A new disaccate pollen grain from the Triassic of Argentina

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Resumen. UN NUEVO GRANO DE POLÉN BISACADO DEL TRIÁSSICO DE ARGENTINA. Cedripites tectus sp. nov., es un grano de polen bisacado haploxilonoide a ligeramente diploxilonoide de contorno oval, recuperado del Grupo Rincón Blanco (Triássico Medio a Tardío) en la provincia de San Juan, oeste de Argentina. El cuerpo es subrábico en proyección polar y subtrapezoidal en vista lateral. El pasaje entre los sacos y el cuerpo es transicional. Los sacos muestran una fuerte inclinación distal. La cappula ocupa cerca de un décimo del ancho del cuerpo. Una breve discusion acerca de las miosporas fósiles semejantes a Cedrus, reafirma el uso de Cedripites Wodehouse.

Abstract. Cedripites tectus sp. nov., from the Middle to Late Triassic Rincón Blanco Group of San Juan province, west of Argentina, is a haploxylonoid to slightly dyloxylonoid disaccate pollen grain with a longitudinally oval amb. The corpus is almost rhombic in polar view and trapezium-like in off-polar compression. The sacs show a strong distal inclination and merge gradually with the corpus, encompassing a narrow cappula about one tenth of the corpus breadth. A brief discussion on Cedrus-like fossil miospores validates the usage of Cedripites Wodehouse.


Introduction

In Argentina, Middle to Late Triassic basins are widespread in the central-western region (Zavattieri and Batten, 1996). Within the Precordillera, the non-marine Cuyo Basin includes several sub-basins of which Rincón Blanco is one of the north-eastern depocentres in San Juan province (figure 1). Rincón Blanco is a fault-bounded, narrow trough containing about 2300 m of mostly clastic sedimentary rocks (Barredo et al., 1999). The succession begins with the coarse alluvial conglomerates and high-energy sandstones of the Ciénaga Redonda, Cerro Amarillo, and Panul formations. The horizontal stratified, fluvial and lacustrine beds of the Portezuelo Formation overlie these units. The Portezuelo levels include sandstones, shales, marls and tuffs with tetrapod footprints and a scarce taphoflora composed by Ancepsia sp., Lepidopterus stormbergensis (Seward) Townrow, Taeniopites sp., articulates and wood remains. They grade upward into the deep lacustrine facies of the Carrizalito Formation. The sedimentary fill terminates in the lacustrine and fluvial sag facies of the Casa de Piedra Formation. This unit contains conchostracans and characteristic specimens of the Dicroidium Flora, such as different species of Xylopterus, Zuberia and Taeniopites (Barredo et al., 1999). The Portezuelo, Carrizalito and Casa de Piedra Formations yield rich palynofloras related to the Ipswich Microflora (Dolby and Balme, 1976; Zavattieri and Batten, 1996). Among the spores are Cadargasporites sp. cf. C. senectus de Jersey and Hamilton, Calamospora tener (Leschik) de Jersey, Densoisporites sp. cf. D. psilatus (de Jersey) Raine and de Jersey, Limatulasporites limatulus (Playford) Helby and Foster, and Playfordiaspora cancellosa (Playford and Dettmann) Maheshwari and Banerji. Pollen taxa include Alisporites australis de Jersey, A. lowwoodensis de Jersey, Chordasporites australiensis de Jersey, Cycadopites follicularis Wilson and Webster, Platysaccus queenslandi de Jersey, and Striatopodocarpites sp. cf. S. panti (Jansonius) Balme. Botryococcus is consistently represented through the lacustrine levels, mainly within the Casa de Piedra Formation. The new species, Cedripites tectus, occurs as a minor but conspicuous constituent of the palynological assemblages, from the Portezuelo through Casa de Piedra Formations, of the Rincón Blanco Group.

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Material and methods

This paper is based on the study of 35 palynological samples from Arroyo del Corral and Ciénaga Larga creeks, in southwestern San Juan province, Argentina (figure 1). Laboratory procedures followed conventional practices. Carbonates and silicates were removed by treatment with hydrochloric and hydrofluoric (70%) acids. Residues were sieved on a 25 μm mesh and mounted in unstained glycerin jelly as well as in cellozize on glass slides. Specimens were examined under a Leitz Orthoplan binocular microscope. Photomicrographs were taken with a Leitz Orthomat camera using AGFANAP AFX 25 film. Palynological slides are prefixed BAFC-PI. The illustrated specimens are identified with a slide number and England Finder coordinates. Terms used for measurements of pollen grains follow the scheme of Erdtman (1954, 1957).

Systematic palynology

Genus Cedripites Wodehouse 1933

1963 Cedripollinites Danzé-Corson and Laveine, in Briche et al., p. 94.
1955 Septaesporites Leschik, p. 61.
1955 Lorisporeites Leschik, p. 63.
1955 Rimaesporites Leschik, p. 64.

Type species. Cedripites eocenicus Wodehouse 1933.

Discussion. Cedripites was erected by Wodehouse (1933) based on a single Cedrus-like pollen grain from the Eocene of Colorado, U.S.A. A brief diagnosis and a drawing of the holotype, Cedripites eocenicus Wodehouse, were given. Although Wodehouse’s diagnosis was sketchy, the genus was undoubtedly validly published according to Article 38 of the ICBN, Saint Louis Code (Greuter et al., 2000). Wodehouse (1933) clearly considered Cedripites as morphologically comparable, but not necessarily related, to modern Cedrus miospores. Potonié (1958) and Balme (1970) discussed the genus and validated its usage. The circumscription of Cedripites causes problems, however, owing to its sketchy diagnosis. The species C. tectus, described in this paper, fits very well with the general characters of Cedripites (as opposed to those of modern Cedrus pollen) regarding the disposition of sacci and exine structure. Descriptions and illustrations in Wodehouse (1935), Pokrovskaya (1950), and Erdtman (1954, 1957, 1965) characterize Cedrus pollen on the basis of its thickwalled cappa and distally inclined sacchi, which merge gradually with the corpus without a sharp demarcation. Forms with a markedly polygonal corpus and narrow cappule as seen in C. tectus are not common among extant Cedrus or fossil Cedrus-like species. We are aware of the difficulties of interpreting the morphology of Cedrus-like fossil miospores. However, our detailed studies support the assignment of C. tectus in Cedripites Wodehouse, although in fact, by doing so, we slightly expand the current circumscription of this genus. However, we avoid emending its diagnosis, because, as originally erected, this genus is broad enough in concept.

Cedripollinites Danzé-Corson and Laveine (in Briche et al., 1963) is an obligate junior synonym of Cedripites. Saepatosporeites Leschik 1955, Lorisporeites Leschik 1955, and Rimaesporites Leschik 1955 (see also Scheuring, 1974), considered previously as synonymous by Bharadwaj and Singh (1964) and Jain (1968), are probably also synonyms of Cedripites. The Gondwanan species, Rimaesporites aquilonalis Goubin, 1965 (or cf. Rimaesporites aquilonalis Goubin, as currently cited in Australia and Antarctica; see Dolby and Balme, 1976; Helby et al., 1987; Foster et al., 1994), is doubtful. The holotype of the species R. aquilonalis shows a proximal cleft but this character is apparently absent from the paratypes. Cedripodites Maljavkina 1964 and Krepimippollinites Tiwari and Vijaya 1995 bear the same morphology in corpus-saccul construction, and are probably also synonyms of Cedripites. Following Balme (1970), Parviacritites Couper 1958, closely resembles Cedripites and is also
a probable junior synonym of this genus, *Paravesicaspora* Klaus 1963, is clearly haploxylonoid and exhibits a markedly, transverse-elongated corpus. *Scheuringipollenites* Tiwari 1973, displays an almost circular amb, a corpus that is hardly discernible and an ill-defined sulcus. *Klausipollenites* Jansonius 1962 (see also Balme, 1970, and Tiwari and Vijaya, 1995), exhibits small rigid sacchi which tend to be joined through the equator giving a monosaccate appearance, and a small, poorly defined distal tenuitas.

Figure 2. A-H, *Cedrites tectus* sp. nov., from Ciénaga Larga and Arroyo del Corral creeks, Rincón Blanco area, San Juan province, Argentina / quebradas de Ciénaga Larga y Arroyo del Corral, área de Rincón Blanco, provincia de San Juan, Argentina. A, BAF-Pi 1302(1) N25/0, polar view / vista polar; B, BAF-Pi 1300(3) O39/3, lateral view / vista lateral; C, holotype / holotipo, BAF-Pi 1302(1) O62/0, polar (distal) view / vista polar (distal); D, holotype / holotipo, BAF-Pi 1302(1) O62/0, polar (proximal) view / vista polar (proximal); E, BAF-Pi 1182(1) A56/0, lateral view / vista lateral; F, BAF-Pi 1181(1) A46/4, polar view / vista polar; G, BAF-Pi 1302(3) J21/2, polar view / vista polar; H, BAF-Pi 1182(5) M46/0, polar view / vista polar. Scale bar / Escala gráfica: 50 μm. All specimens to the same scale / Todos los especímenes a igual escala.
on the distal pole. *Alisporites Daugherty 1941*, has a well-defined central corpus displaying a homogenous, unstructured wall.

**Cedripites tectus** sp. nov.

**Figures 2.A-H**

**Holotype.** BAFC-PI 1302(1) O62/0; figures 2.C-D.

**Repository.** The palynological collection, Geological Sciences Department, Buenos Aires University, Argentina.

**Type Locality.** Ciénaga Larga Creek, Rincón Blanco area, northeast of Barreal, San Juan Province, Argentina.

**Type Stratum.** The sample yielding the holotype is a shale intercalation among the tuffs of the topmost fluvial facies, Casa de Piedra Formation, Rincón Blanco Group, east flank of the Ciénaga Larga syncline, ca. 25 m below the top of the unit. For a geological map of the area, see Barredo (1999), and Barredo and Ramos (1997).

**Occurrence.** Portezuelo, Carrizalito, and Casa de Piedra Formations, Rincón Blanco Group.

**Derivatio nominis.** Referring to the sacchi, close to one another adjacent to the distal pole (etymology: Latin, *tectus*, covered, hidden).

**Diagnosis.** Disaccate pollen grains, haploxylonoid to slightly diploxylonoid. Amb oval, exhibiting markedly longitudinal elongation. In polar view corpus almost rhombic, trapezium-like in off-polar compression. Cappa heavily thickened, endoreticulate (alveolar ektektene), 3.3-5.5 μm thick. Bacula-like elements of ektektene (infractemae) perpendicularly disposed on the proximal pole. Sacci almost elliptical, showing a strong distal inclination. Proximally as well as laterally, sacci merge gradually with the corpus. The endoreticulum is continuous between the cappa and the sacchi wall where they exhibit a tendency to radial elongation, constituting brochi of 1.1-1.5 μm in diameter. Cappula narrow, about one tenth of the corpus breadth, displaying a homogeneous (unstructured), thinned wall.

**Measurements** (55 specimens). Total breadth, 58.71(87) μm; sacchi breadth, 37.48(61) μm; total height, 38.44(52) μm; corpus breadth, 35.51(61) μm; corpus depth, 34.48(61) μm; corpus height, 35.37(41) μm; cappula breadth, 2.5-6 μm.


**Discussion**

*Cedripites tectus* sp. nov. is an important addition to the rich, pollen-dominated, Triassic palynofloras of Argentina. Following Wodehouse (1933) and Balme (1970), we regard *Cedripites* Wodehouse, as embracing pollen grains belonging to several groups of gymnosperms.

*Cedrus*-like pollen grains make their first appearance in the geological record in the late Palaeozoic, being minor constituents of Late Permian palynological assemblages of Pakistan and Russia (Balme, 1970). They are present in both typical Gondwanan palynological assemblages of Triassic age namely the high-latitude Ipswich and the low-latitude Onslow Microfloras (Balme, 1970; Dolby and Balme, 1976). During the Jurassic, *Cedrus*-like pollen grains declined in abundance and disappeared from Gondwana, but they are conspicuously represented in the Northern Hemisphere palynofloras throughout the Cretaceous and Cainozoic (Pokrovskaya, 1950; Balme, 1970). Unlike many late Mesozoic and Cainozoic *Cedrus*-like miospores, which can be referred with some confidence to the Pinaceae, Late Permian and Triassic specimens are of unknown botanical affinity. Although the morphological evidence is not conclusive, it is, however, likely that Triassic *Cedripites* were wind-dispersed, siphonogamous pollen grains of probable coniferalean origin.

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