

## Palynological study of spores of the species *Asplenium scolopendrium* L. (syn *Phyllitis scolopendrium* (L.) Newman, *Scolopendrium officinale* Sm.), (*Aspleniaceae* Newman) in Albania

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(Received: 11 December 2024, Accepted: 29 December 2024)

(5th International Conference on Scientific and Academic Research ICSAR 2024, December 23-24, 2024)

**ATIF/REFERENCE:** Golloshi, A., Kapidani, G., Shuka L., Meço, M., Pupuleku, B., Kallajxhiu, N., Dauti, A., Jançe, A. (2024). Palynological study of spores of the species *Asplenium scolopendrium* L. (syn *Phyllitis scolopendrium* (L.) Newman, *Scolopendrium officinale* Sm.), (*Aspleniaceae* Newman) in Albania. *International Journal of Advanced Natural Sciences and Engineering Researches*, 8(11), 741-745.

**Abstract** – *Asplenium scolopendrium* L (*Aspleniaceae* Newm) is a homosporous herbaceous plant. This study presents a detailed morphological analysis of spores from *Asplenium scolopendrium* L. in Albania. At the same time, a comparison of palynological data of this species with those obtained from the literature was made.

The spores are of the bilateral type. They are monolete. So they only have one laesura. The spores have oval to ellipsoidal contours, up to bean-shaped. The surface of the exine is smooth (psilate) and of uniform thickness. The exine is about 1.5 µm thick.

The perispore is cristate - fenestrate, and is well developed. The folds of the perispore join at the base. They form wrinkles of various 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 with the literature data.

The material for the study was taken fresh in the Pogradec area, in SouthEast of Albania. The study was done with a Motic BA310 light microscope with 400x and 1000x magnification.

Keyword: *Asplenium*, grains spore, laesura, exine, perispor

### Introduction

Species *Asplenium scolopendrium* L. (syn *Phyllitis scolopendrium* (L.) Newman, *Scolopendrium officinale* Sm.) (*Aspleniaceae* Newm) is a perennial herbaceous fern with isospores that has many synonyms.

The following synonyms are given in Wikipedia as: (*Asplenium scolopendrium* subsp. *antrijovis* (Kümmerle) Brownsey & Jermy, *Biropteris antrijovis* Kümmerle, *Phyllitis antrijovis* (Kümmerle)

Seitz, *Phyllitis fernaldiana* Á. Löve, *Phyllitis japonica* Kom, *Phyllitis japonica* subsp. *americana* (Fernald) Á. Löve & D. Löve, *Phyllitis lindenii* (Grep.) Maxon, *Phyllitis scolopendrium* (L.) Newman, *Phyllitis scolopendrium* var. *americana* Fernald, *Phyllitis scolopendrium* var. *scolopendrium* (L.) Newman, *Scolopendrium lindenii* Hook, *Scolopendrium officinarum* Sw, *Scolopendrium scolopendrium* (L.) H. Karst, *Scolopendrium vulgare* Sw).

It is described in the text of Flora in Albania Vol.1 and in the text Flora Europaea. Vol. 1. as a plant with simple leaves, with large sori arranged in rows. *Asplenium scolopendrium* L is used as a medicinal and ornamental plant. Tutin (1993). It is found in Albania in shady places, near running waters, in wells, cavities and walls, etc., mainly in low-lying areas. Papanicolaou (1989). The study of the spores of this fern was published for the first time in our country by Kapidani (1988). The article provides new data on the morphological study of spores of the species *Asplenium scolopendrium* L from our country. In this paper we have used the same study methodology as Kapidani (1998) but with better optical tools. At the same time, a comparison is made of palynological data of this species with those obtained from the literature.

## Material and methods

The material for the study was taken fresh in the surroundings of Pogradec, Albania, by Shuka<sup>1</sup>. (Fig 2-4). 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.

## Results and discussions

The material for the study was taken fresh. In Flora Europaea. Vol. 1 (1993) a description is given *Asplenium scolopendrium* L., *Sp. Pl.* 1079 (1753) (*Phyllitis scolopendrium* (L.) Newman, *Scolopendrium officinale* Sm.). Leaves 5-60 cm, persistent; petiole up to ½ as long as the lamina; lamina 3-6(-7) cm wide, linear-lanceolate, cordate at the base, the margin slightly undulate, entire. Sori 8-18 mm wide, linear, parallel, usually occupying more than ½ the width of the lamina. Shady places. S., W. & C. Europe, extending to S.E. Sweden and N. Ukraine. All except Fa Fe Is Rs (N, B, C, E) Sb. Many variants of this species, some with curled or cleft fronds, are known both in nature and in cultivation. Tutin T.G et al. (1993)

*Asplenium scolopendrium* (L) is a fern with simple and well-developed leaves. In our species there are 24-36 rows of longitudinal sori, arranged in parallel. (Fig 1-4).



Fig. 1- 4. Photo of *Asplenium scolopendrium* L with simple leaves and with longitudinal and parallel sores

The spores are in bilateral type, with oval to ellipsoidal, to bean-shaped contours. The aperture or laesura is monolete or single ray. The laesura is  $\frac{3}{4}$  of the length of the spore. The perispore is cristate-fenestrate and is well developed. The folds of the perispore join at the base. The perispore ridges in the upper part form conical peaks. Near the base they are irregularly fenestrate and are difficult to distinguish in the light microscope at 1000x magnification. (Fig.9-12). At 400x microscopic magnification the fenestrate sculpture gives the impression of being verrucate. (Fig.5-8).

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  $\mu\text{m}$ .

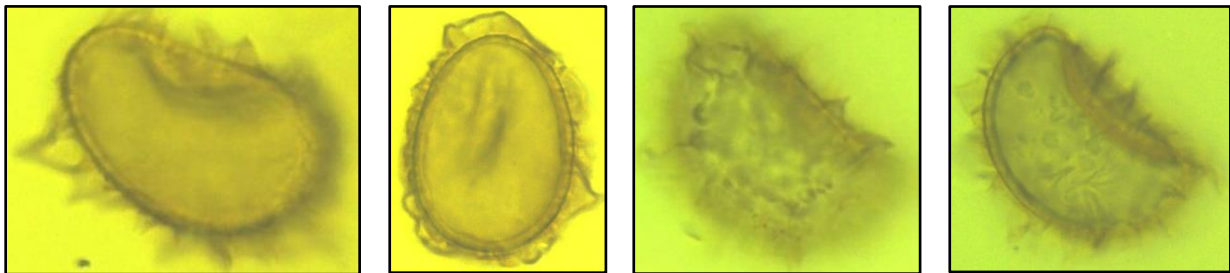


Fig. 5-8. Photo of *Asplenium scolopendrium* L spores at 400x magnification

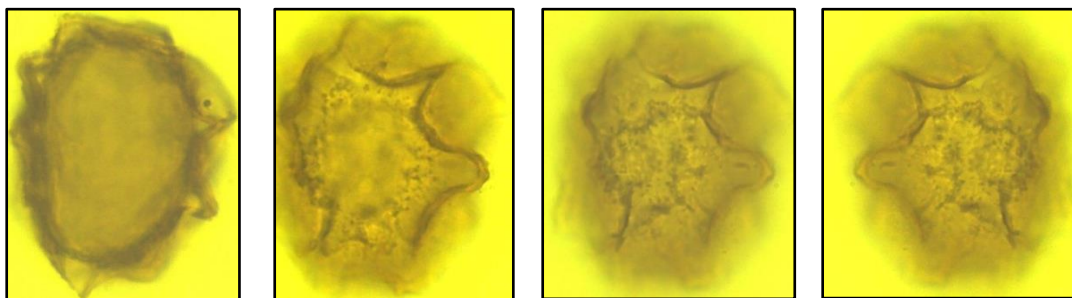


Fig. 9-12. Photo of *Asplenium scolopendrium* L spores at 1000x magnification

The exine is smooth or psilate. Its thickness is uniform and reaches about 1.5  $\mu\text{m}$ . Length of spores with perispore 32-42 (35)  $\mu\text{m}$ . Length of spores without perispore 23-30 (26)  $\mu\text{m}$ . Width of spores with perispore 25-32 (28)  $\mu\text{m}$ . Width of spores without perispore 16-22 (18)  $\mu\text{m}$ . After processing with the alkaline method, the perispore is well preserved. The color after processing with KOH is light brown. During processing by the acetolysis method, the perispore splits or disappears altogether, revealing the smooth exine.

The palynological features of *Asplenium scolopendrium* L 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 scolopendrium* L of our country with literature data.

Author	Length of spores with perispore (µm)	Length of spores without perispore (µm)	Width of spores with perispore (µm)	Width of spores without perispore (µm)	Perispore (µm)	Laesura
Golloshi (2024)	32-42 (35)	23-30 (26)	25-32 (28)	16-22 (18)	4 - 5	Monolete
Kapidani (1988)	33.6-45.5 (37.9)	24.2 -31.3 (26.7)	24 – 31.2 (27.3)	16.8 - 21.6 (20)	to 7	Monolete
Abbas (2017)	35x40		30x36			
Babrov (1983)	28.8-39.6 (45.0)		23.2-32.4		3.4-5.0 (8.0)	Monolete
DAI Xi-Ling (2005)	24.0-34.3				foraminate-alate	Monolete
Lin (2013)	31–35					Monolete
Zenkterler (2012)	50-65		35-44			Monolete
Szkudlarz (2024)	35–43		25–31		to 5	Monolete

Based on the trait Length of spores with perispore, DAI Xi-Ling (2005) reports a minimum length of 24.0×34.3 µm. While Zenkterler (2012) reports a maximum Length of spores with perispore of 50-65 µm . The dimensions of the spores reported by other authors do not make a major difference.

## Conclusions

- The spores of *Asplenium scolopendrium* (L) are monolete. Laesura is about  $\frac{3}{4}$  of the length of the spore. The perispore is cristates fenestrate and is well developed. The perispore ridges in the upper part form conical peaks. They can reach up to 4-5 µm. The ektexine is psilate. The thickness of the exine is about 1.5 µm.
- From the palynological analysis of *Asplenium scolopendrium* (L) it is observed that our species does not have major morphometric differences from those given in the literature.

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