Cryptogamie, Mycologie, 2005, 26 (4): 293-298

Erysiphe deutziae – a new epidemic spread in Europe

Adrien BOLAY [a], Uwe BRAUN [b], Rolf DELHEY [c], Volker KUMMER [d], Marcin PIĄTEK [e] & Agata WOŁCZAŃSKA [f]*

[a]Conservatoire et Jardin botanique de Genève, CP. 60, CH-1292 Chambésy, Switzerland

[b]Martin-Luther-Universität, FB. Biologie, Institut für Geobotanik und Botanischer Garten, Neuwerk 21, D-06099 Halle (Saale), Germany e-mail: braun@botanik.uni-halle.de

[c]Departamento de Agronomia, Universidad Nacional del Sur, Altos de Palihue, 8000 Bahía Blanca, Argentina ; e-mail: rdelhey@criba.edu.ar

[d]Universität of Potsdam, Institut für Biochemie und Biologie, Lennéstr. 7a, D-14471 Potsdam, Germany e-mail: kummer@rz.uni-potsdam.de

[e]Department of Mycology, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, 31-512 Kraków, Poland e-mail: mpiatek@ib-pan.krakow.pl

[f]Department of General Botany, Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland e-mail: awolczan@biotop.umcs.lublin.pl

Abstract – *Erysiphe deutziae* (Bunkina) U. Braun & S. Takam. is powdery mildew fungus that is currently spreading in Europe. The anamorph of this species has been found in France, Germany, Poland and Switzerland on *Deutzia* sp. (cult.), *Deutzia* × *magnifica* (Lemoine) Rehder and *Deutzia scabra* Thunb. The morphology, taxonomy and worldwide distribution of *Erysiphe deutziae* are described, illustrated and discussed.

Erysiphales / powdery mildew fungus / *Deutzia* / Europe

Résumé – *Erysiphe deutziae* (Bunkina) U. Braun & S. Takam. est un oïdium actuellement en extension en Europe. Le stade anamorphe de cette espèce a été trouvé en France, en Allemagne, en Pologne et en Suisse sur *Deutzia* sp. (cultivé), *Deutzia* × *magnifica* (Lemoine) Rehder et *Deutzia scabra* Thunb. La morphologie, la taxinomie et la distribution mondiale d'*Erysiphe deutziae* sont décrites, illustrées et discutées.

Erysiphales / oïdium / *Deutzia* / Europe

---

* Correspondence and reprints:

INTRODUCTION

The climatic conditions prevailing in Europe in recent years are favourable for epidemic spread of alien powdery mildew fungi. During the last three decades several species have spontaneously appeared and/or expanded in the continent. These fungi are either from North America or East Asia. Examples of introduced North American powdery mildews are *Erysiphe azaleae* (U. Braun) U. Braun & S. Takam. (Piątek, 2003), *Erysiphe elevata* (Burrill) U. Braun & S. Takam. (Ale-Agha *et al.*, 2004), *Erysiphe flexuosa* (Peck) U. Braun & S. Takam. (Ale-Agha *et al.*, 2000) and *Erysiphe symphoricarpi* (Howe) U. Braun & S. Takam. (Kiss *et al.*, 2002). Successful invasions from East Asia are, *inter alia*, *Erysiphe palczewskii* (Jacz.) U. Braun & S. Takam., *E. vanbruntiana* (W.R. Gerard) U. Braun & S. Takam. (Braun, 1995) and *Erysiphe syringae-japonicae* (U. Braun) U. Braun & S. Takam. (Piątek, 2003). Recently another species of Asiatic origin, *Erysiphe deutziae* (Bunkina) U. Braun & S. Takam., has been found in several European countries and seems to be spreading.

MATERIAL AND METHODS

The host plants infected with powdery mildew were collected in man-made habitats, taken to laboratory, air dried, and then examined by means of standard light microscopy (various microscopes have been used by the particular authors, e.g., NIKON Eclipse E600 with Nomarski phase contrast, Olympus BX50). Observations and measurements of microscopic elements were made from slide preparations stained with solution of 5% KOH using oil immersion. Some of them were also made from fresh material. The examined collections are deposited at G, HAL, KRAM, LBLM and herb. Kummer. The abbreviations of the herbaria follow Holmgren *et al.* (1990).

DESCRIPTION

Erysiphe deutziae (Bunkina) U. Braun & S. Takam., Schlechtendalia 4: 7. 2000. (Fig. 1)
= *Microsphaera deutziae* Bunkina, Nov. Sist. Niz. Rast. 10: 80. 1973.

Mycelium on the upper part of leaves, rarely on green fruits, effused, evanescent, forming subcircular to irregular white patches, mycelial mats thin and delicate; hyphae straight to flexuous-sinuous, with septa, moderately branched, 3-5 μm wide; appressoria slightly to distinctly lobed, single or in opposite pairs, 8-10 × 3-5 μm; conidiophores erect, 57.5-82.5 × 7.5-10.0 μm, composed of straight foot cell, 40-70 × 7-10 μm, with a basal septum near the branching point of the mycelium, followed by one or two straight cells; conidia formed singly, doliiform, ellipsoid-cylindrical to oblong-cylindrical, (21.2-)25.0-32.5 × 12.5-15.0 μm, often with oil drops, without fibrosin bodies, with germ tubes at the basal end. Chasmothecia absent.

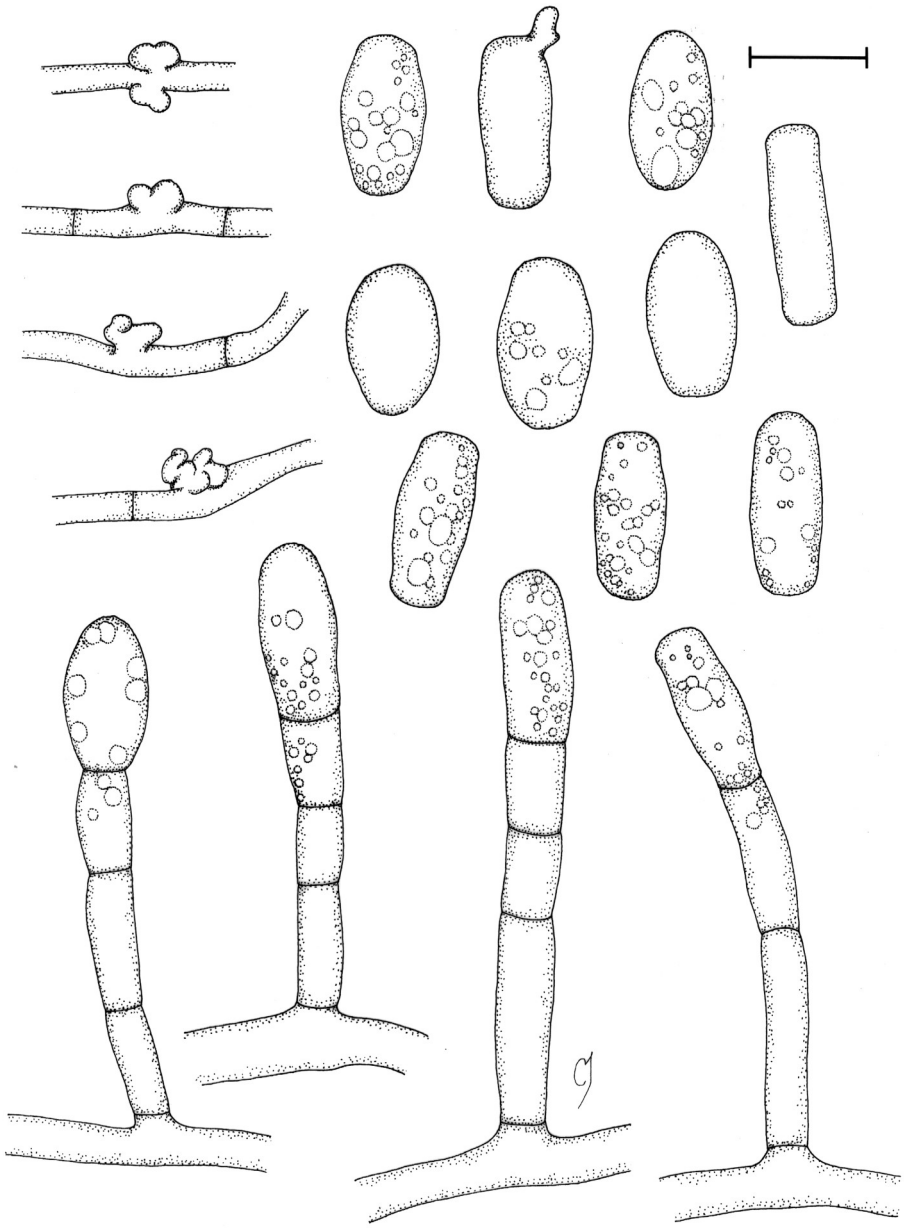

Fig. 1. *Erysiphe deutziae*, appressoria, conidiophores, conidia (bar, 20 μm), drawn by J. Cabała.

Specimens examined: On *Deutzia* × *magnifica* (Lemoine) Rehder (= *Deutzia scabra* × *Deutzia vilmorinae* Lemoine et Bois ex Vilm. et Bois): **GERMANY.** Nordrhein-Westfalen, Düsseldorf, 17 Jul. 2004, *R. Delhey & M. Kiehr* (HAL); On *Deutzia* cf. × *magnifica* (Lemoine) Rehder: **GERMANY.** Brandenburg, Potsdam-Bornim, garden colony Gr. Herzberg 2, 9 May 2002, 12 Oct. 2003, *V. Kummer* (herb. Kummer, 1012/1, 1012/3; HAL); Geltow, Garden Centre near Baumgartenbrück, 13 Jun. 2002, *V. Kummer* (herb. Kummer, 1012/2); On *Deutzia scabra* Thunb.: **FRANCE**. Ain, Autoroute A 40, Cerdon, Aire de repos de Ceignes, Sept. 2002, *A. Bolay* (G), Savoie, Aix-les-Bains, Parc au bord du lac du Bourget, June 2004, *A. Bolay* (G); **POLAND**. Warszawa, at Belwederska Str., 5 Nov. 2004, *M. Piątek* (KRAM). **SWITZERLAND** (all samples collected by A. Bolay and deposited in G). Canton Fribourg, Meynier, bord du lac de Morat, Sept. 2002, Canton Genève, Genève, Jardin botanique, Oct. 2001, Sept. 2002, Aug. 2003, Place des Nation, Oct. 2002, Parc Mon Repos, Oct. 2002, Parc OMC, Oct. 2004, Canton Neuchâtel, Neuchâtel, Expo 02, bord du lac, Oct. 2002, Canton Obwalden, Sachseln, Flüli, Hôtel Montana, Aug. 2002, Canton Vaud, Morges, Ch. du Bochet, Oct. 2001, Sept. 2002, Morges, Parc de l'Indepéndance, Sept. 2002, Sept. 2003, Morges, Park de Vertou, Oct. 2002, Nyon, Ch. de la Redoute, Oct. 2001, Apr. 2003, Nyon, Ch. de Plantaz, Oct. 2001, Sept. 2002, Nyon, Ch. d'Eysins, Oct. 2001, Apr. 2002, Nyon, Ch. Monastier, Oct. 2004, Servion, Zoo, Oct. 2001, Signal de Bougy, Oct. 2001, May 2002, Tolochenaz, Caves Cidis, Oct. 2002, Vevey, Gare CFF, Nov. 2002, Canton Zürich, Zürich, Zoo, Restaurant Alter Klösterli, Oct. 2004; On *Deutzia* sp. (cult.) [*Deutzia scabra* Thunb. × *Deutzia* sp.]: **GERMANY**. Bavaria, Herrsching, Ammersee, 4 Aug. 2004, *R. Delhey* (HAL); **POLAND**. Lublin, 6 Sept. 2004, 19 Oct. 2004, *A. Wołczańska* (LBLM-8478, LBLM-8479).

DISCUSSION

The only powdery mildew known from *Deutzia* spp. is *Erysiphe deutziae*. This species has been described in the genus *Microsphaera* Lév. as *M. deutziae* by Bunkina (1973) from Primorski Krai in the Russian Far East. Molecular studies (Takamatsu *et al.*, 1999; Mori *et al.*, 2000) have shown that morphological characters of chasmothecia are less important for the systematical classification of the powdery mildews than morphological characters of anamorphs. In fact the anamorphs of *Erysiphe* DC. and *Microsphaera* have lobed appressoria and conidia without fibrosin bodies, formed singly on conidiophores. These anamorphs belong to *Oidium* [Link] subg. *Pseudoidium* (Y.S. Paul & J.N. Kapoor) R.T.A. Cook, A.J. Inman & C. Billings (Cook *et al.*, 1997). As a consequence of the above mentioned results, Braun and Takamatsu (2000) reduced the genus *Microsphaera* to synonymy with *Erysiphe* DC. *emend*. and proposed appropriate new combinations, including *Erysiphe deutziae* (Bunkina) U. Braun & S. Takam.

Erysiphe deutziae is a widespread species in the East Asia, known from the Far East of Russia and Japan (Braun, 1987). From the Far East of Russia it has been recorded on *Deutzia glabra* Kom. (Karis, 1995) and *D. parviflora* Bunge [= *D. amurensis* (Regel) Airy Shaw] (Amano, 1986; Braun, 1987; Bunkina, 1991), and from Japan on *D. crenata* Siebold & Zucc., *D. gracilis* Siebold & Zucc. and *D. scabra* Thunb. [incl. *D. sieboldii* var. *dippeliana* C.K. Schneid.] (Amano, 1986; Braun, 1987; Nomura, 1995).

In Europe, *Erysiphe deutziae* has been collected on *Deutzia scabra* and hybrids of this species with other *Deutzia* spp. in France, Germany, Poland and Switzerland. The determination of cultivated *Deutzia* spp. is often very difficult or even impossible, since most plants cultivated as "*Deutzia scabra*" are probably hybrids. The numerous findings in 2004 suggest that *Erysiphe deutziae* is currently

well acclimatized on the European continent and that the species is in an early phase of expansion. However, in all localities known no chasmothecia have been found, i.e., the fungus occurred only as anamorphic state, which is not unusual for powdery mildew fungi introduced to new areas or on new host plants (e.g., Ing, 2000; Kiss *et al*., 2002; Braun *et al*., 2003). It is known that only some of them produce chasmothecia immediately after introduction, e.g., *Erysiphe flexuosa* and *Erysiphe elevata*, the agents of the latest spectacular powdery mildew invasions in Europe. Many other powdery mildew fungi form only anamorphs in the first years after introduction, e.g., *Erysiphe russellii* (Clinton) U. Braun & S. Takam. This powdery mildew has been known from Europe as anamorph since the end of 19th century (Blumer, 1967), chasmothecia are only known since the 1978 (Geljuta & Marchenko, 1987), and currently the teleomorph is known from many regions of the continent. Some other powdery mildews are only able to form anamorphic states despite that they have been introduced to Europe many years ago, e.g., *Erysiphe catalpae* Simonyan and *Erysiphe howeana* U. Braun. Nevertheless, the formation of chasmothecia of *Erysiphe deutziae* could be possible in Europe. As the bushes of various species and interspecific hybrids of *Deutzia* are commonly planted as ornamentals in parks and gardens, the further spreading of this powdery mildew in Europe is possible and can be expected.

Acknowledgements. We are grateful to Dr. Pierre-Arthur Moreau (Lille, France) for translation of French abstract and to Dr. Jolanta Cabała (Kraków, Poland) for her skilful illustrations. This study was supported in part by the State Committee for Scientific Research in Poland (KBN), grant no. 2P04G 076 26p02.

REFERENCES

AMANO K., 1986 — Host range and geographical distribution of the powdery mildew fungi. Japan Scientific Societies Press.

ALE-AGHA N., BRAUN U., FEIGE B. & JAGE H., 2000 — A new powdery mildew disease on *Aesculus* spp. introduced in Europe. *Cryptogamie Mycologie* 21(2): 89-92.

ALE-AGHA N., BOLAY A., BRAUN U., FEIGE B., JAGE H., KUMMER V., LEBEDA A., PIĄTEK M., SHIN H.D. & ZIMMERMANNOVÁ-PASTIRČAKOVÁ K., 2004 — *Erysiphe catalpae* and *E. elevata* in Europe. *Mycological Progress* 3(4): 291-296.

BLUMER S., 1967 — *Echte Mehltaupilze (Erysiphaceae)*. G. Fischer Verlag, Jena.

BRAUN U., 1987 — A monograph of the Erysiphales (powdery mildews). *Beiheft zur Nova Hedwigia* 89: 1-700.

BRAUN U., 1995 — *The powdery mildews (Erysiphales) of Europe*. G. Fischer Verlag, Jena-Stuttgart-New York.

BRAUN U. & TAKAMATSU S., 2000 — Phylogeny of *Erysiphe*, *Microsphaera*, *Uncinula* (Erysipheae) and *Cystotheca*, *Podosphaera*, *Sphaerotheca* (Cystotheceae) inferred from rDNA ITS sequences – some taxonomic consequences. *Schlechtendalia* 4: 1-33.

BRAUN U., CUNNINGTON J.H., BRIELMAIER-LIEBETANZ U., ALE-AGHA N. & HELUTA V., 2003 — Miscellanous notes on some powdery mildew fungi. *Schlechtendalia* 10: 91-95.

BUNKINA I.A., 1973 — Novye vidy i formy mučnisto-rosjanyh gribov juga Primorskogo Kraja (Dal'nego Vostoka). *Novosti Sistematiki Nizshikh Rastenii* 10: 79-83.

BUNKINA I.A., 1991 — *Erysiphales* (pp. 11-142). *In*: Plantae Non Vasuculares, Fungi et Bryopsida Orientis Extreme Sovietici, Fungi, Tomus 2, Ascomycetes, Clavicipitales, Helotiales. Nauka, Leningrad.

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(8): 975-1002.

GELJUTA V.P. & MARCHENKO P.D., 1987 — *Microsphaera russelii* Clint. – novyj dla SSSR vid mučnistorosjanogo griba (Erysiphaceae). *Mikologia i Fitopatologia* 21(2): 122-124.

HOLMGREN P.K., HOLMGREN N.H. & BARBETT L.C., 1990 — *Index herbariorum, Part. 1: The Herbaria of the World. 8th edn*. Regnum Vegetabile 120: 1-163.

ING B., 2000 — *Microsphaera azaleae*, the perfect state of the *Rhododendron* mildew in England. *Mycologist* 14(4): 165.

KARIS H., 1995 — *Erysiphaceae Lév. in Eastern Europe and North Asia*. Botanical Garden Tallinn, Tallinn.

KISS L., BOLAY A., TAKAMATSU S., COOK R.T.A., LIMKAISANG S., ALE-AGHA N., SZENTIVÁNYI O., BOAL R.J. & JEFFRIES P., 2002 — Spread of the North American snowberry powdery mildew fungus, *Erysiphe symphoricarpi* (syn. *Microsphaera symphoricarpi*), to Europe. *Mycological Research* 106(9): 1086-1092.

MORI Y., SATO Y. & TAKAMATSU S., 2000 — Evolutionary analysis of the powdery mildew fungi using nucleotide sequences of the nuclear ribosomal DNA. *Mycologia* 92: 74-93.

NOMURA Y., 1997 — *Taxonomical Study of Erysiphaceae of Japan*. Yokendo LTD, Tokyo.

PIĄTEK M., 2003 — *Erysiphe azaleae* and *Erysiphe syringae-japonicae* introduced in Poland. *Mycotaxon* 87: 121-126.

TAKAMATSU S., HIRATA T., SATO Y. & NOMURA Y., 1999 — Phylogenetic relationships of *Microsphaera* and *Erysiphe* sect. *Erysiphe* (powdery mildews) inferred from rDNA ITS sequences. *Mycoscience* 40: 259-268.