. We believe that findings of this study will make contributions to the biodiversity and taxonomy in future.

MATERIALS and METHODS

The specimens were collected from Antalya province. In order to ensure a systematic study of the material, herbarium samples were prepared and kept as voucher specimens at the Eskişehir Osmangazi University Herbarium. For the anatomical study; specimens of plant were fixed in 70% alcohol. From the Herbarium sample, the detailed morphological characteristics of the species were established. For the anatomical investigations, samples were taken from alcohol by hand and scalpel. Anatomical sections of the plants were taken from its root, stem and leaves. The photograph dimensions were 100 µm (Metcalfe and Chalk 1950, Esau 1967, Fahn 1967, Yentür 1995).

Polen samples were obtained from dried flower specimens from Eskişehir Osmangazi University Science and Art Faculty Department of Biology Herbarium (OUFE). At the palynological study, pollens of 10-15 different herb's flowers were used for each specimen which were taken from different areas. The pollen morphology of taxa was investigated using light microscopy. Faegri and Iversen's terminology for the names of the exine layers was used (Faegri and Iversen 1975). In the light microscope investigation, the pollen grains acquired from the samples were obtained using the preparation method described by Wodehouse (1935) and Erdtman (1969). Identifications and counts at 10x and 40x plan objectives were used; for the purpose of identification, a 100x plan oil-immersion objective was used. Pollen identifications and counts were obtained by Prior binocular microscope. The spacing between each ocular micrometer was 0.98 µm. According to Wodehouse's (1935) and Erdtman's (1969) methods, the exine ansd intine thickness of the taxa was measured. Terminologies for pollen morphology were used (Wodehouse 1935, Pokrovskaia 1958, Kuprianova 1967, Erdtman 1966, Erdtman 1969, Faegri and Iversen 1975).

RESULTS

1. Anatomical Investigations

1.1. Root transverse section of *Eranthis hymalis*

There is a peridem layer on the outer surface of the root. Its cells are crushed, broken up and sometimes worn out. Parenchymatous cortex is present under the periderma. The breadth of its cells is equal the length. These cells have regular layers. Endoderm is located at the end of cortex layer. Phloem occupies a narrow area between scleranchyma bundles and xylem. Cambium cells and phloem are distinguishable with each other. In contrast to the stem, any parenchymatous pith region doesn't found in root sections (Fig. 1).

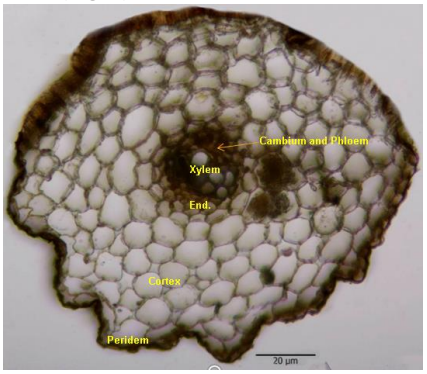

Figure 1. Root transverse section of *Eranthis hymalis*

1.2. Stem transverse section of *Eranthis hymalis*

A large amount of blanketing and secreting down erupt from the epidermis. Epidermal cells are surrounded by a thin and slightly undulated cuticle. Cortex is much layered and parenchymatous. Cells of the cortex are ovoid. Any collenchymatous tissue doesn't found in here excep the vascular bundles. There is a thick sclerenchymatous sheath on the phloem tissue which occupies a wide region. Cambium is not distinguishable and parencymatic pith is crushed (Fig. 2).

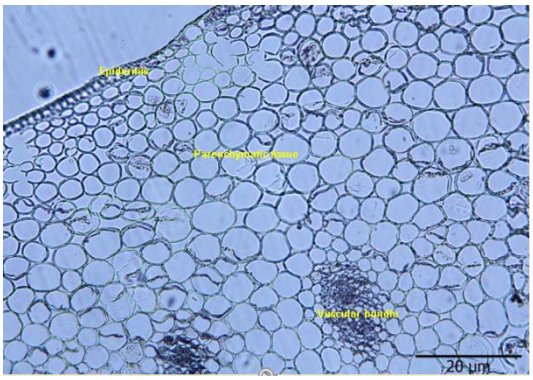

Figure 2. Stem transverse section of *Eranthis hymalis*

1.3. Leaf transverse section of *Eranthis hymalis*

Sections revealed the bifacial anatomical structure of the leaf lamina, delimited by an upper epidermis and a lower one. Under the upper epidermis, one layered palisade parenchyma was found and aerencyhma was located under palisade. Vascular bundles were collateral and closed, xylem situated towards the upper epidermis and phloem situated towards the lower epidermis. Vascular bundles were protected by 2 sclerenchyma arches (Fig. 3).

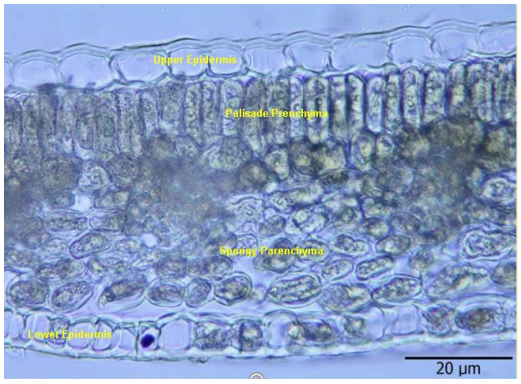

Figure 3. Stem transverse section of *Eranthis hymalis*

2. Palynological Investigations

Pollen grains of *Eranthis hymalis* are identified as tricolpate and their exine structure is scabrate (Fig. 4). According to the literatures, aperture features and exine structure are essential criteria for determination the phylogenetic relationships between taxa (Kuprinova, 1967; Cronquist, 1968; Walker, 1974a-b; Takhtajan, 1980). Except variational ones, All morphological differences are directly related with genetic differences as be in the pollen grains of related taxa (Cronquist, 1968).

In addition to the systematic features of taxa, morphological features of pollen grains should be important distinctive characters. We believe that, this study will bring light into phylogenetic relationship between investigated taxa.

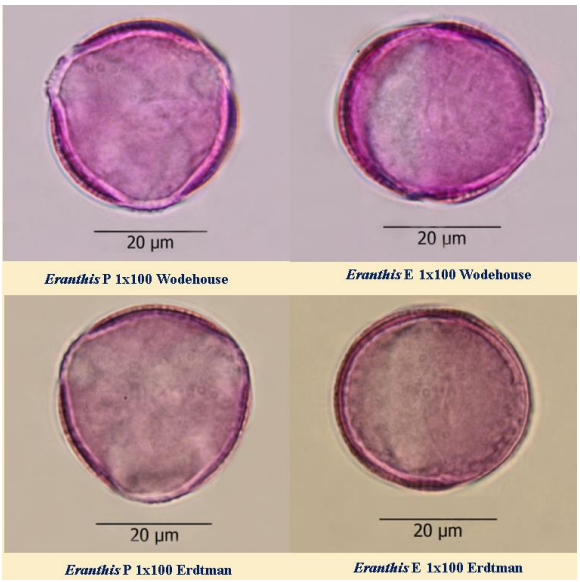

Figure 4. Pollen grains of *Eranthis hymalis*

REFERENCES

[1.] Cronquist A. 1968. *The evolution and classification of the flowering plants*. Thomas Nelson Ltd. Edinburgh, London.

[2.] Esau, K. 1967. Plant Anatomy. John Willey & Sons, Inc., New York.

[3.] Erdtman, G., 1966. Pollen Morphology and Plant Taxonomy, Angiospermae, Hafner, New York.

[4.] Erdtman, G., 1969. Handbook of Palynology Morphology, Taxonomy, Ecology. An Introduction to the Study of Pollen Grains and Spores. Hafner Pub. New York.

[5.] Fahn, A. 1967. Plant Anatomy. Pergamon Press., New York.

[6.] Faegri, K. and Iversen, J. 1975. Textbook of pollen analysis. 3rd edition. Munksgaard, Copenhagen.

[7.] Kuprianova A. 1967. Apertures of pollen grains and their evolution in Angiosperms. Paleobot. *Playnology*, 3: 73-80.

[8.] Metcalfe, C.R., & Chalk, L., 1950. *Anatomy of the Dicotyledons*. At The Clarendon Press, Oxford; London.

[9.] Pokrovskaia I.M. 1958. Analyse pollinique, Publie avec l'aide du Centre National de la Recherche Scientifique, Moscou, Numero 24:398-431.

[10.]Takhtajan, A.L., 1980. Outline of the classification of flowering plants (Magnoliophyta). Botanical Review, 46: 225-359.

[11.]Walker, J.W., 1974a. Evolution of exine structure in the pollen of primitive Angiosperms. American Journal of Botany, 61: 891-902.

[12.]Walker, J.W., 1974b. Aperture Evolution in the pollen of primitive Angiosperms. American Journal of Botany, 61: 1112-1137.

[13.]Wodehouse R.P., 1935. Pollen grains. Mc Grew Hill, New York.

[14.]Yentür, S. 1995. Bitki Anatomisi. İst. Üniv. Yay. No. 3803. İstanbul.