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Podosphaera cf. *pruinosa* on *Rhus hirta* in Germany

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Abstract: Boyle, H., Braun, U., Jage, H., Kummer, V. & Zimmermann, H. 2008: *Podosphaera* cf. *pruinosa* on *Rhus hirta* in Germany. Schlechtendalia **17**: 33–38.

The introduction of a new powdery mildew disease on *Rhus hirta* in various parts of Germany (Brandenburg, Rhine-Westphalia, Sachsen-Anhalt and Saxony) is reported. The anamorph found on this host agrees well with the North American *Podosphaera pruinosa*. Although the teleomorph has not yet been found in Germany and a molecular study has not yet been possible due to the lack of fresh North American material for a comparison, there is little doubt that the European outbreak of the *Rhus* powdery mildew disease may be referred to as *Podosphaera pruinosa*. Morphology, taxonomy and distribution of *Podosphaera* species on *Rhus* and other hosts of the Anacardiaceae are discussed in detail.

Zusammenfassung: Boyle, H., Braun, U., Jage, H., Kummer, V. & Zimmermann, H. 2008: *Podosphaera* cf. *prui-nosa* auf *Rhus hirta* in Deutschland. Schlechtendalia **17**: 33–38.

Es wird über das Auftreten einer neuen Mehltaukrankheit auf *Rhus hirta* in verschiedenen Teilen Deutschlands (Brandenburg, Rheinland-Pfalz, Sachsen und Sachsen-Anhalt) berichtet. Die auf diesem Wirt gefundene Anamorphe stimmt gut mit der nordamerikanischen *Podosphaera pruinosa* überein. Obwohl noch keine Teleomorphe in Deutschland gefunden worden ist und ein molekularer Vergleich mangels der Verfügbarkeit nordamerikanischer Aufsammlungen von Frischmaterial noch nicht möglich war, besteht kaum Zweifel, dass der europäische Ausbruch dieser *Rhus*-Mehltaukrankheit auf *P. pruinosa* zurückzuführen ist. Morphologie, Taxonomie und Verbreitung von *Podosphaera*-Arten auf *Rhus* und anderen Wirten der Anacardiaceae werden im Detail diskutiert.

Key words: powdery mildew, Erysiphales, *Rhus*, *Podosphaera*.

In Germany, *Rhus hirta* (L.) Sudw. (= *R. typhina* L.), native in submeridional-temperate (oceanic) eastern North America, is a common ornamental shrub, which is also known as a neophyte in cities (Jäger 2005). Between August and October 2007, numerous collections of the anamorphic state of a powdery mildew have been found in different parts of Germany (Brandenburg, Rhine-Westphalia, Sachsen-Anhalt and Saxony). The symptoms and micromorphological features are characterised as follows (Fig. 1, Plate 1).

Mycelium amphigenous, mainly hypophyllous, but also at the leaf rhachis and the upper stem parts, forming thin white patches or being effuse, heavy infections may cause disfigurations and distortions of stems and leaves as well as reddish brown to deep brown discolorations; hyphae branched, septate, occasionally with constrictions at the septa, hyaline, smooth, thin-walled, 2–6 µm wide, near the base of conidiophores sometimes up to 8 µm wide, with almost indistinct to nipple-shaped appres-

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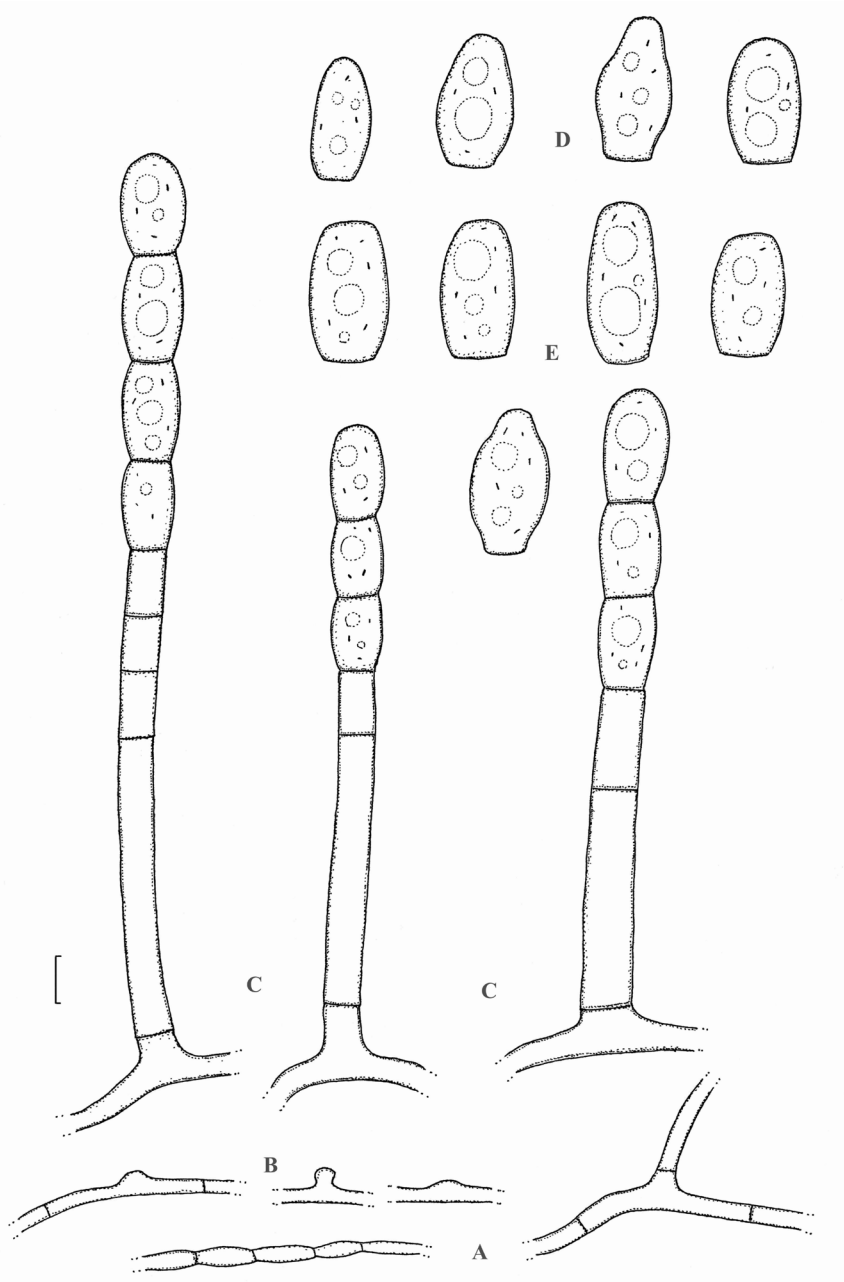


Fig. 1: Anamorph of the powdery mildew *Podosphaera* cf. *pruinosa* on *Rhus hirta*, **A** – hyphae, **B** – appressoria, **C** – conidiophores, **D** – primary conidia, **E** – secondary conidia (bar = 10 µm).

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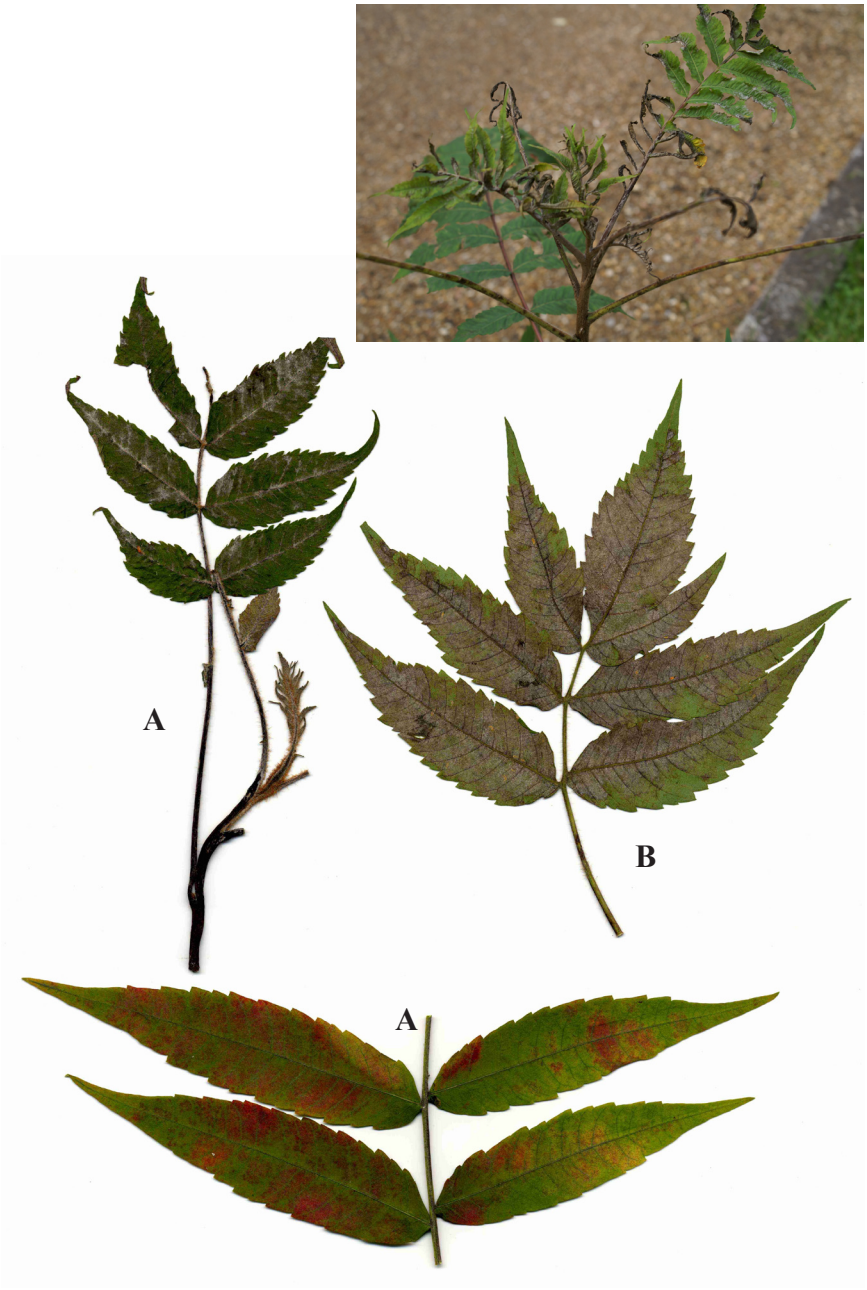


Plate 1: Symptoms of the powdery mildew *Podosphaera* cf. *pruinosa* on *Rhus hirta.* **A** – epiphyllous symptoms, **B** – hypophyllous symptoms. Photo (above): H. Baumbach.

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soria, up to 6 µm diam. Conidiophores arising from superficial hyphae, erect, straight to somewhat curved, subcylindrical, up to about 140 µm long, with foot-cells 30–80(–120)×8–13 µm, followed by (0–)1–2(–3) shorter cells (the basal septum usually formed at the branching point of the mycelium, but occasionally also somewhat distant, up to 20 µm). Conidia catenate, chains with crenate edge lines; primary conidia (first conidia formed) obovoid with rounded apex and subtruncate base, secondary conidia ellipsoid-ovoid, doliiform, both ends subtruncate, 20–35×11–22 µm, length/width ratio 1.3–2.1, hyaline, smooth, with small to large oil drops and conspicuous fibrosin bodies.

Material examined: On *Rhus hirta*, Germany, Brandenburg: Potsdam-West, Werderscher Damm, MTB 3643/2.2, 30 Aug. 2007, V. Kummer 1203/1 (HAL 2080 F, herb. Kummer); Teltow, Lenau Street, car park, MTB 3445/4.4, 16 Sep. 2007, V. Kummer 1203/2 (HAL 2079 F; herb. Kummer); Glindow, Street Langer Grund, garden, MTB 3643/1.4, 14 Oct. 2007, V. Kummer 1203/4 (herb. Kummer); Lübben: near restaurant „Spreeblick“, garden, MTB 4049/3.2, 15 Oct. 2007, V. Kummer 1203/5 (herb. Kummer); Potsdam-West: Forst Street corner Zeppelin Street, border of a garden, MTB 3644/1.1, 17 Oct. 2007, V. Kummer 1203/6 (herb. Kummer); Krugau, south end in the direction of Dürrenhofe, MTB 3949/4.4, 6 Oct. 2007, V. Kummer 1203/3 (HAL 2082 F; herb. Kummer). Sachsen-Anhalt: Könnern, Rothenburger Street, garden, MTB 4336/2, 28 Aug. 2007, H. Zimmermann [Jage 1671/07] (HAL 2086 F); Naumburg, road in the direction to Jena, garden area “Am Kalten Hügel“, MTB 4836/4.2, 2 Sep. 2006, H. Jage [986/07] and U. & K. Richter (HAL 2088 F; herb. Jage); Gatersleben, garden of the ‘Leibnitz-Institut für Pflanzengenetik und Kulturpflanzenforschung’ (IPK), MTB 4133/4, 5 Sep. 2007, P. & D. Hanelt [Jage 1570/07] (HAL 2084 F; herb. Jage); Dübener Heide, Kemberg, Dixmühlenweg/Feldweg, garden, MTB 4241/2.4, 5 Sep. 2007, H. Jage 999/07 (HAL 2085 F; herb. Jage); Magdeburg-Altstadt, area of the university, MTB 3835/4, 11 Sep. 2007, W. Lehmann [Jage 175/07] (HAL 2087 F); Freyburg, Winzerweg, border of a garden, MTB 4736/4.3, 12 Oct. 2007, U. Richter [Jage 1568/07] (HAL 2083 F; herb. Jage); Halle (Saale), Halde Hufeisensee WNW Kanena, MTB 4538/1.3, 6 Oct. 2007, D. Frank (herb. Jage 1809/07); Wittenberg, Poetenweg, MTB 4141/2.2, 10 Oct. 2007, H. Jage 1534/07 (HAL 2089 F); Wittenberg, Schatzung Street, MTB 4141/2.2, 10 Oct. 2007, H. Jage 1541/07 (HAL 2090 F). Saxony: Leipziger Tieflandbucht, Bad Lausick, Bad Street, MTB 4841/4.2, 8 Sep. 2007, H. Boyle & S. Hoeflich (GLM F080772, HAL 2147 F); Erzgebirge, Niederschöna, Ringweg, garden, MTB 5046/2.3, 22 Sep. 2007, F. Klenke [Jage 1673/07] (HAL 2091 F; herb. Jage); Eastern Oberlausitz, Deutsch Ossig, MTB 4855/4.4, 10 Oct. 2007, S. Hoeflich, (GLM F080773, HAL 2146); Muskauer Heide, Sagar, Unterdorf 2, MTB 4454/4.3, 11 Oct. 2007, H. Boyle & S. Hoeflich (GLM F080774, HAL 2145 F). Rhine-Westphalia, Bad Kreuznach, southern part, in gardens, Victoriastift, SE Nahe bridge, MTB 6113/3.1.3., 24 Oct. 2007, H. Hanisch & U. Zahn (herb. Jage 1738/07), Kleist corner Lessing Street, MTB 6113/3.1.4., 26 Oct. 2007, H. Hanisch (herb. Jage 1744/07), on the same tree associated with *Leptothyrium sumacis* Madej (herb. Jage 1744A/07).

Due to the characters of the appressoria and the catenate conidia with fibrosin bodies, this conidial state belongs in *Oidium* subgen. *Fibroidium* Cook et al., which is the anamorph of *Podosphaera* Kunze (Cook et al. 1997, Braun et al. 2002), and agrees well with the brief description of the conidial state of the North American *Podosphaera pruinosa* (Cooke & Peck) U. Braun & S. Takam. [≡ *Sphaerotheca pruinosa* Cooke & Peck] in Braun (1987), which was based on herbarium samples. Although the teleomorph has not yet been found in Germany and a molecular study has not yet been possible due to the lack of fresh North American material for a comparison, there is little doubt that the European outbreak of the *Rhus* powdery mildew disease may be referred to as *Podosphaera* cf. *pruninosa*. *P. pruinosa* is known from eastern and central USA and Canada on *Rhus aromatica* Ait., *R. copallina* L., *R. glabra* L., *R. hirta* and *R. vernix* L. (Amano 1987, Farr et al. 1989). *P. pruinosa* is a new powdery mildew disease for Germany and Europe in general. Other powdery mil-

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dew species of the genus *Podosphaera* on *Rhus* and other hosts of the Anacardiaceae can be excluded due to clear morphological differences. Bolay (2005) recorded *Podosphaera pannosa* (Wallr. : Fr.) de Bary on *Cotinus coggygria* Scop. (≡ *Rhus cotinus* L.) from Switzerland. Hanlin (1963) reported *P. pannosa* from Georgia, USA, on *Rhus glabra*. The anamorph of *P. pannosa* is, however, distinguishable from the conidial form of *P. pruinosa* by its pannose mycelial patches of persistent secondary mycelium. Reports of *Podosphaera macularis* (Wallr. : Fr.) U. Braun & S. Takam. [≡ *Sphaerotheca macularis* (Wallr. : Fr.) Lind] on *Rhus* spp. (Amano 1986, Farr et al. 1989) refer to *P. pruinosa*. *P. macularis* s. str. [= *Sphaerotheca humuli* (DC.) Burrill] is confined to *Humulus* spp., i.e., the application of the names *S. macularis* or *S. humuli* for the *Rhus* powdery mildew was based on the former, wide species concept within the powdery mildew fungi following the old taxonomy of Salmon (1900). *S. macularis* in this circumscription comprises almost the whole former *Sphaerotheca* Lév. sect. *Sphaerotheca*. Plurivorous species of *Podosphaera* sect. *Sphaerotheca* subsect. *Magnicellulatae* (U. Braun) U. Braun & Shishkoff, viz. *P. fusca* (Fr.) U. Braun & Shishkoff and *P. xanthii* (Castagne) U. Braun & Shishkoff, as sources of the outbreak of the European powdery mildew disease of *Rhus hirta* can also be excluded since these species may be distinguished by their shorter foot-cells of the conidiophores and distinct symptoms. Furthermore, the sudden outbreak of this powdery mildew disease is a point in favour of a specific fungus of *Rhus*, since previous, sporadic records of anamorphs on *Rhus* spp. belonging to *Oidium* subgen. *Fibroidium*, indicating infections by plurivorous powdery mildews, are unknown.

References

Amano, K. 1986: Host range and geographical distribution of the powdery mildew fungi. Tokyo, Japan: Japan Scientific Societies Press.

Bolay, A. 2005: Les Oïdiums de Suisse (Erysiphacées). Cryptogamica Helvetica **20**: 3–173.

Braun, U. 1987: A monograph of the Erysiphales (Powdery Mildews). Beihefte zur Nova Hedwigia **89**: 1–700.

Braun, U., Cook, R.T.A., Inman, A. J. & Shin, H.D. 2002: The taxonomy of the powdery mildew fungi, pp. 13–55. In: Bélanger, R., Bushnell, W., Dik, A.J. & Carver, T.L.W. (Eds.): The Powdery Mildews. A comprehensive treatise. APS Press, St. Paul.

Cook, R.T.A., Inman, A.J. & Billings, C. 1997: Identification and classification of powdery mildew anamorphs using light and scanning electron microscopy and host range data. Mycological Research **101**: 975–1002.

Farr, D.F., Bills, G.F., Chamuris, G.P. & Rossman, A.Y. 1989: Fungi on plants and plant products in the United States. APS Press, St. Paul.

Hanlin, R.T. 1963: A revision of the Ascomycetes of Georgia. Georgia Agricultural Experiment Station, N.S., **175**: 1–65.

Jäger, E.J. [Ed.] 2005: Exkursionsflora von Deutschland. Gefäßpflanzen: Grundband. München.

Salmon, E. 1900: A monograph of the Erysiphaceae. Memoirs of the Torrey Botanical Club **9**: 1–292.

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