

Research Advances

New Discovery of Palynological Assemblage for the Shahezi Formation from Type Locality, Southeastern Songliao Basin

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Objective

The Shahezi Formation is the main source rock stratum during the faulting stage of the Songliao Basin, and could not be distinguished from the coal-bearing clastic member of the Yingcheng Formation in lithostratigraphy. Previous petroleum geologists have done a lot of research on palynostratigraphy in drill cores inside the Songliao Basin. The understanding of the palynological assemblage characteristics of the Yingcheng Formation has been agreed (Wan Chuanbiao et al., 2009; Gao Ping et al., 2011; Wang Chenglong et al., 2017), but there is still controversy over the Shahezi Formation. Therefore, the research in the type locality of the Shahezi Formation is more important. This paper first reports the palynological assemblage of the Shahezi Formation in the type locality, providing a new evidence for biostratigraphic division and correlation.

Methods

The type locality of the Shahezi Formation is located at the Shahezi Coal Mine (42°49'5.6"N, 124°10'11.0"E), Shahezi Village, Changtu County, Liaoning Province. According to the research of Yang Xuelin of Jilin Institute of Coal Geology in 1979, the Shahezi Formation can be divided into two members in the Shahezi Coal Mine: the lower member is composed of tuff and tuffaceous mudstone, and the upper member is composed of mudstone, siltstone, conglomerate and coal.

Six palynological samples in this paper were collected from the upper member of the Shahezi Formation in the Shahezi Coal Mine. The samples were treated with hydrochloric and hydrofluoric acid to remove carbonates and silicates, respectively. A Leica DM4000B biomicroscope was used for fossil identification. The detailed experimental process followed some references.

All the slides are stored at the College of Earth Sciences, Jilin University.

Results

Five of the six samples were palynologically productive. Three samples of them were rich in palynological fossils. Based on the quantitatively important taxa, a palynological assemblage named *Granulatisporites-Perinopollenites* was recognized. The characteristics of this assemblage are as follows (Fig. 1):

(1) It is dominated by gymnosperm pollens (71.43%

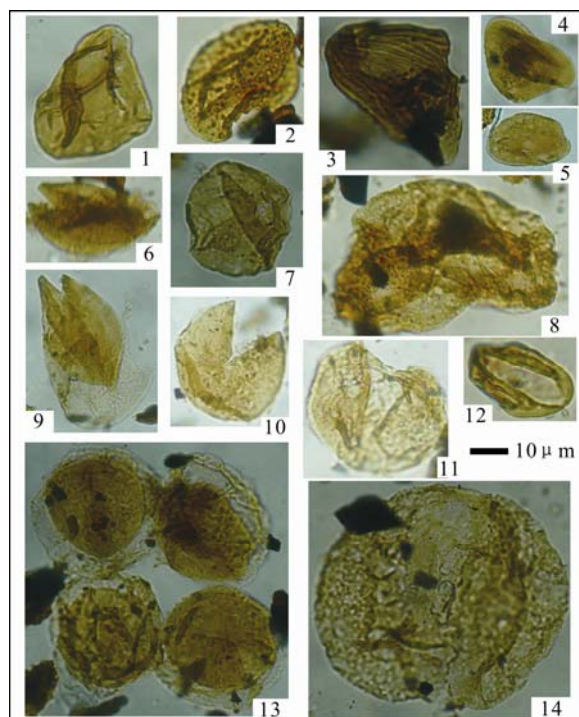


Fig. 1. Typical palynological fossils from the Shahezi Formation in the Shahezi Coal Mine.

(1), *Cyathidites*; (2), *Baculatisporites*; (3), *Cicatricosisporites*; (4), *Granulatisporites*; (5), *Polypodiaceasporites*; (6), *Schizosporis*; (7), *Inaperturopollenites*; (8), *Pinuspollenites*; (9), *Concentrisporites*; (10), *Taxodiaceapollenites*; (11), *Abietinaepollenites*; (12), *Cycadopites*; (13), *Perinopollenites*; (14), *Paleoconiferus*.

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–84.48%), followed by pteridophyte spores (15.52%–28.57%), no angiosperm pollen found.

(2) *Perinopollenites* (13.39%–18.97%) is the most abundant taxa among the gymnosperm pollens, followed by *Taxodiaceapollenites* (7.14%–10.17%), *Abietinaepollenites* (6.78%–12.07%), *Pinuspollenites* (5.36%–8.62%) and *Paleoconiferus* (0.89%–12.07%). *Piceapollenites* (0–6.78%), *Cedripites* (0–5.08%), *Podocarpidites* (0.89%–6.90%), *Concetrissporites* (3.57%–6.78%), *Inaperturopollenites* (0–6.90%), *Spheripollenites* (0–5.36%) and *Cycadopites* (0–5.36%) are common. *Cerebropollenites*, *Protopinus*, *Pseudopinus*, *Abiespollenites*, *Piceites*, *Protopicea*, *Pseudopicea*, *Quadraeculina*, *Pseudowalchites*, *Ginkgo* and *Classopollis* are rare.

(3) Pteridophyte spores are dominated by *Granulatisporites* (1.72%–6.25%), followed by *Polypodiaceasporites* (1.72%–5.36%), *Cyathidites* (1.69%–5.17%), *Schizosporis* (0–5.17%) and *Cicatricosisporites* (0–5.08%). *Osmundacidites* (0–3.39%) and *Fixisporites* (0–3.39%) are common. *Deltoidospora*, *Punctatisporites*, *Concavissimisporites*, *Converrucosisporites*, *Leptolepidites*, *Apiculatisporites*, *Acanthotriletes* and *Baculatisporites* are rare.

The amount of *Perinopollenites* is as high as 13.39%–18.97% in this assemblage. This feature has not been seen in other strata of the Early Cretaceous in the Songliao Basin. The same as most Early Cretaceous palynological assemblages in Northern China, bisaccate pollen grains are abundant in this assemblage (32.10%–39.70%), such as *Abietinaepollenites*, *Pinuspollenites*, *Paleoconiferus* and *Piceapollenites*. However, it is noteworthy that pollen without sacchi is also prosperous (30.51%–39.66%), including *Aletes* (*Inaperturopollenites*, *Taxodiaceapollenites* and *Spheripollenites*), *Monocolpates* (*Cycadopites* and *Ginkgo*) and *Monoporines* (*Perinopollenites* and *Classopollis*). According to the above characteristics, this assemblage is

consistent with that of the Jiufotang Formation in western Liaoning, and obviously different from that of the Yingcheng Formation in the Songliao Basin.

Conclusions

A palynological assemblage named *Granulatisporites-Perinopollenites* was recognized from the type locality of the Shahezi Formation in the southeastern margin of Songliao Basin. The most obvious feature of this assemblage is high content of *Perinopollenites*. Bisaccate pollen and pollen without sacchi are both prosperous. This assemblage is consistent with that of the Jiufotang Formation in western Liaoning, and obviously different from that of the Yingcheng Formation in the Songliao Basin.

Acknowledgment

This research was supported by the research project of Exploration and Development Research Institute of Jilin Oilfield Company Ltd. (Grant No. JLYT-YJY-2013-JS-305).

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