

Recent Outbreaks of *Gremmeniella abietina* in Slovenia

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Abstract

Brunchorstia dieback has been a recognised disease of conifers in Slovenia since the 1980s. However, the first large-scale outbreak occurred in 2006. The second outbreak followed in 2009. The affected regions were the Ljubljana basin, the Carinthia region and the Alpine region. The outbreaks were closely related to weather conditions; a higher intensity of the disease was induced by colder and longer winters. Austrian and Scotch pine were affected. Apothecia of *Gremmeniella abietina* were found for the first time in Slovenia.

Keywords | *Brunchorstia pinea*, *Pinus*, Scleroderris canker, apothecia, weather conditions

Kurzfassung

Triebsterben-Epidemien durch *Gremmeniella abietina* in Slowenien

Das Brunchorstia-Triebsterben ist in Slowenien seit den 1980er Jahren als Krankheit bei Nadelhölzern bekannt. Der erste großflächige Ausbruch der Krankheit wurde allerdings erst 2006 registriert. Eine zweite Epidemie folgte 2009. Die betroffenen Gebiete waren das Laibacher Becken, die Region Koroška und die Julischen Alpen. Die Epidemien stehen in engem Zusammenhang mit der Witterung, kältere und längere Winter bedingten eine stärkere Intensität der Krankheit. Sowohl Schwarzkiefer als auch Waldkiefer waren betroffen. Erstmals in Slowenien wurden Apothecien von *Gremmeniella abietina* nachgewiesen.

Schlüsselwörter | *Brunchorstia pinea*, Kiefer, Scleroderris-Krankheit, Apothecien, Witterung

Brunchorstia dieback of conifers caused by *Gremmeniella abietina* (Lagerb.) M. Morelet has been a known disease in Slovenia since the 1980s. However, in that period the disease was limited to individual trees in the central part of Slovenia. The first record of *G. abietina* in Slovenia dates back to the 1980s when it was found on a few Austrian pine trees (*Pinus nigra*) in Ljubljana (D. Jurc, unpublished data). The disease was also intercepted in forest nurseries, e.g. on *P. nigra* and *P. wallichiana* in the 1980s (Jurc 1996). The infected plants were destroyed in accordance with legislation. Another record is from 1991 when *G. abietina* was found on the dead branches of a single Norway spruce tree (*Picea abies*) near Ortnek (Jurc et al. 1991). Until 2006, only single occurrences of Brunchorstia

dieback were recorded; in that year, the first large-scale outbreak of Brunchorstia dieback in Slovenia was noted (Ogris and Jurc 2006). Two regions were affected most: the Ljubljana basin and the Carinthia region. In the Ljubljana basin, the disease was most frequent on Scotch pine (*Pinus sylvestris*), but in the Carinthia region the outbreak was limited to Austrian pine (Ogris 2006). In the outbreak areas in 2006, an average 20 % of the crown died off, but it ranged up to 60 %. The second outbreak occurred again in the Carinthia region in 2009 (Ogris 2009). Additionally, a new region was affected: the Julian Alps along the Soča River (record from Bovec on Austrian and Scotch pine; Figure 1).

The outbreaks of *G. abietina* in Slovenia were strongly related to the weather conditions. The winter of 2005/06 was slightly colder, the level of snow cover was higher and snow cover lasted longer. Winter temperatures were 0.5 to 1 °C lower than the long-term average of 1971–2000. The snow cover lasted until the end of March in the valleys (usually to the beginning of February). The case in Slovenia is similar to those documented from Japan and the Swiss Alps. Epidemics of the disease in Japan in 1970 emerged following a prolonged period of snow cover and un-

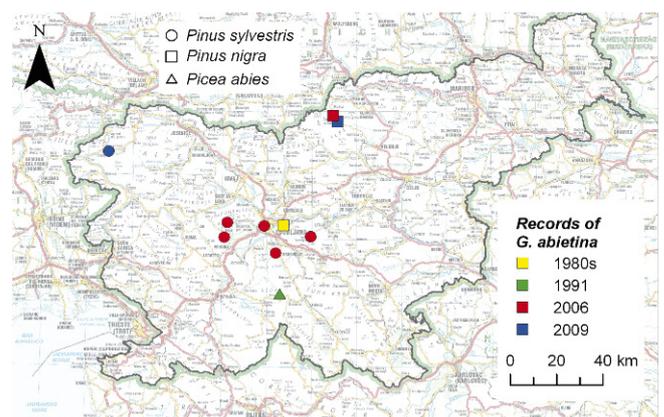


Figure 1: Records of *Gremmeniella abietina* in Slovenia to 2009. The records from the 1980s and 1991 refer to single occurrences of the disease. The records from 2006 and 2009 refer to large-scale outbreaks.

Abbildung 1: Meldungen von *Gremmeniella abietina* in Slowenien bis 2009. Die Meldungen aus den 1980ern und 1991 waren vereinzelte Vorkommen, die Berichte von 2006 und 2009 betreffen großflächige Ausbrüche.

usually low temperatures around 0 °C at the end of September and in the beginning of October in 1969 (Yokota et al. 1975b). In the case study from the Swiss Alps, the dieback level of *P. mugo* and *P. cembra* was strongly correlated to the duration of snow cover in the spring (Senn 1999). Outbreaks are triggered by these conditions because *G. abietina* is already growing at 0 °C while the host is still dormant (Yokota 1975a).

In 2009, we observed apothecia on Austrian pine samples from Žerjav (near Črna in the Carinthia region). Apothecia were brown to black and measured 0.5–1.2 mm. Asci were hyaline and measured 99–127 (110) × 8.7–10.8 (9.7) µm. The asci had eight ascospores. The ascospores were hyaline, with three to four cells, and measured 14.6–20.0 (17.0) × 4.5–5.9 (5.2) µm. To our knowledge, this is the first record of *G. abietina* apothecia in Slovenia. However, we do not know to which strains it belongs; most likely *G. abietina* in Slovenia is part of European-Alpine strain and not of North American or Asian because our strain has the characteristics of the European strain: it seldom produces apothecia and damages mature trees or saplings. Those characteristics differ from the North American strain, which affects mostly saplings up to 2 m height and produces numerous apothecia.

The symptoms for *Brunchorastia* dieback in Slovenia were dead and pitched buds, lesions in the bark that



Figure 2: Dead shoots of the current year are a typical symptom of *Brunchorastia* dieback. At the beginning, the needles are yellowing and browning. Later they fall off.

Abbildung 2: Tote Triebe des laufenden Jahres sind ein typisches Symptom des *Brunchorastia*-Triebssterbens. Zu Beginn sind die Nadeln gelblich und bräunlich, später fallen sie ab.

spread in direction from buds down the shoots, dieback of shoots (from one to three years old, most commonly one-year shoots; Figure 2), needle yellowing and browning (at early stage of the disease), needle shedding (at latter time), healthy needles on older parts of shoots. Pycnidia were located on the buds and needle scars. They measured 0.2–1.4 mm. Conidia were hyaline, curved, with three to five septa, and measured 28–51 × 3–4 µm. The morphological characteristics matched the description of *Brunchorastia pinea* (P. Karst.) Höhn., the anamorph of *G. abietina*.

Recent outbreaks of *G. abietina* in Slovenia reflect suitable ecological conditions for the disease to develop. The expected spread risk is high on *Pinus* spp. and Norway spruce under favourable weather and site conditions. Therefore, a monitoring programme is in place, carried out by the Slovenian Forest Service. In the case of heavily damaged trees, sanitary felling is proposed. Such felling, however, is prohibited in protected areas.

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