Data Article

Fossil Ginkgoales cuticle fine details data from East Inner Mongolia, Northeast China

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\textbf{A B S T R A C T}

The data presented in this article are related to the research paper entitled “Cuticle ultrastructure of \textit{Baiera furcata} from Northeast China and its implication in Taxonomy and Palaeoenvironment” (Guignard et al. 2019 \cite{1}). The data correspond to a study of the ultrastructural fine cuticle details of fossil \textit{Baiera furcata} (Ginkgoales) from the Lower Cretaceous Huolinhe Formation in Hologola of East Inner Mongolia, Northeast China. Two sets of data are provided here: 1/ thickness measurements of the layers of four types of cuticles, i.e. ordinary epidermal cells and stomatal apparatus, 2/ ten EDS element analysis of ordinary epidermal cell cuticle layers; the latter data also contain cuticle layers values of \textit{Sphenobaiera huangii} from the Lower Jurassic Xiangxi Formation in Zigui of Hubei Province, Central China used for comparison in the research article; EDS cell remnant values of \textit{Baiera furcata} are also included. Some of these data have been used efficiently for taxonomy and palaeoenvironment topics. As they are the first data for genera \textit{Baiera} and \textit{Sphenobaiera} of the Ginkgoales, they can serve in the future for considerations of taxonomical comparisons, palaeoreconstructions, palaeoenvironment and evolution.

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Specifications Table

| Subject     | Palaeobotany |
|-------------|--------------|
| Specific subject area | The present data consist in two complementary sets of precise measurements of: 1) the thicknesses of the layers of ordinary epidermal cell cuticles of upper and lower cuticles of fossil plant *Baiera furcata*, and the subsidiary and guard cell cuticles of the stomatal apparatus of the lower cuticle; 2) EDS values of ten elements (C, N, O, Al, Si, S, Cl, K, Cu and Os) in the layers of ordinary epidermal cell cuticles of *Baiera furcata* and *Sphenobaiera huangii*; same EDS values with *Baiera furcata* cell remnants. |
| Type of data | Raw tabulated data |
| How data were acquired | Light microscope, transmission electron microscope TEM, Energy Dispersive Spectroscopy EDS. Numerical images of cuticle details were measured with Image J, with Java and Windows. Data are: original 30 measurements for the thicknesses of the layers; 5 checks for ten elements analysis of cuticles; 10 checks for ten elements of cell remnants. |
| Data format | Raw measurements of the various layers of the cuticle and raw tabulated data of EDS elements analysis |
| Parameters for data collection | Pieces of cuticle were treated with hydrofluoric acid and macerated in Schulze’s solution, then treated with dilute ammonium hydroxide. The samples for TEM and EDS analysis were prepared following Lugardon’s technique (1971 [2] for spores and pollen, adapted for plant cuticles, technique also used for living plant cuticles (conifers and angiosperms; Bartiromo et al. 2012 [3], 2013 [4]). |
| Description of data collection | Fossil cuticles were picked from *Baiera furcata*. The samples were treated with various chemicals. Selected leaves were embedded in Epon resin and cut with diamond knife to get thin sections (1 μm) and ultrathin sections (60–70 nm). The latter sections were mounted on copper grids and two sets were obtained: one set was stained and observed with transmission electron microscope, the other set remained unstained for Energy Dispersive Spectroscopy analysis performed with the same TEM. For *Sphenobaiera huangii* cuticles, report to the research article of Wang et al. [5]. For EDS data, the same technique was used, with the blocks of Epon resin already prepared in this latter research articles. |
| Data source location | Institutions: - Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, 39 East Beijing Road, Nanjing 210,008, China -Univ Lyon, Université Claude Bernard Lyon 1, CNRS, ENTPE, UMR 5023 LEHNA, F-69.622, Villeurbanne, France For the material, *Baiera furcata* was from Holingola City of East Inner Mongolia, Northeast China (45°29’06” N, 119°34’30” E.) *Sphenobaiera huangii* was from Xiangxi Town of Zigui County, Hubei, China (30°50’20” N, 110°40’15” E). |
| Data accessibility | Within the article |
| Related research article | Guignard, C., Yang, X.-J., Wang, Y.-D. Cuticle ultrastructure of *Baiera furcata* from Northeast China and its implication in Taxonomy and Palaeoenvironment [1]. Review of palaeobotany and palynology https://doi.org/10.1016/j.revpalbo.2019.05.006 |

Value of the Data

- This is the first ultrastructural data on cuticle layers thicknesses from *Baiera furcata*, very well preserved in this locality of East Inner Mongolia, allowing a very suitable number of measurements among fossil records. As a member of Ginkgoales, which is the most widespread
Mesozoic fossil group (Harris et al. [6]; Zhou and Wu [7]), it represents rare material in this important order which still has living representatives, allowing future fruitful studies and comparisons.

- These new ultrastructural data of fine details of layers of cuticles concern an ultrastructural group of cuticles within Ginkgoales (Guignard et al. [1]) still poorly documented. Related with the increasing number of fine details studies in this order (Wang et al. [5], Taylor et al. [8], Villar de Seoane [9], Guignard and Zhou [10], Del Fueyo et al. [11], Villar de Seoane et al. [12], Guignard et al. [13], Nosova et al. [14]), a larger data set in this order rich of many taxa and infra-groups may bring new fruitful insights in various topics like taxonomy, palaeoenvironment and evolution (Guignard [15], Niklas [16]).

- Very recent papers and reviews (Seale [17], Kane et al. [18], Bhanot [19]) enhance the interests and promises of plant cuticle studies in very various fields. EDS elements analysis of fossil cuticles is a new topic with still very few data, however Ginkgoales are more and more present (Guignard et al. [1], Del Fueyo et al. [11], Guignard et al. [13]), and provide; new insights in taxonomy, palaeoenvironment are also very promising for evolution (Guignard [15]). Moreover, although fossil plant cell remnants are studied, EDS elements data provided here are very new and may reveal to be valuable for further studies about the knowledge and understanding of plant cells.

1. Data Description

The outer surface of plant leaf is generally surrounded by a cuticle. Generally speaking, in a "theoretical" fossil plant cuticle (= CM, cuticular membrane), two regions may occur: the outer cuticle proper (= CP) made with polylamellate A1 and granulous A2 layers, the inner cuticular layer (= CL) with fibrilis B1 and granulous B2 layers. As the presence or absence of these constituents depend on each taxon and more or less on each type of cuticle within each taxon, a rather high possibility of combinations exist (Guignard [15]). The two taxa data presented here are made with A2 and B1 layers. Two supplementary material (appendices A and B) of cuticle fine details contain thickness values of the layers and for EDS elements values. One supplementary material (appendix C) contains cell remnants EDS data for *Baiera furcata*.

Supplementary material Appendix A contains raw measurements of the cuticle layers of *Baiera furcata*, with 30 values for each of the two layers (A2 and B1) among four types of cuticles observed, namely ordinary epidermal cell cuticles of upper and lower cuticles, subsidiary and guard cell cuticles of the lower cuticle. All values are in µm.

Supplementary material Appendix B contains EDS element analysis checked in both lower and upper layers (namely A2 and B1) of ordinary epidermal cell cuticles of the two taxa *Baiera furcata* (Lindley et Hutton) Braun and *Sphenobaiera huangii* (Sze) Hsü (this latter taxon being formerly studied in the details of its layers in Wang et al. 2005 [5]). Ten elements (C, N, O, Al, Si, S, Cl, K, Cu and Os) were detected and are presented in the raw tabulated results directly extracted from IDFix software linked with the transmission microscope. For each check (5 checks for each layer), 10 columns detail the element analysed (Elt), its line (Ligne: K, L…), its intensity (Int) and error (erreur), K factor (K factor) and its compensation (Comp. KF), weight and atomic percentage (P% and A%), oxide% (Ox%), ratio Peak/background (Pk/Bg).

Supplementary material Appendix C contains EDS element analysis of cell remnants of *Baiera furcata* (Lindley et Hutton) Braun, for ordinary epidermal cell cuticles, detailed as in appendix B. Ten checks were performed.

2. Experimental Design, Materials and Methods

Data were from two species *Baiera furcata* and *Sphenobaiera huangii*, from the former taxon for ultrastructural layers measurements. *Baiera furcata* was collected from the lower coal-bearing
bed of the Huolinhe Formation in the Huolinhe coal mine of Holingola City of the Inner Mongol Autonomous Region, where sometimes it is dominating in some horizons and might be coal-forming plant. Specimens of this site are very well preserved and cuticles were easily picked up from specimens.

The samples for transmission electron microscope (TEM) were prepared following Lugardon's technique[2], performed for spores and pollens and adapted for plant cuticles, also used for living plant cuticles (conifers and angiosperms; Bartiromo et al. [3,4]. This technique (Guignard [15]) consists of one week's procedure, after several weeks of fixation in paraformaldehyde. During the embedding week, cuticles are dropped in Osmium tetroxide (one overnight), then in increasing concentrations of ethanol (one day plus one overnight), then in increasing concentrations of Epon resin mixed with propylene oxyde (one day), finally only in Epon resin, the fifth day a hardener is added to Epon resin. The leaf cuticles are then dropped in moulds where they remain three days at 60 °C. The blocks of Epon resin containing the cuticles are then ready to be cut. 11 pieces, from six leaves, were embedded in Epon resin: five blocks were made from ten treated (HF + Schulze's solution) pieces, one block was made from one untreated material (not used for measurements, as the sections were of unfavorable quality). From these, firstly thin sections (1 μm), mounted on glass slides and observed with Light microscope, enabled to select the best parts of the cuticles for ultrathin sections. Secondly, 110 ultrathin sections of 60–70 nm thickness were collected on uncoated 300 mesh copper grids (100 transversal sections, i.e., perpendicular to the leaf length; ten longitudinal sections, i.e., parallel to the leaf length). Some attempts were also made with ten single-slot oval whole 2 mm/1 mm uncoated copper grids. The sections were then stained with uranyl acetate and lead citrate. Ultrathin sections were selected, observed and photographed with a Philips CM 120 TEM at 80 kV, at the Centre de Technologie des Microstructures (CTµ) of Lyon-1 University, France. Although Sphenobaiera huangii was embedded before in Epon resin (Wang et al. [5]), both taxa were prepared similarly. For the details of numbers of Epon resin blocks and sections of this latter taxon, see Wang et al. [5].

EDS (energy dispersive spectroscopic) analysis was performed on the TEM using SIRIUS SD ENSOTECH and IDFIX software with acceleration voltage 120 kV, spot sizes 1–3, processing time 60–120 s, constant time of four μseconds. Fifteen copper 300 mesh uncoated grids of Baiera furcata and five for Sphenobaiera huangii were made, devoid of uranyl acetate and lead citrate staining.

The hand specimen is housed in the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China. TEM and EDS material, and negatives, are stored in the Lyon-1 University, Villeurbanne, France.

Ethics Statement

The paper is not currently being considered for publication elsewhere.

CRediT Author Statement

Gaëtan Guignard: Conceptualization, Methodology, Data curation, Investigation; Xiao-Ju Yang: Conceptualization, Writing - Original draft preparation, Visualization; Yong-Dong Wang: Writing - Reviewing and Editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.
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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.dib.2021.107163.

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