



## ***In situ* pollen of *Alnus kefersteinii* (Goeppert) Unger (Betulales: Betulaceae) from the Oligocene of Bechlejovice, Czech Republic**

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**ABSTRACT.** Pollen grains of *Alnipollenites verus* type were isolated from male catkins found in the Oligocene deposits at Bechlejovice, Czech Republic. This record supported the opinion that *Alnipollenites verus* (Potonié) Potonié is synonymous with *Alnus kefersteinii* (Goeppert) Unger.

**KEY WORDS.** Pollen, palaeobotany, palynology, Tertiary, Bechlejovice, *Alnus*

### INTRODUCTION

Studies of *in situ* pollen are important in regard of taxonomic position of the plants (e.g. Kvaček & Konzalová 1996, Liu et al. 2001, Kohlman-Adamska et al. 2004). In this paper I present the first record of pollen *in situ* of the genus *Alnus* from the Oligocene of North Bohemia. Pollen grains of the *Alnipollenites verus* type have been isolated from two well preserved catkins found in the Bechlejovice locality.

The palaeontological research of the Bechlejovice locality has a long tradition. The first macro remains of fossil plants were reported by Engelhardt (1895). Since that time, numerous palaeontological papers on plants recorded at Bechlejovice have been published (see Kvaček & Walther 2004 for a comprehensive summary).

### MATERIAL AND METHODS

The locality Bechlejovice is situated in the central part of the České středohoří Mountains. Fossiliferous layers are located south-east of the town of Děčín (Fig. 1).

The age of the locality was determined by Konzalová (1981) as Early and early Late Oligocene on the basis of the presence of the index sporomorph *Boehlensipollis hohlii* W. Kr. in the Bechlejovice pollen spectra.

Pollen grains discussed in this paper were isolated from two specimens of *Alnus kefersteinii* (Goeppert) Unger (Fig. 2A, 3A) morphologically identical with other specimens formerly described by Kvaček & Walther (2004, pl. 2, fig. 4). These plant remains are preserved in laminated diatomite as compressions/impressions with small amount of carbonized substance. Attempts to prepare pollen *in situ* were not always successful. Only

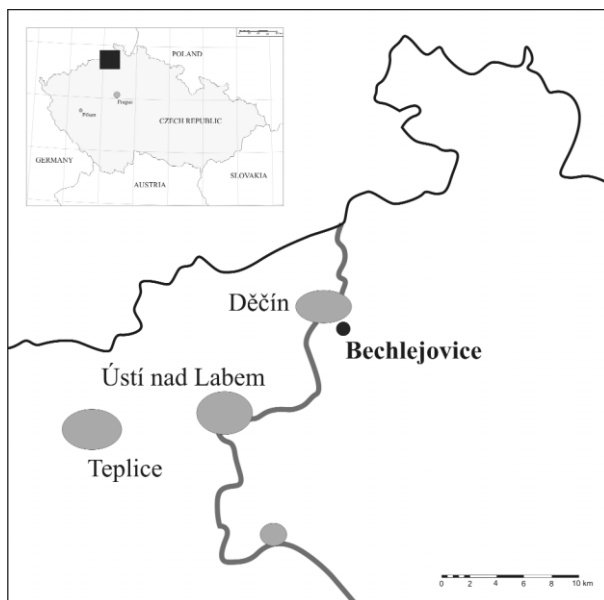


Fig. 1. Map of the central part of the České středohoří Mountains, showing the position of the Bechlejšovice locality.

two catkins yielded pollen described here. Due to poor preservation, only hydrofluoric acid was used for maceration of samples, thereafter the samples were acetolysed (Erdtman 1943). In spite of a long maceration, the pollen rains had to be separated mechanically from each other and from the matrix.

Both catkin-bearing specimens are deposited in the collection of the National Museum, Prague, Czech Republic (NMP).

## SYSTEMATICS

**Family: Betulaceae S. F. Gray**

**Genus: *Alnus* L.**

REMARKS: Macroscopic remains of both male catkins were assigned to *Alnus kefersteinii* (Goepfert) Unger by Kvaček & Walther (2004). These cone-like infructescences are flattened, long stalked. They are 11-15 mm long and 5-8 mm wide. The inflorescences consist of units interpreted as male dichasia. Pollen isolated from stamens of these specimens was determined as *Alnipollenites verus* type.

***Alnus kefersteinii* (Goepfert) Unger**

(Fig. 2A, 3A)

SYN:

1838 *Alnus kefersteinii* Goepfert 1838: 564, pl. 41, figs 1-5. (Salzhausen)

1847 *Alnus kefersteinii* (Goepfert) Unger 1847: 113, pro parte, pl. 33, fig. 2 (non pl. 33, figs 1, 3-4). (Bílina)

1998 *Alnus kefersteinii* (Goepfert) Unger 1847: Kvaček & Walther, 8, pl. 3, figs 5, 6, text-fig. 13.6. (Kundratice)

2004 *Alnus kefersteinii* (Goepfert) Unger 1847: Kvaček & Walther, 20, pl. 2, figs 3, 4, text-fig. 11.8. (Bechlejšovice)

MATERIAL: NMP G08551 (Fig. 2A), NMP G08552 (Fig. 3A).

DESCRIPTION: Male catkins fragmentary, more than 10 mm long, about 8 mm wide, with pollen in situ of the *Alnipollenites verus* type (for description see below). Stamens and florets were not discernible due to their poor preservation.

REMARKS: The same type of inflorescences has been previously described from the Oligocene of Bechlejovice (Kvaček & Walther 2004, p. 20, pl. 2, fig. 4) and Kundratice (Kvaček & Walther 1998, p. 8, pl. 3, fig. 4). In both floras, the catkins were associated with infructescences of *A. kefersteinii* and leaves of *Alnus gaudinii*. These organs obviously belong to the same alder, which was widespread in the Oligocene to Pliocene of Europe (Mai & Walther 1988).

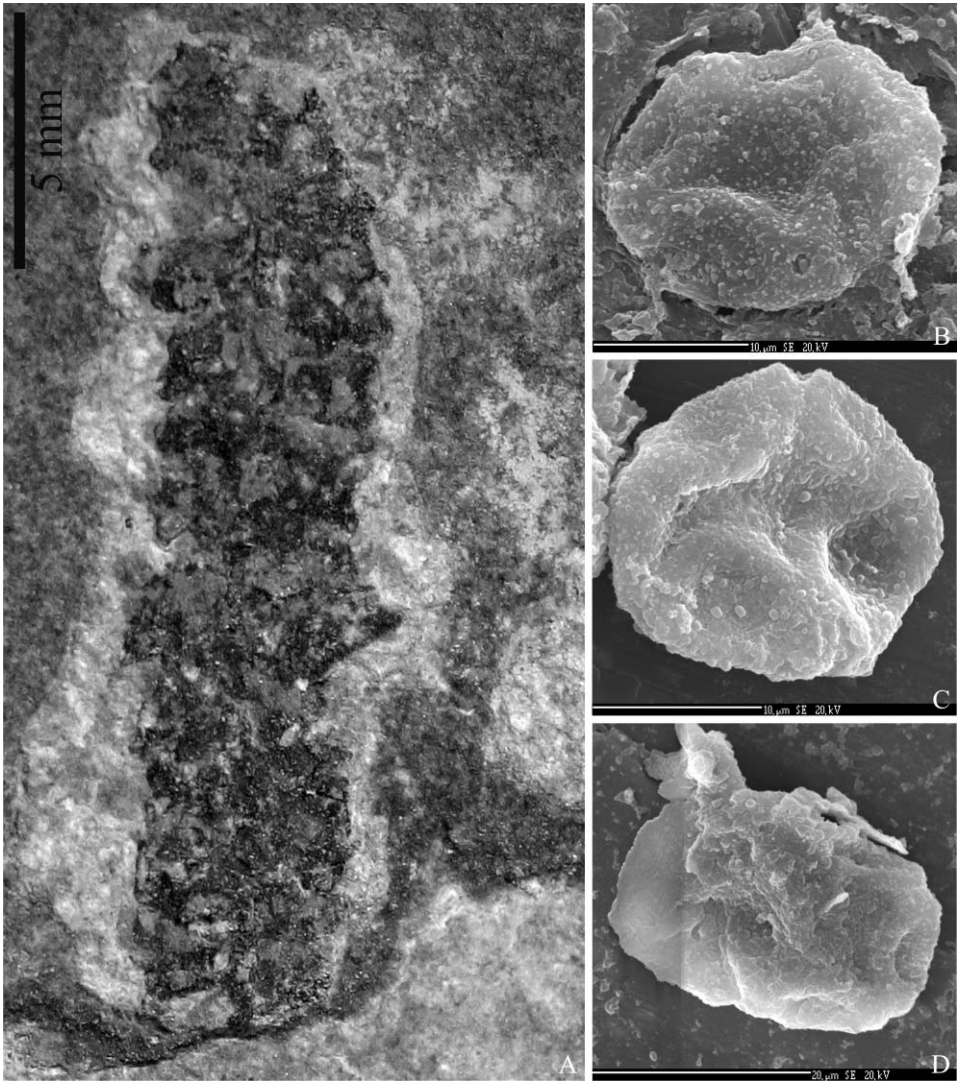


Fig. 2. A: *Alnus kefersteinii* (Goepfert) Unger, male catkin (NMP G08551); B-D: *Alnipollenites verus* (Potonié) Potonié, 5 porate pollen grains isolated from specimen G08551.

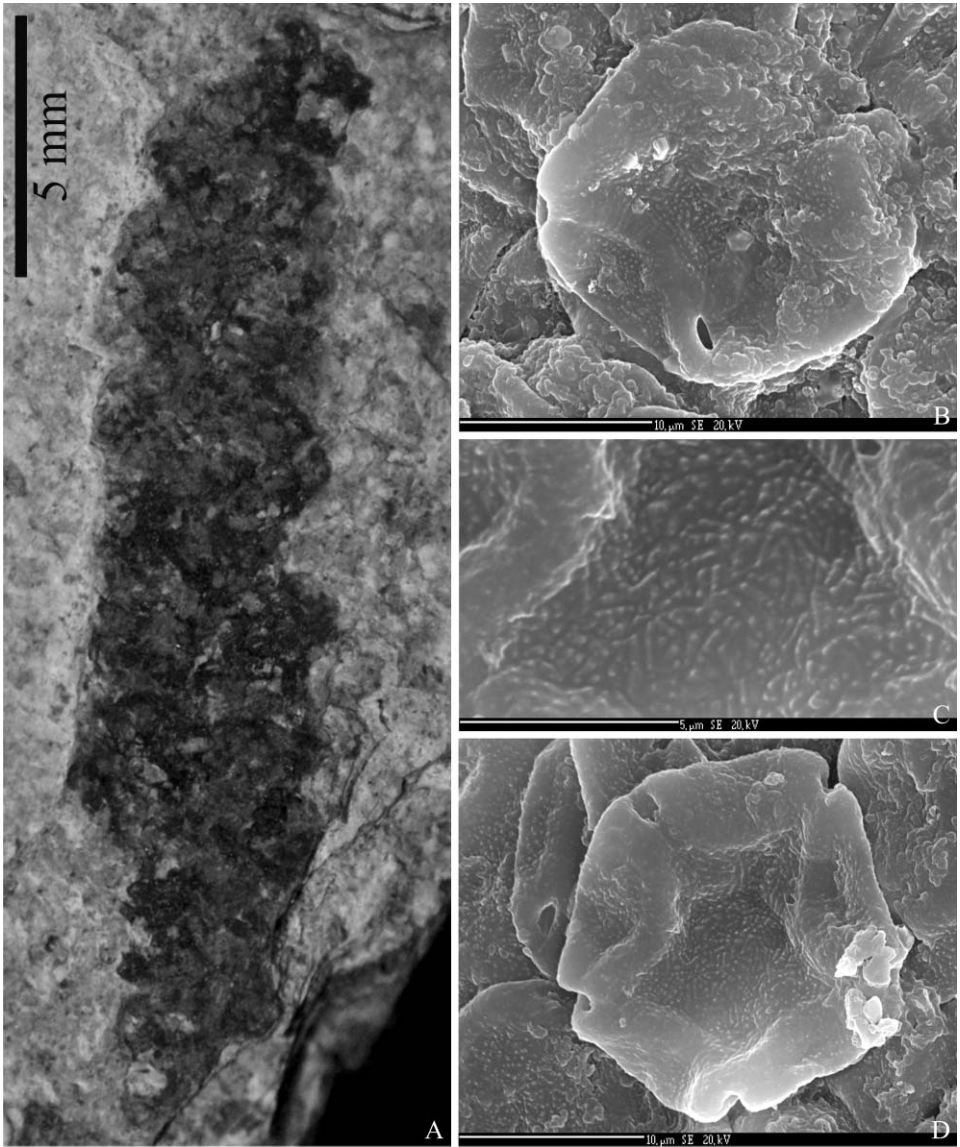


Fig. 3. A: *Alnus kefersteinii* (Goepfert) Unger, male catkin (NMP G08552); B-D: *Alnipollenites verus* (Potonić) Potonić, 5 porate pollen grains isolated from specimen G08552.

***Alnipollenites verus* (Potonić 1931) Potonić 1960**

(Fig. 2B-D, 3B-D)

SYN:

1934 *Alnipollenites verus* R. Pot.: 58-59, pl. 2, figs 13, 17, 18, 25, 26, pl. 6, fig. 28.

DESCRIPTION: Pollen grains have pentagonal shape (Fig. 3D); they are pentaporate with pores having vestibulum. They are 15-20 µm in diameter, having granulate microstructure on the surface (Fig. 3C). Their garland-arranged folds of the exine extend from pore to pore (Fig. 2B, 3D); these so-called arci are typical for the genus *Alnipollenites*.

REMARKS: Pollen grains of *Alnipollenites verus* (Pot.) Pot. were divided according to their size into 3 morphotypes (Nagy 1985). Pollen grains studied in this paper are 15-20 µm in diameter and belong thus to *A. verus* f. *minor* sensu Nagy (1985). This form was described as being 17-19 µm in diameter. There are only pentaporate pollen grains in this inflorescences but sometime (in dispersed spectrum) typical 4, 6 and 7 pored variants can be found (e.g. Nagy 1985, Knobloch et al. 1996).

## CONCLUSIONS

The male catkins of *Alnus kefersteinii* (Goepfert) Unger contain pentaporate pollen grains of *Alnipollenites verus* (Potonié) Potonié. The study of these pollen grains confirmed that catkins from the Oligocene of Bechlejovice belong to *Alnus kefersteinii* (Goepfert) Unger. This conclusion is in agreement with the opinion of Göppert (1838), which was based on gross morphology of catkins.

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## REFERENCES

- Engelhardt H., 1895: Beiträge zur Paläontologie des böhmischen Mittelgebirges. I. Fossile Pflanzen Nordböhmens. – Lotos (Neue Folge) 15: 113-116.
- Erdtman G., 1943: An introduction to pollen analysis. – Waltham, Mass.: Verdoorn, xv + 239 pp.
- Göppert H.R., 1838: De floribus in statu fossili commentatio. – Nova Acta Academiae Caesareae Leopoldino-Carolinae Germanicae Naturae Curiosorum 18: 547-572.
- Kohlman-Adamska A., Ziemińska-Tworzydło M. & Zastawniak E., 2004: In situ pollen in some flowers and inflorescences in the Late Miocene flora of Sośnica (SW Poland). – Review of Palaeobotany and Palynology 132: 261-280.
- Knobloch E., Konzalová M. & Kvaček Z., 1996: Die obereozäne Flora der Staré Sedlo-Schichtenfolge in Böhmen (Mitteleuropa). – Rozprawy Českého Geologického Ústavu 49: 1-260.
- Konzalová M., 1981: *Boehlempollis* und andere Mikrofossilien des böhmischen Tertiärs (vulkanogene Schichtenfolge). – Journal of Geological Science, Paleontology 24: 135-162.
- Kvaček Z. & Konzalová M., 1996: Emended characteristic of *Cercidiphyllum crenatum* (Unger) R. W. Brown based on reproductive structures and pollen *in situ*. – Palaeontographica (B) 239: 147-155.
- Kvaček Z. & Walther H., 1998: The Oligocene volcanic flora of Kundrytice near Litoměřice, České Středohoří volcanic complex (Czech Republic) - a review. – Sborník Národního Muzea, Řada Přírodovědná 54: 1-42.
- Kvaček Z. & Walther H., 2004: Oligocene flora of Bechlejovice at Děčín from the neovolcanic area of the České středohoří mountains, Czech Republic. – Sborník Národního Muzea, Řada Přírodovědná 60: 9-60.
- Liu Y.S., Zetter, R., Mohr B.A.R. & Ferguson D.K., 2001: The flowers of an extinct legume from the Miocene of southern Germany. – Palaeontographica (B) 256: 159-174.
- Mai D.H. & Walther H., 1988. Die pliozänen Floren von Thüringen, Deutsche Demokratische Republik. – Quartärpaläontologie 7: 55-297.
- Nagy E., 1985: Sporomorphs of the Neogene in Hungary. – Geologica Hungarica, Series Paleontologica 47: 1-470.