International Journal of Coal Geology 189 (2018) 70–74

Contents lists available at ScienceDirect

International Journal of Coal Geology

journal homepage: www.elsevier.com/locate/coal

Fossil cutin of *Johnstonia coriacea* (Corystospermaceae, Upper Triassic, Cacheuta, Argentina)

José A. D'Angelo[a,b,*], Erwin L. Zodrow[b]

[a] IANIGLA-CONICET, FCEN, Universidad Nacional de Cuyo, M5502JMA Mendoza, Argentina
[b] Palaeobotanical Laboratory, Cape Breton University, Sydney, Nova Scotia B1P 6L2, Canada

ARTICLE INFO

Keywords:
Cuticle
Cutin
Corystospermaceae
Triassic
Argentina

ABSTRACT

For the first time, a cutin polymer was obtained from specimens of *Johnstonia coriacea* (Corystospermales, Corystospermaceae) from the Upper Triassic of Cacheuta, Argentina. These are preserved as fossilized cuticles i.e., naturally macerated compressions under anoxic conditions. Laboratory oxidation reactions were used to obtain the cuticle, which after additional, long-term oxidation yielded the cutin polymer. Cutin, cuticles, and fossilized cuticles, were analyzed by semi-quantitative Fourier transform infrared (FTIR) spectroscopy. Cutin IR spectrum was mainly characterized by intense peaks of aliphatic stretching bands at 3000–2600 cm^{-1}, ester C=O groups centered at 1730–1715 cm^{-1}, and aromatic C=C absorption bands at 1645–1640 cm^{-1}. Values of semi-quantitative, IR-derived ratios of cutin were lower than those of the cuticle. The only exception was the notably higher C=O/C=C ratio found in cutin, which is supportive of the presence of ester C=O groups. CH_{al}/C=O value (0.8) of *J. coriacea* compares with those recorded for *Lycopersicon esculentum* (0.8; extant) and *Macroneuropteris sheuchzeri* (0.9; Pennsylvanian), which indicates a similar cross-linking degree of the monomers characterizing the cutin of both extant and fossil taxa.

1. Introduction

Johnstonia Walkom, 1925 is a leaf fossil-genus assigned to the Family Corystospermaceae Thomas (1933), typically found in the Triassic of Gondwana. Walkom (1925) proposed the name *Johnstonia* for a group of relatively small, forked fronds from the Mesozoic of Tasmania (Australia), which can be easily identified by the absence of pinnules, having an entire, slightly lobed or pinnatifid laminar margin, and taeniopteroid venation (e.g., Frenguelli, 1943; Retallack, 1977; Petriella, 1979, 1981, 1985; Stipanicic et al., 1995). However, other authors (e.g., Townrow, 1957; Bonetti, 1966; Archangelsky, 1968) synonymized *Johnstonia* with *Dicroidium* (Gothan, 1912), an iconic Permian-Triassic frond-like leaf that inhabited all Gondwanan continents (Anderson and Anderson, 1983).

Although *J. coriacea* (Johnston, 1887) Walkom, 1925 is one the most common species of the genus, its cuticular morphology is known from a limited number of specimens only (e.g., Jain and Delevoryas, 1967; Archangelsky, 1968; Retallack, 1977). The general chemical composition of the *J. coriacea* cuticle has been studied in the context of coalification characteristics and chemotaxonomy (D'Angelo, 2006; D'Angelo et al., 2011). However, the macromolecular constituents (monomers) of *J. coriacea* cuticle are completely unknown.

In this contribution we report the first data on the resistant nature of a highly aliphatic cutin macropolymer in foliar remains of *J. coriacea* (Upper Triassic, Cacheuta, Argentina).

2. Materials and methods

The *J. coriacea* specimens originated from Upper Triassic strata of the lower Cacheuta Formation (Trinchera La Mary locality, Cacheuta, Mendoza, Argentina) (Fig. 1A–C). Their macro- and micro-morphological features and chemical preservation characteristics are excellent, in agreement with lower vitrinite reflectance values (Ro% = 0.61, sd = 0.07, n = 40) of coal samples from the associated (unnamed) coal seam (Fig. 1B).

The specimens that were freed from the rock matrix (Fig. 2A) using HF (48%) are fossilized cuticles (i.e., naturally macerated compressions under anoxic conditions; see Zodrow and Mastalerz, 2009). These were laboratory-oxidized (using 4–6 g of $KClO_3$ dissolved in 150 mL non-fuming HNO_3) to obtain (1) a bleached cuticular material after one-day treatment, and (2) a beige cuticular material after 60-day treatment at room temperature (see Schulze, 1855). For simplicity, (1) and (2) are

* Corresponding author at: Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA)-CCT-CONICET-Mendoza, Avda. Ruiz Leal s/n Parque Gral, San Martín (5500), Mendoza, Argentina.
E-mail address: joseadangelo@yahoo.com (J.A. D'Angelo).

https://doi.org/10.1016/j.coal.2018.02.016
Received 25 January 2018; Received in revised form 20 February 2018; Accepted 22 February 2018
Available online 24 February 2018
0166-5162/

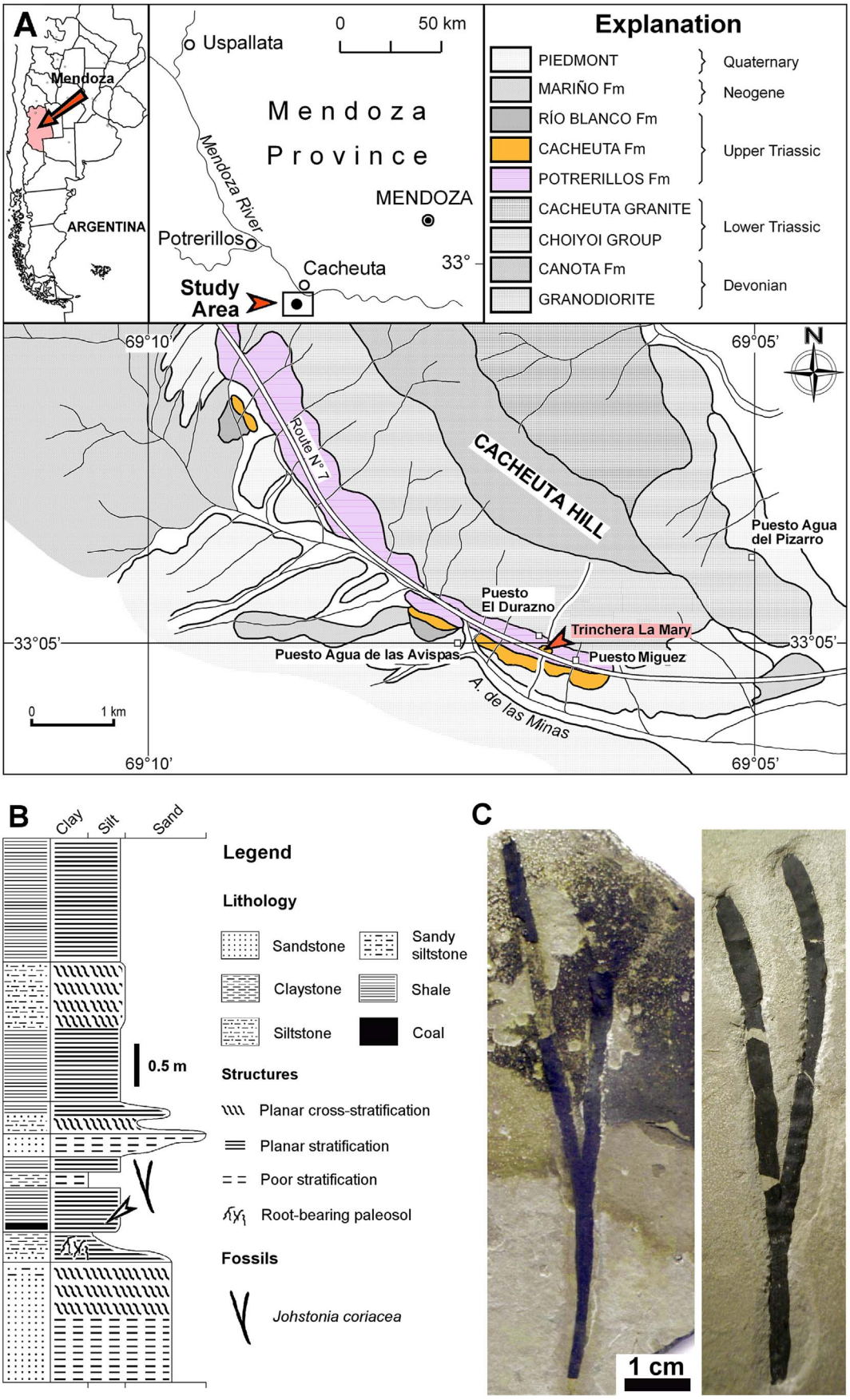

Fig. 1. (A) Location map and geologic sketch of the sampling area. (B) Stratigraphic section of Trinchera La Mary locality, Cacheuta, Mendoza, Argentina. (C) Hand specimens.