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Research Article

COMPARATIVE POLLEN MORPHOLOGY OF TWO *LONICERA* TAXA GROWING ON MEŞELİK CAMPUS IN ESKİŞEHİR

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ABSTRACT. In this study, pollen morphology of two *Lonicera* taxa grown in Eskişehir Meşelik campus was investigated comparatively. *Lonicera* pollen grains are triocolporate type and prolate-spheroidal shaped. As a result of microscopic examinations, the distinctions between taxa were revealed statistically. While the structure is tectatae in both taxa, the skulp is echinulate in *L. etrusca*; *L. implexa* shows echinate ornamentation.

Keywords: *Lonicera* ssp*., pollen morphology, Meşelik Campus, Eskişehir, Turkey*

INTRODUCTION

Pollen morphology makes an important contribution to modern systematic and phylogenetic studies on the differentiation of systematic groups. As a matter of fact, pollen morphology and cytology are widely used in today's accepted classification systems in plants.

The classification of pollen, which is essential in taxonomic studies, is made according to their shape, structure and exine ornamentation. In this respect, the structure of the exine membrane forming the outer part of the pollen and the shapes seen in this structure are especially important taxonomic characters for classification of plants.

In recent years, evolutionary processes have been tried to be revealed by modern taxonomic studies, where the results obtained from phylogeny are applied to systematic studies. Detailed palynological studies on pollen have revealed that their pollen evolves just like other parts of plants. Today, intensive pollen researches are carried out in many countries and their collections are prepared and compared with pollen types in past geological periods [1, 2, 3].

In addition to all these studies, in recent years, palynological studies with electron microscopy have made a great contribution to the definitive distinction of plant species in terms of taxonomics and phylogenetic relationships have been clarified. By using electron microscopy, the structure of the exine and intin layers of pollen were examined in detail, so that it was possible to distinguish at the level of variety, race and even population.

Investigation of the differences in the size, detailed structural characters and ornamentation of all pollen grains are used as a very useful tools in terms of distinguishing different varieties and types. For example, the exine membrane surface structure is used today to distinguish species and even genotypes [4, 5, 6].

Palynological studies help to reveal new taxonomic plant groups. By using the morphological features of pollen and the differences of these features between taxonomic groups, plant identification keys based on clear and invariant characters can be generated. With the determination of atmospheric pollen, it is possible to easily identify and classify various plant species in forests or in various habitats.

In addition, palynomorphological studies help to distinguish between natural and cultivated plant hybrids. Moreover, it gives important clues about the evolution of plants. Today, palynomorphological data is one of the important references of taxonomy in investigating the phylogenetic relationships of plants [7, 8].

In this study carried out in Eskişehir Meşelik Campus, the palynomorphological characteristics of two *Lonicera* species were determined. This study aims to create a reference by obtaining data from this study for future taxonomic researches on *Lonicera* taxa.

MATERIALS AND METHODS

The study material consists of pollens of *Lonicera* species grown in Eskişehir Meşelik Campus between 2020-2021 (Fig. 1). The plant sampling process was carried out during the spring months in the 2020-2021 period. Pollen samples collected from newly opened flowers for palynological studies were labeled and stored in paper envelopes.

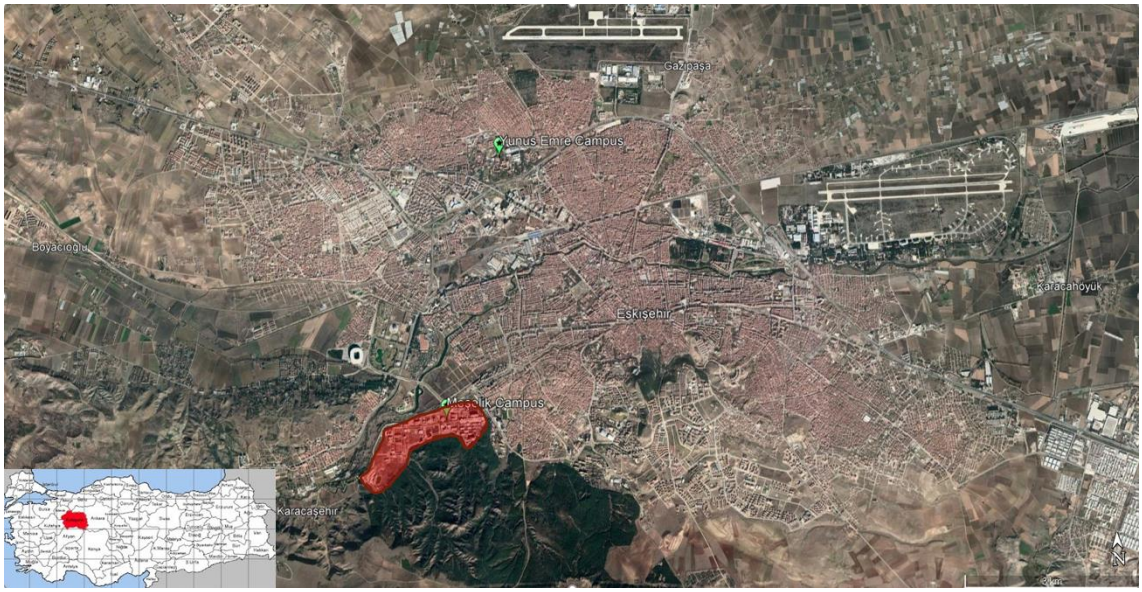

Fig. 1. *Location of Meşelik Campus in Eskişehir/Turkey*

Pollen samples were taken from *Lonicera* taxa grown in Eskişehir Meşelik Campus. In palynological studies, pollens obtained from flowers of 10-15 different plants for each *Lonicera* taxa were used. During the collection of plants, samples belonging to the studied taxa were placed separately in paper envelopes to prevent the mixing of different pollens. In our study, the pollen morphology of taxa were examined by light microscopy. The terminology of Faegri and Iversen has been used in naming the exine layers [9].

The examination of current pollens under the light microscope was done by Wodehouse (1935) and fossilized pollens by Erdtman (1969) methods [10, 11]. Morphological examination of the pollens was done under Nikon binocular microscope

by oil immersion lens (x100). All parameters were measured 50 times to determine the averaged values. Standard deviation and variations have been calculated. Each range in the ocular micrometer is 0.98 µm. Microphotographs were taken with a Nikon 80i type microscope and a KAMERAM Digital camera in the Eskişehir Osmangazi University, Faculty of Arts and Science, Department of Biology. The magnification of the photos is x 1000. For Scanning electron microscopy (SEM) examinations, unacetholyzed pollen grains were placed on the fixing plate and covered with gold and examined under Jeol 5600 LV Scanning electron microscope (SEM) [12, 13].

Various basic palynological books and various studies have been used for the diagnosis of pollen [1, 9, 10, 11, 12, 13, 14, 15, 16].

RESULTS

Lonicera etrusca

Fig. 2. Lonicera etrusca a: *General view* ***b:*** *Flowers*

Species: *Lonicera etrusca* (Birleşik yapraklı hanımeli)
Pollen Type: Tricolporatae
Pollen Shape: Prolate**,** P/E= 0,98 µm (W); 0,85 µm (E)
Exine: Average thickness 1,28 µm (W); 1,01 µm (E)
Aperture: Margins of Colpi are distinct, short.
Structure: Tectatae
Sculpture: Echinulate

Table 1. *Morfometric Data of Lonicera etrusca*

	Wodehouse			Erdtman			
	M		S	M		S	
P	55,20	±	2,35	62,79	±	2,32	µm
E	33,76	±	3,18	56,82	±	3,48	µm
clg	37,14	±	3,25	55,72	±	3,10	µm
clt	24,28	±	2,47	13,85	±	1,38	µm
plg	12,33		2,11	12,22		1,42	µm
plt	12,48		1,66	13,88		1,44	µm
L	35,13	±	2,22	57,30	±	3,21	µm
t	-	±	-	13,98	±	1,55	µm
i	0,89	±	0,18	-		-	µm
Ex	1,28	±	0,28	1,01	±	0,00	µm

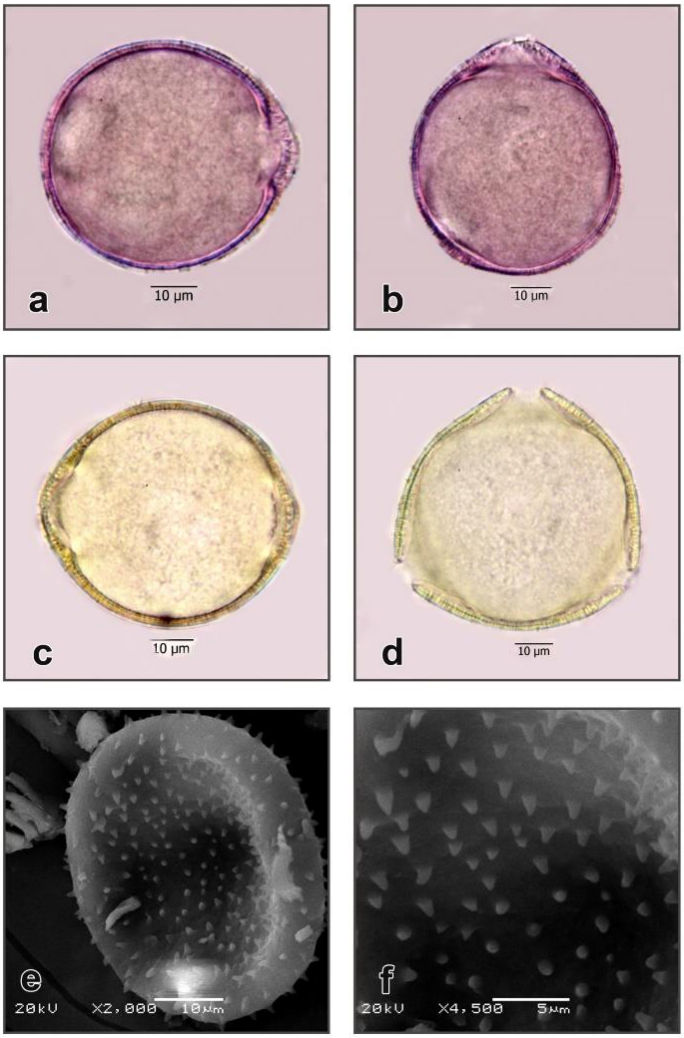

Fig. 3. *LM and SEM microphotograps of Lonicera etrusca (a. Equatorial (W), b. Polar (W), c. Equatorial (E), d. Polar (E), e. Equatorial (SEM), f. Exine ornamentation (SEM)).*

Lonicera implexa

Fig. 4. Lonicera implexa a: *General view* ***b:*** *Flowers*

Species: *Lonicera implexa* (Yerli hanımeli)
Pollen Type: Tricolporatae
Pollen Shape: Spheroidal**,** P/E= 1,08 µm (W); 0,89 µm (E)
Exine: Average thickness 1 µm (W); 0,88 µm (E) Thickening heterogeneous.
Aperture: Colpi short and wide; ends rounded.
Structure: Tectatae
Sculpture: Echinatae

Table 2. *Morfometric Data of Lonicera implexa*

	Wodehouse			Erdtman			
	M		S	M		S	
P	50,00	±	2,50	48,20	±	2,33	µm
E	44,28	±	3,25	46,80	±	2,38	µm
clg	43,78	±	3,45	38,40	±	2,24	µm
clt	7,12	±	1,68	6,72	±	1,34	µm
plg	14,32		1,98	8,42		0,89	µm
plt	8,14		1,22	6,88		0,91	µm
L	48,25	±	1,86	34,70	±	2,26	µm
t	8,36	±	1,72	6,18	±	0,76	µm
i	1,00	±	0,00	-		-	µm
Ex	1,00	±	0,00	0,88	±	0,16	µm

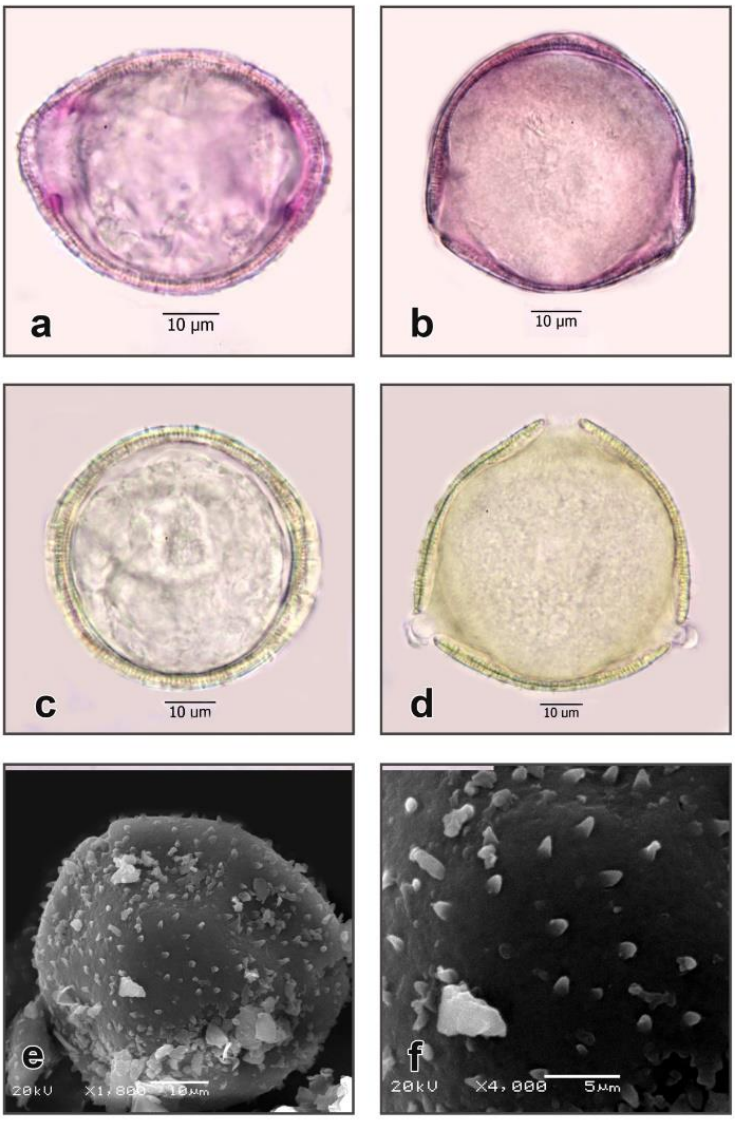

Fig. 5. *LM and SEM microphotograps of Lonicera implexa (a. Equatorial (W), b. Polar (W), c. Equatorial (E), d. Polar (E), e. Equatorial (SEM), f. Exine ornamentation (SEM)).*

DISCUSSION

Caprifoliaceae is a small family that includes species mostly found in the northern hemisphere. Shrubs or herbs. Leaves opposite; stipules absent or if present adnate to the petiole and usually small. Flowers paired, on long peduncles, or in cymes, heads or whorls, hermaphrodite, actinomorphic or zygomorphic. Sepals 5. Corolla gamopetalous, petals usually 5. Stamens usually 5, alternating with the petals, ovules 1-many in each loculus. Fruit (in Turkey) a drupe or few-seeded berry; seeds with fleshy endosperm. inserted on the corolla tube. Ovary inferior, 1-5-locular, placentation axile.

It is a family with no economic importance and some of its taxa are used for landscaping purposes. Taxa of Caprifoliaceae are usually flowering in spring and summer periods. They found in sunny places and temperate climates. They could be grown in any type of soil and can be produced by seed and cuttings. In landscaping, they can be used

as a landscape element in parks, gardens, roads, streets and avenues, individually or in groups. *Lonicera* taxa within the scope of the study are also included in the Caprifoliaceae family.

In this study, pollen morphology of *Lonicera etrusca* and *L. implexa* distributed in Eskişehir Meşelik Campus was investigated using light microscopy and scanning electron microscopy.

When we look at the palynological studies conducted around the world in general, it is seen that pollen atlas databases are created electronically in many countries and they are regularly updated. These pollen atlases provide information not only in pollen shape, size and ornamentation, but also in terms of allergic properties. Unfortunately, no studies were found in Turkey except for the pollen atlases made by Aytuğ (1971) and Pehlivan (1995) [1-3]. This study is important in terms of revealing the pollen morphology of *Lonicera* taxa distributed both in Turkey and Eskişehir.

Lonicera pollen grains are tricolporate type. Also pollen grains of these two taxa nearly same size. However, along with these similarities, there are serious differences between the pollens of *Lonicera* taxa. It was determined that the pollen shape of these two taxa was different. While the pollen grains of *L. etrusca* are prolate (P/E= 0,98 µm (W); 0,85 µm (E)), *L. implexa*'s spheroidal (P/E= 1,08 µm (W); 0,89 µm (E)). Differences in exine thickness of the *Lonicera* taxa examined within the scope of the study were also determined. Avarage thickness of exine in *L. etrusca* is 1,28 µm (W); 1,01 µm (E) and 1 µm (W); 0,88 µm (E) in *L. implexa* too. It was also observed that exine in *L. implexa* showed heterogeneous thickenings. While the structure is tectatae in both taxa, the skulpture is echinulate in *L. etrusca*; *L. implexa* shows echinate ornamentation.

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