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Research Article

Palynological study of spores of the species *Asplenium septentrionale* (L.) Hoffm. in Albania

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Abstract-*Asplenium septentrionale* (L.) Hoffm.is a small herbaceous isospore plant. The study presents the morphological description of the spores of *Asplenium septentrionale* (L.) Hoffm in Albania. At the same time, a comparison of the palynological data of this species with those from the literature is made. The spores are monolete and of the bilateral type. So, they have only one laesura. The spores have oval to ellipsoid, to bean-shaped contours. The surface of the exine is smooth (psilate) and of uniform thickness. The exine is about 1.5 µm thick.

The perispora has spiny cristae, not uniform, but well developed. The perispore folds merge at the base. They form wrinkles of different shapes, giving the impression that they are independent of each other. The size of the perispore ornaments varies. They can reach up to 4-5 µm. Through this study, more information is provided on the morphological features of the spores of this species of our country compared to the literature data.

The material for the study was taken fresh in the Kolosian, Kukës area, Albania. The study was carried out with a Motic BA310 light microscope with 400x and 1000x magnification.

Keywords: Asplenium, Spores, Laesura, Exine, Perispore.

I. INTRODUCTION

Asplenium septentrionale (L.) Hoffm. is a small herbaceous isospore plant with "untraditional" fronds. It grows in dense clumps that resemble tufts of grass. According to Plants of the World Online it has several synonyms: *Acropteris septentrionais* (L) Link in Hort. (1833), *Amesium septentrionale* (L), Newman in Hist (1844), *Blechnum septentrionale* (L) Wallr (1831), *Chamaefilix septentrionalis* (L) Farw (1931), *Scolopendrium septentrionale* (L) Roth in Tent (1799), *Tarachia septentrionalis* (L) Momose in J. Jap (1960*), Belvisia septentrionalis* (L) Mirb. In J.B.A.M. de Lamarck & C.F.B. de Mirbel, 1802), *Acrostichum septentrionale* L. (1753).

It is described in the text Flora in Albania Vol.1 and in the text Flora Europae. Vol. 1. *Asplenium septentrionale* (L.) Hoffm., *Deutschl. Fl. Crypt.* 12 (1795). Rhizome caspases, sometimes short creeping. Leaves 5-15 cm;

petiole 2-3 times as long as the lamina, dark reddish-brown only at the base, abruptly becoming green; lamina much reduced, thick, dark green, glabrous, dichotomously forked 1-3 times; segments c. 1 mm wide, linear, decurrent along the rhachis, minutely forked again at the apex. Sori elongate, running the whole length of the segment. Tutin (1993).

In Albania, it is found on rocky slopes, in mountainous and alpine areas. Paparisto (1989). The study of the spores of this fern is based on the terminology of Erdman (1965), Punt (1994), Kapidani (1996, 2005). The article provides the first time a morphological study of spores of the species *Asplenium septentrionale* (L.) Hoffm from our country.

At the same time, a comparison is made of palynological data of this species with those obtained from the literature.

II. MATERIAL AND METHODS

The material for the study was taken fresh in the surroundings of Kolosian, Kukës area, Albania by Shuko[1]. (Fig 1-4) A variety of processing methods can be used to study the morphological characteristics of microspore grains. The results of palynological studies of spores depend to a large extent on the method of chemical processing. Also, cracks and deformations of the spores are observed during chemical processing. It is therefore recommended to use more than one processing method. In our work we have chosen the alkaline method.

• Alkaline method

This method consists in processing the material with KOH or NaOH at a concentration of 10%. The spores are boiled in the alkaline solution for 2-5 minutes and are constantly checked under the microscope so that they do not turn dark. After we have reached the right color, we rinse the material with distilled water several times until the neutral environment is reached. Rinsing is done by decantation and centrifugation. After rinsing, the preparation is closed with glycerin gelatin.

To realize the fixing of preparations we used the adhesive method of preparation made by gelatin-glycerol (Kisser, 1937). The terminology used is based on that recommended by Erdtman (1965), Punt.et al. (1994) and Kapidani (1996, 2005) The palynological features analyzed in this paper are classification by type, shape, size, aperture characteristics, exine sculpturing, etc. For the study of microspore grains, a Motic BA310 light microscope was used. Measurements and microscopic photographs were taken at 400X and 1000X magnification.

III. RESULTS AND DISCUSSIONS

The material for the study was taken fresh. In Flora Europae. Vol. 1 (1993) a description is given *Asplenium septentrionale* (L.) Hoffm., *Deutschl. Fl. Crypt.* 12 (1795). Rhizome caespitose, sometimes short-creeping. Leaves 5-15 cm; petiole 2-3 times as long as the lamina, dark reddish-brown only at the base, abruptly becoming green; lamina much reduced, thick, dark green, glabrous, dichotomously forked 1-3 times; segments c. 1 mm wide, linear, decurrent along the rhachis, minutely forked again at the apex. Sori elongate, running the whole length of the segment. 2n = 144. *Siliceous rocks and walls. Most of Europe but rarer in the east*. All except Az Bl Cr Fa Ho Is Rs (B, E) Sb.Tutin T.G et al. (1993) (Fig 1-4)

Fig. 1- 4. Photo of *Asplenium septentrionale* (L.) Hoffm., in dense bunches like the bunches of grass and sores

The spores are bilateral in type, with oval-ellipsoidal to bean-shaped contours. The aperture or laesura is monolete or single ray.

The perispore is has spiny cristae, not uniform and is well developed. The folds of the perispore join at the base. The perispore ridges in the upper part form spiny peaks. (Fig. 5-8). Near the base they are irregularly

The perispore ridges form folds of various shapes. They appear to be independent of each other. The size of the perispore ornaments varies. They can reach up to 4-5 μm. (Fig. 9-12).

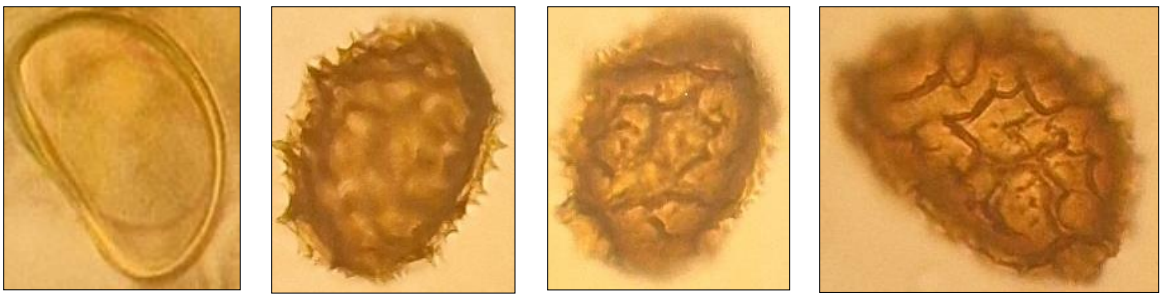

Fig. 5-8. Photo of *Asplenium septentrionale* (L.) Hoffm spores at 400x magnification

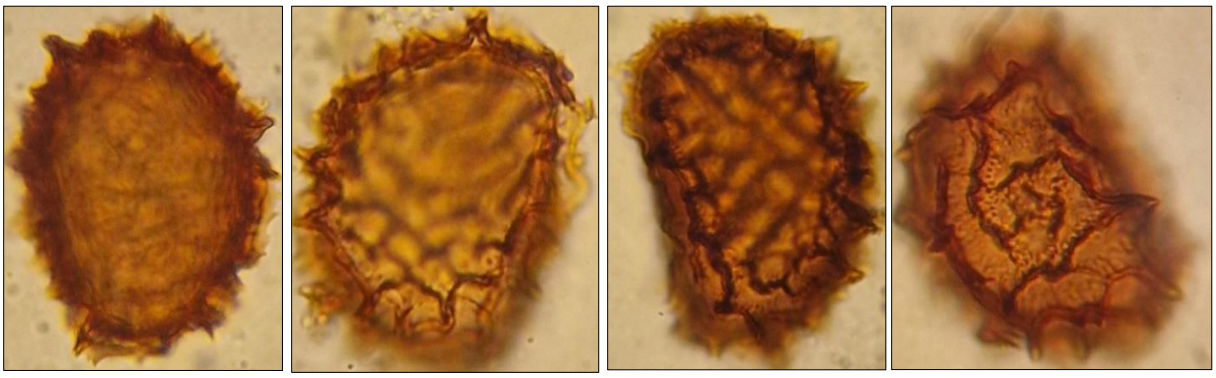

Fig. 9-12. Photo of *Asplenium septentrionale* (L.) Hoffm spores at 1000x magnification

The exine is smooth or psilate. Its thickness is uniform and reaches about 1.5 μm. (Fig. 5). Length of spores with perispore 44-54 (46.8) μm. Width of spores with perispore 32-36 (35.2) μm.

After processing with the alkaline method, the perispore is well preserved. The color after processing with KOH is brown.

During processing by the acetolysis method, the parispore splits or disappears altogether, revealing the smooth exine.

The palynological features of *Asplenium septentrionale* (L.) Hoffm of our country compared with some data found in the literature are presented in Table 1. We believe that palynological study of the spores of this fern will contribute to a better understanding of this plant.

Table 1. Comparative table of palynological features of *Asplenium septentrionale* (L.) Hoffm of our country with literature data.

Author	Length of spores with perispore (µm)	Width of spores with perispore (µm)	Perispori (µm)	Laesura
Golloshi (2025)	44-54 (46.8)	32-36 (35)	4 – 5 has spiny cristae	Monolete
Nayar (1964)	33 x 47 (34)	29 X 43 (32)	4 Spinulose	Monolete
Zenkteler (2012)	35-46	25-34	Echinulate, winged folds	Monolete
Szkudlarz (2024)	39–48	28–37	micropapillae, sometimes echinate	Monolete

Based on the trait Length of spores with perispores, Golloshi (2025) reports a maximum length of 44-54 (µm). While Zenkteler (2012) reports a minimum width of 25-34. The spore dimensions reported by other authors do not make any major difference.

IV. CONCLUSIONS

- The spores of *Asplenium septentrionale* (L.) Hoffm is monolete. The perispore is has spiny cristae and is well developed. The perispore ridges in the upper part form conical peaks. The perispore can reach up to 4-5 µm. The ektexine is psilate.
- From the palynological analysis of *Asplenium septentrionale* (L.) Hoffm it is observed that our species does not have major morphometric differences from those given in the literature.

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