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DATA ON THE PALYNOMORPHOLOGICAL CHARACTERSTIC OF THE GENUS *SILENE* FROM ALBANIA

ABSTRACT

The palynomorphological features of four species belonging to the genus *Silene* (*Silene italica*, *Silene armeria*, *Silene pusilla* and *Silene fabarioides*) from different regions of Albania, were investigated and studied by light microscope. This study aims to assess and highlight the existence of significant differences in pollen size, distance between two pores, the exine sculpture and pores number found in these species. Pollen grains were usually radially symmetrical, polar, polyaperturate, spheroidal. The pores were circular contours, operculate which due to thickening of intine in this zone, come out like a cupole. The number of pores varied from 20 to 26 in *Silene italica*, from 16 to 20 pores in *Silene fabarioides* and *Silene armeria*, and from 12 to 16 pores in *Silene pusilla*.

The ornamentations of exine varied from microechinate to microperforate (punctate) at *Silene italica*, *Silene fabarioides* and *Silene pusilla*, whereas at *Silene armeria* the sculpture of exine was reticulate.

The biggest pollen grains were found in *Silene fabarioides*, whereas the smallest ones were found in *Silene armeria*.

Keywords: *Pollen grains, furrow, exine, intine, granulate.*

INTRODUCTION

Referring to the Albanian flora PAPANASTASOPOULOS *et al.* (1988), the Caryophyllaceae family consists of 27 genus and 169 species, while the genus *Silene* has 44 species.

Criteria for species determination of genus *Silene* served the palynological features of exine, size of pollen grains and pores, distance between two pores and pores surface.

Pollen grains of this genus were polyantoporate with pores clearly defined by presence above the exine, giving the body contours big waving. The number of pores of these species varied from 12 to 26. The ornamentations of exine varied from microechinate to microperforate (punctate) in the three types studied (*Silene italica*, *Silene fabarioides* and *Silene pusilla*), whereas at *Silene armeria* the sculpture of exine was reticulate. The plant populations of *Silene fabarioides* were found on rocky places of Rrajca habitats. The plant of *Silene pusilla* were found in alpine pasture, in places with humidity near the rocks in Shebenik habitats. While species *italica* and *armeria* were collected respectively in Krrabë and Letëm - Librazhd district.

This study aims:

-To assess and highlight the existence of significant differences in pollen size, the exine sculpture, distance between two pores and pores number found in these species;

-To provided detailed information on the morphological features of these pollen grains by comparing of the vulgaris species studied from Albanian palynologist Gëzim Kapidani (KAPIDANI, 1996).

MATERIAL AND METHODS

Palynomorphological characteristics of pollen grains of four plants of the *Silene* genus, collected in fresh conditions, were studied by using three analytical methods as follows:

Acetolysis of ERDTMAN (1960) method

Acetolysis of AVETISJAN (1950) method

Basic fuchsine of SMOLJANINOVA and GOLLUBKOVA (1953) method.

The first two methods of acetolysis were used to get the best results of the study of sporoderma elements, whereas the method of fuchsine was used to study the form, and size of aperture, which in some cases enabled us to identify the sculpture elements of exine.

There were prepared 3 - 5 microscope slides for each plant by different methods and they were studied by the microscope "Motic BA310". There were presented the microscopic photos of pollen grains of the plant studied in polar and equatorial view with magnification x 1000, taken by Pupuleku Blerina. There were presented photographs of respective plant as well.

STUDY AREA

Pollen grains were collected in Rrajcë-Shebenik, Krrabë and Letëm habitats. The Rrajcë-Shebenik area has a surface of 3,392,766 ha. The altitude varies from 300 m to 2,264 m. The climate is typical continental, with an annual average temperature

of 13.4 Celsius degree and with an average annual precipitation of 1,360 mm. The Krraba hills consist of hilly clusters that extend eastwards to the Zaranika valley, and in between the Elbasan fields in the south and the Erzen river valley in the north. This huge hilly cluster reaches the highest point of Gracen's tower at 932 m. The climate varies from warm Mediterranean to cool mountainous (QIRJAZI, 1990).

RESULTS

1. *Silene pusilla* Waldst. & Kit., *Silene quadrifida* auct.

Perennial or biennial plants, stems 20-80 cm branched. Spread in the forest, grassy areas, rock and shrubby. Food plant. Flowering: April to July (PAPARISTO *et al.*, 1988)

Pollen grains were monad, radially symmetrical, apolar and with spheroidal shape. In polar and equatorial view pollen grains had spheroidal contours.

The aperture was polyantoporate with numerous pores. The number of pores varied from 12 to 16. The pores were circular in shape but clearly defined by presence above the exine. Each operculum is covered with conical spinules. The diameter of pores varied from 4.3 to 5.5 μ , while average value was (4.7) μ . Distance between two pores (mesopore) varied from 4.4 to 4.9 μ , while average value was (4.7) μ .

The exine was doubled thin layers with the sculpture that varied from microechinate to microperforate (punctate).

The thickness of exine varied from 2.4 to 3.1 μ while average value was (2.8) μ . The ectexine was two times thicker than endexine. The diameter of pollen grains varied from 26.8 to 31.1 μ , while average value was (30.8) μ (Figure 1: b, c).

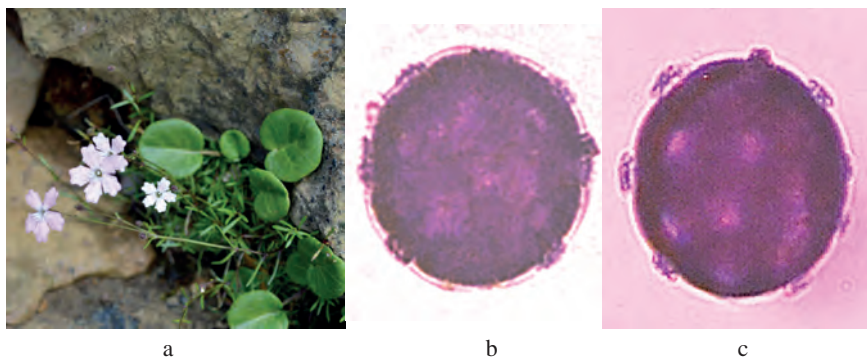


Figure 1. a: *Silene pusilla* plant; Pollen grains b: In polar view; c: In equatorial view X 1000

2- *Silene italica* (L.) Pers.

Perennial plants, up to 80 cm high. Common plant in the woods and glades up to 1400 m. Food plant. Flowering: April to July (PAPARISTO *et al.*, 1988).

Pollen grains were monad, radially symmetrical, apolar and with spheroidal shape. In polar and equatorial view pollen grains had spheroidal contours.

The aperture was polyaperturate. The number of pores varied from 20 to 26. The pores were circular contours, operculate which due to thickening of intine in this zone, come out like a cupole. Each operculum is covered with conical spinules. The diameter of pores varied from 4.2 to 5.1 μ , while average value was (4.7) μ . Distance between two pores (mesopore) varied from 5.3 to 5.8 μ , while average value was (5.6) μ .

The exine was doubled thin layers with the sculpture that varied from microechinate to microperforate (punctate). The thickness of exine varied from 2.4 to 3 μ , while average value was (2.8) μ . The ectexine was three times thicker than endexine. The diameter of pollen grains varied from 42.6 to 52.2 μ , while average value was (47.1) μ (Fig. 2 b, c).

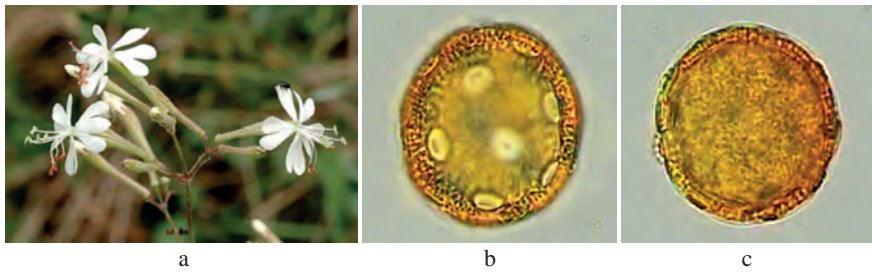


Figure 2. a: *Silene italica* plant; Pollen grains b: In polar view; c: In equatorial view X 1000

3. *Silene fabarioides* Hausskn.

Perennial plants, up to 100 cm high. Spread in rock mountainous areas. Flowering: June to July (PAPARISTO *et al.*, 1988).

Pollen grains were monad with spheroidal contours in polar and equatorial view. The aperture was polyaperturate. The number of pores varied from 16 to 20. The pores were circular in shape but clearly defined by presence above the exine. The operculum is covered with unequal reticula. The diameter of pores varied from 6.7 to 8 μ while average value was (7.2) μ . Distance between two pores (mesopore) varied from 6.3 to 6.6 μ , while average value was (6.5) μ .

The exine was doubled layers with the sculpture that varied from microechinate to microperforate (punctate). The ectexine was two times thicker than endexine.

The thickness of exine varied from 3 to 3.6 μ , while average value was (3.3) μ . The diameter of pollen grains varied from 52.2 to 58.8 μ , while average value was (52.1) μ (Figure 3: a, b).

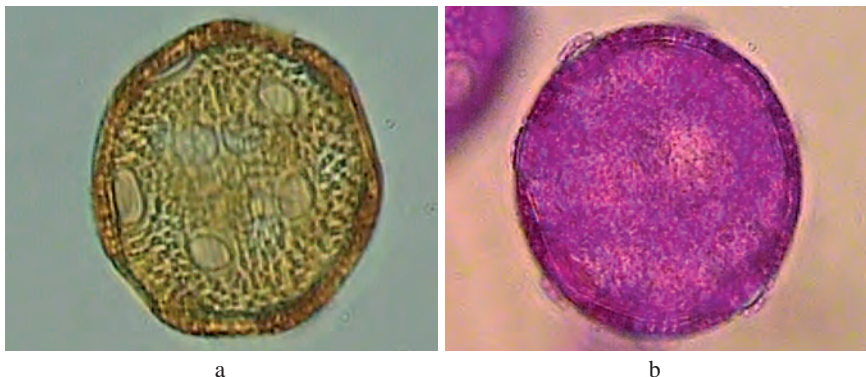


Figure 3. a: *Silene fabarioides* pollen grains a: In polar view; b: In equatorial view X 1000

4. *Silene armeria* L.

Perennial or biennial plants, 40 - 60 cm high. Found in forest, areas with grass, shrubby and rocks. Flowering: April to July (PAPARISTO *et al.*, 1988).

Pollen grains were monad, isopolar and with spheroidal shape. In polar and equatorial view, pollen grains had circular frame.

The aperture was polyaperturate. The number of pores varied from 16 to 20. Pores provided with operculum. The pores were circular contours. The diameter of pores varied from 1.9 to 2.7 μ , while average value was (2.4) μ . Distance between two pores (mesopore) varied from 4.1 to 4.6 μ , while average value was (4.4) μ .

The exine was doubled layers with reticulate sculpture. The thickness of exine varied from 1.8 to 1.95 μ , while average value was (1,87) μ . The ectexine was two times thicker than endexine. The diameter of pollen grains varied from 24.8 to 28.5 μ , while average value was (26.9) μ (Figure 4: b, c).

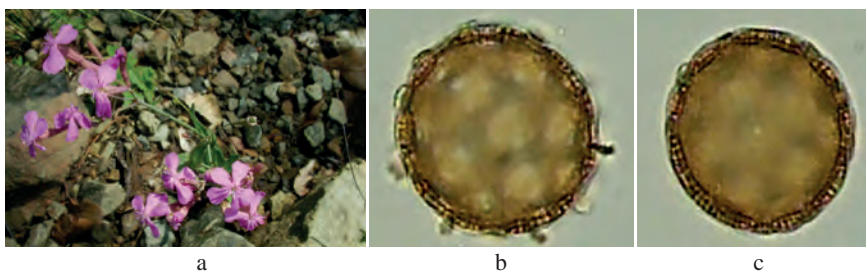


Figure 4. a: *Silene armeria* plant; Pollen grains b: In polar view; c: In equatorial view X 1000

DISCUSSION

Table 1. Comparative table of palynomorphological features of *Silene* genus

Species	The diameter of pollen grains (μ)	The diameter of pores (μ)	Distance between two pores (μ)	Number of pores	The sculpture of exine	The thickness of exine (μ)
<i>Silene italica</i>	42.6-52.2 (47.1)	4.2-5.1 (4.7)	5.3-5.8 (5.6)	20-26	punctate	2.4-3 (2.8)
<i>Silene fabarioides</i>	52.2-58.8 (52.1)	6-7.8 (7.2)	6.3-6.6 (6.5)	16-20	punctate	3-3.6 (3.3)
<i>Silene armeria</i>	24.8-28.5 (26.9)	1.9-2.7 (2.4)	4.1-4.6 (4.4)	16-20	reticulate	1.8-1.9 (1.87)
<i>Silene pusilla</i>	26.8-31.1 (30.8)	4.3-5.5 (4.7)	4.4-4.9 (4.7)	12-16	punctate	2.4-3.1 (2.8)
<i>Silene vulgaris</i>	34-49.7 (43.4)	4-5.5	4-4.8	8-10	reticulate	2.5-3

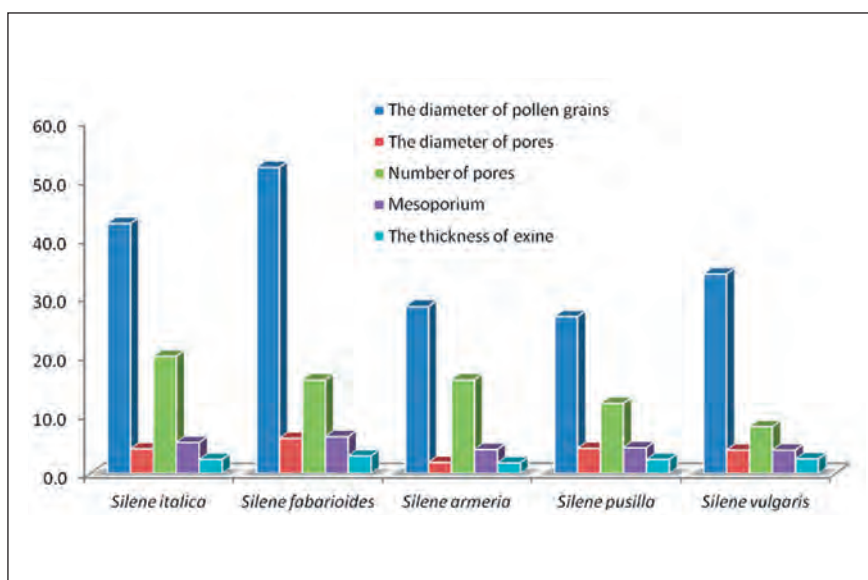


Figure 5. Minimum dimensions of pollen grains of five species of *Silene* genus.

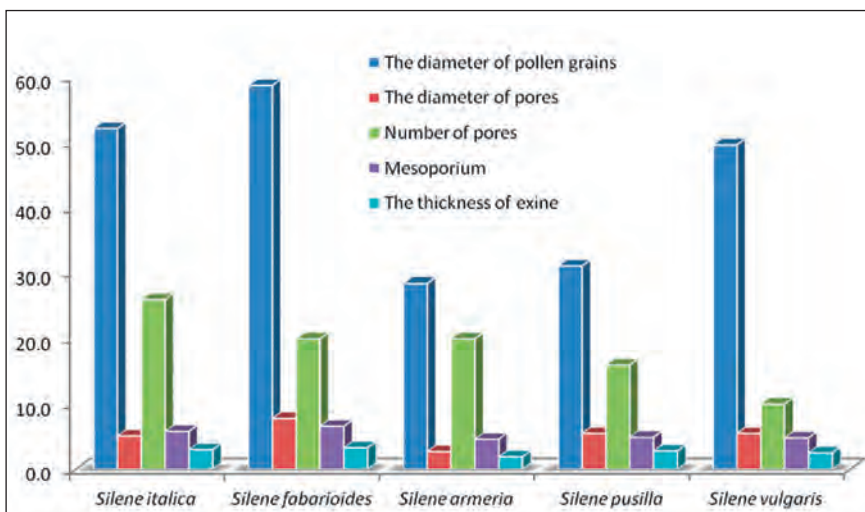


Figure 6. Maximum dimensions of pollen grains of five species of *Silene* genus.

In Tab. 1, comparative palynomorphological data were provided for four species of *Silene* (*armeria*, *italica*, *fabarioides*, *pusilla*) and *Silene vulgaris* described by KAPIDANI (1996).

By the comparative study of four species of *Silene* genus taken in analysis, in polar and equatorial view it was observed a great similarity in the aperture features of pollen grains, as well as in the pores that were circular contours (operculate), where each operculum was covered with conical spinules.

As noted by the data of Table 1, the pollen grains of *Silene* genus were presented with the following differences:

The exine structure varied from microechinate to microperforate (punctate) at *Silene italica*, *Silene fabarioides* and *Silene pusilla* to reticulate at *Silene armeria*. Based on the data of Albanian palynologique literature KAPIDANI (1996), similarities at the ornamentations of exine that was reticulate at pollen grains of *Silene armeria*, were detected.

The number of pores varied from 20 to 26 at *Silene italica*, from 16 to 20 pores at *Silene fabarioides* and at *Silene armeria* and from 12 to 16 pores at *Silene pusilla*. Referred to the literature (SLADKOV, 1967; FAEGRI and IVERSEN, 1975; MOORE *et al.*, 1978; GHAZANFAR, 1984; KAPIDANI, 1996; PUPULEKU, 2002; YILDIZ *et al.*, 2010) at *Silene vulgaris* pollen grains appear the smallest number of pores (varied from 8 to 10).

Referring to the chart 1, the biggest dimensions for all palynological indicators studied were identified at *Silene fabarioides* pollen grains, whereas the smallest ones were found at *Silene armeria*.

CONCLUSIONS

The palynomorphological study of four plants of *Silene* genus showed that there were many similarities in palynological features of pollen grains, according to the literature sources, such as:

- The aperture was polyantoporate;
- The pollen grains had spheroidal contours in polar and equatorial view;
- Circular pores were clearly defined by presence above the exine;
- The operculum is covered with conical spinules at three species of genus *Silene*, but at *Silene fabarioides* the operculum is covered with unequal reticula;
- The number of pores varied from 12 to 26. The smallest number of pores were found at *Silene pusilla* (12-16), whereas the biggest ones were found at *Silene italica* (20-26);
- The ornamentations of exine were generally microechinate to microperforate (punctate) and reticulate only at *Silene armeria*;
- The biggest pollen grains were found at *Silene fabarioides*, whereas the smallest ones were found at *Silene armeria*.

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