

DEPARIA CHINGII (ATHYRIACEAE) - A NEW SPECIES WAS REPORTED FROM CHINA

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Abstract

Deparia chingii, a new species was reported from China. Comparative study was conducted between *D. chingii*, a new species, and *D. paterseii*, a related species, using a combination of plant resources, taxonomy, palynology, macrography, micrography, microscopic and submicroscopic structures. The results showed that the leaves of *D. chingii* were oval rectangular circle, bipinnately lobed, 8-10 pairs of lateral pinnae were close to each other, with short stalks, and the first pair of pinnae on the lower part of the leaves were slightly shortened; the leaves were glabrous on both sides; stipe, rachis and costae were nearly smooth; sori short linear, 4 to 6 pairs per lobe, and the sori were separated from each other when mature, with short pubescent on the dorsal side of the indusium, perispore with auricular ornamentation. The leaves of *D. paterseii* were ovate-oblongate, double pinnation, separated laterally, with 8 to 10 pairs of pinnae; stipe, rachis, costae and both sides of leaf are covered with small scales and nodal pubescence, sori often cover the dorsal lobes when mature, perispore with long columnar or prickly ornamentation.

Introduction

Qin Renchang's classification system was used to classify pteridophyte in China 2000 years ago, and the Athyriaceae was divided into *Athyriopsis* Ching and *Lunathyrium* Koidz. Li (1988) have published three new species of *Athyriopsis shandongensis*, *Athyriopsis lushanensis* and *Lunathyrium shandongense* (Li 1984). Li (1991) studied the spore morphology of three species of *Lunathyrium*. According to the classification system of Qin Renchang, Zhu (1999) published Flora of China 3 (2), which recorded 19 species of *Lunathyrium* and 15 species of *Athyriopsis* in China. Wang and Dai (2010) studied the spores of 7 species of *Lunathyrium* and 5 species of *Athyriopsis*. *Deparia*, Hooker and Greville was founded in 1829. Flora of China was the first to adopt *Deparia* in China, and recorded 53 domestic species. Zhang Xianchun's classification system recorded 72 species in China (Zhang and Sun 2015). Li *et al.* (2019) established the Subgen. *Athyriopsis* (Ching) J. X. Li and X. J. Li and Subgen. *Lunathyrium* (Koidz.) J. X. Li and X. J. Li based on the characteristics of perispore ornamentation of *Deparia*. Li *et al.* (2022) published the Atlas of Medicinal Pteridophytes in Shandong Province based on the classification system of Qin Renchang in 2022, which recorded 3 species of *Lunathyrium* and 5 species of *Athyriopsis* in Shandong. Li and Li (2024) published the Atlas of spore morphology of Medicinal Lycophytes and Ferns in Shandong Province based on the classification system of Zhang Xianchun's in 2024, which recorded 11 species of *Deparia* in Shandong. These studies laid a foundation for the establishment of a new species of *Deparia chingii*.

Materials and Methods

Deparia chingii was collected from the Jiangsu lianyungang (Yuntai Mountain). The eight mature spores were examined under an optical microscope. At the same time, the size of the polar and equatorial axes of the spores was measured, and the spore size was recorded. The specimen

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was sprayed with gold and coated for 2 min. The relevant materials were observed under SUPRATM55 scanning electron microscope (SEM). When the voltage was stabilized at 10-15 KV, spore polar view and equatorial view were selected respectively, magnification by 5000 and 10000 times. The experimental methods were carried out following Wen and Nowicke (1999).

Taxonomy: *Deparia chingii* J. X. Li and X. J. Li, sp. nov.

Diagnosis: *Deparia chingii* is similar to *D. paterisii* but differs in some respects, such as *D. chingii* height 45-55 cm, leaves oval rectangular circle, bipinnately lobed, 8-10 pairs of lateral pinnae, with short stalks, the leaves were glabrous on both sides, stipe, rachis and costae were nearly smooth, perispore with auricular ornamentation.

Type: China, Jiangsu Province, Lianyungang, Yuntai Mountain, growing underneath forest wetlands, 34° 42' 17.87"N, 119° 25' 40.19"E, 360 m a. s. l., 16 August 1989, J. X.

Li-026-030 (Holotype: PE, Isotype: SDCM). (Fig. 1).



Fig. 1. *Deparia chingii* J. X. Li and X. J. Li, sp. nov.

Description: Plant height 45-55 cm. Rhizome elongated transverse, 3-4 mm diameter, apex covered with yellowish-brown broad lanceolate transparent scales; leaves approximal, stipe 16-18 cm long, 2-3 mm diameter, base brown, sparsely yellow-brown broad lanceolate scales and curly nodal hairs; leaves oval rectangular circle, 20-35 cm long, 16-18 cm wide, base pair slightly shortened, leaf tip acuminate and pinnatifid, bipinnately lobed, lateral pinnae 8 to 10 pairs, close to each other, pinnae with short stalk, stalk about 2 mm long, base 1 pair of pinnae 6-9 cm long, 2-3 cm wide, oblanceolate, upper 2-3 pairs of pinnae 9-10 cm long, 2-2.5 cm wide, lanceolate,

pinnately deeply lobed, apex short acuminate, upper each pair of pinnae gradually shortened; lobes of lateral separate pinnae rectangular circle, obtuse, sides subentire, 8-10 pairs, oblique; lobes small veins pinnately, 8 pairs below. Rachis, costae, and both sides of leaves sub-smooth, occasionally with a few small scales and nodal pubescence. Sori short linear, straight, solitary on the upper middle side of a small vein, with 1 vein on the base, sometimes with twins on both sides of the upper and lower, each lobe 4-6. Indusium brown, membranous, abaxially pubescent, margin lacerated, indusium are often ectropated when mature and are far away from each other (Table 1). Spore reniform on the equatorial surface, with auricular pattern (Figs 2-3).

Table 1. Comparison of the main distinguishing features of *Deparia* spp.

Species	Leaves	Lateral pinnae	Both sides of leaves	Stipe, rachis and costae	Sori	Perispore ornamentation
<i>D. chingii</i>	Oval rectangular circle, bipinnately lobed	8-10 pairs, close to each other, with short stalks subopposite	Smooth hairless	Occasionally with a few small scales and nodal pubescence	Each lobe bears 4-6 pairs of sori, separated from each other when mature	Auricular
<i>D. patersenii</i>	Ovate-oblongate, double pinnation	8-10 pairs, separate from each other, alternate	Light yellow scales	Densely covered with small scales and nodal pubescence	Each lobe bears 6-8 pairs of sori, close to each other when mature	Long columnar or prickly

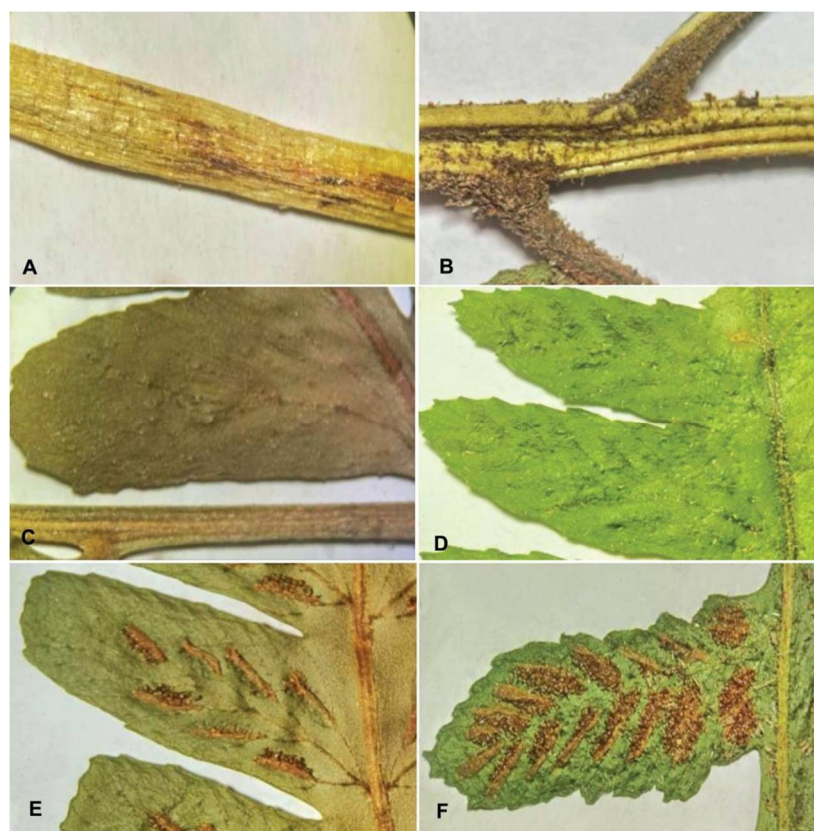


Fig. 2. Rachis, leaves and sori of *Deparia chingii* (A,C,E) and *Deparia patersenii* (B,D,F). A: Rachis smooth, B: Rachis and costae with small scales and nodal pubescence, C: Leaves smooth hairless, D: Leaves light yellow scales, E: Sori 4-6 pairs of separated from each other when mature, and F: Sori 6-8 pairs of close to each other when mature.

Results and Discussion

Spores are the core parts of the reproductive organs of ferns, the places where DNA genetic material exists and the forms of morphology exist. The type characteristics of perispore ornamentation were very stable in the intraspecific, and with significant differences in the interspecies, it provides a scientific basis of palynology for the identification and interspecific classification of fern plants. Lu *et al.* 2007 pointed out that the spore morphology of ferns was of great significance in taxonomic and phylogenetic studies, and the types of perispore ornamentation vary greatly among different taxa, which can be used as an important feature to identify different taxa, or as one of the important bases for establishing a high-level taxon. Jermy pointed out that the palynological morphology of ferns also contributes to the discovery of some new species.

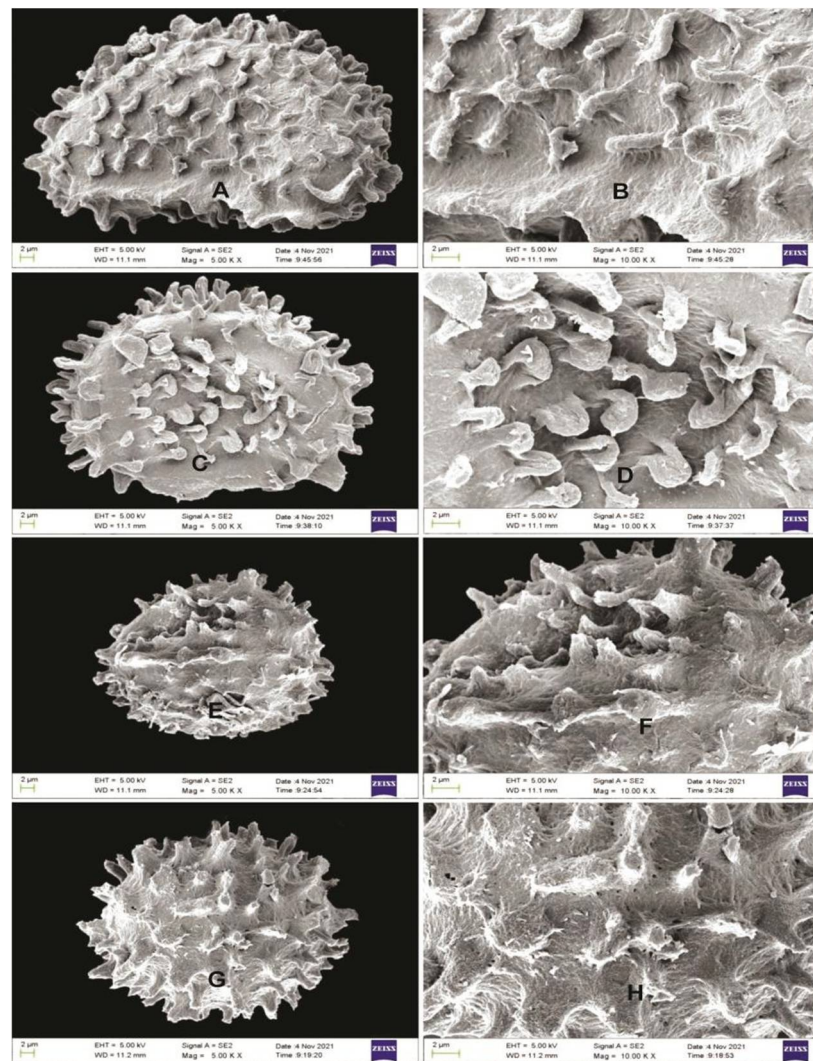


Fig. 3. Spore in polar view of *D. chingii* (5000x, 10000x) (A, B), Spore in equatorial view of *D. chingii* (5000x, 10000x) (C, D), Spore in polar view of *D. paterseii* (5000x, 10000x) (E, F) and Spore in equatorial view of *D. paterseii* (5000x, 10000x) (G, H).

For example, *Dryopteris guanchica* of the *Dryopteris* was a new species discovered through perispore patterns (Jermy 1980). These were two different types of ornamentations, the perispore ornamentation of *Deparia chingii* auricular, while the perispore ornamentation of *D. paterseii* long columnar or spiny. Therefore, the perispore ornamentation provided the scientific basis of palynology for the establishment of a new species of *Deparia chingii*. Palynology has important significance in taxonomy and systematics.

The hair is a protective tissue that grows in different parts of the plant, it not only plays a protective role in adapting the environment survival, but also is the genetic morphological characteristic formed in the long-term systematic evolution, this characteristic is very stable within the population and significantly different between the populations, so it has become the most commonly used classification characteristic and basis of traditional classical taxonomy. There are examples of this in many genera, for example *Hypodematium* plants, the plants are very similar in shape, the different types and densities of rod-shaped glandular hairs and non-glandular hairs in different parts of the plant are important characteristics and basis for the classification and identification of *Hypodematium*. The two species were easy to distinguish, *Hypodematium crenatum* plant was densely pubescent, while the *H. sinense* plant has rod-shaped glandular hair. In the *Deparia*, *Deparia chingii* has smooth hairless on both sides of leaves and no small scales, rachis and costae were nearly smooth, this is different from the *D. paterseii*, in which the upper and lower sides of the leaves densely covered with light yellow scales, and the rachis and costae densely covered with nodal pubescence. It provided an important morphological basis for the establishment of a new species of *Deparia chingii*.

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