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Studies in *Erysiphales* anamorphs (4): species on *Hydrangeaceae* and *Papaveraceae*

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Abstract — Anamorphic powdery mildews on *Hydrangeaceae* and *Papaveraceae* in Germany are revised. Species are documented in detail including line drawings, photomicrographs, and identification keys. On *Papaveraceae* three species are accepted, specifically *Erysiphe macleayae* on *Chelidonium majus* and *Macleaya cordata*, *E. cruciferarum* on *Eschscholzia californica,* and *Oidium* sp. (an unknown species previously assigned to *E. cruciferarum*) on *Pseudofumaria lutea*. Species on *Hydrangeaceae* are *Oidium hortensiae* on *Hydrangea macrophylla* and *E. deutziae* on *Deutzia* cf. *scabra* and *Philadelphus* cf. *coronarius.* The fungus on the latter host plant was previously assigned to *O. hortensiae. Erysiphe deutziae*, *E. macleayae,* and *Oidium hortensiae* are introduced species.

Key words — conidial germination, morphology, neomycete

Introduction

In Germany, there are three species of *Erysiphales* reported on *Papaveraceae* (*Erysiphe cruciferarum*, *Erysiphe* cf. *macleayae*, *Golovinomyces orontii* (Castagne) Heluta); and two (*Erysiphe deutziae*, *Oidium hortensiae*) on *Hydrangeaceae* (Braun 1995, Jage et. al. 2010). The following is a revision of anamorphs on certain host plants of *Papaveraceae/Hydrangeaceae (Chelidonium, Deutzia, Hydrangea, Macleaya, Meconopsis, Philadelphus* and *Pseudofumaria)* for which the host/pathogen affiliations have been doubtful.

Materials & methods

Both fresh and dried structures were examined in tap water mounts with light microscopy using Olympus BH 2 and Zeiss Axioskop 2 Plus. Pertinent features were measured at a magnification of 400× or 1000× and documented by line drawings and photographs using a Canon A1 or Canon Powershot A80. From each specimen up to 25 spores were measured. To induce conidial germination, the method of Schmidt & Scholler (2002) was applied. Fresh conidia were spread on a microscope slide and placed

in a Petri dish with moist cellulose tissue. The closed Petri dishes were incubated at room temperature and exposed to daylight through a north-facing window for 24 h.

Specimens were studied from HAL, KR, and private herbaria (Herbarium J. Kruse, A. Schmidt). Specimens collected by the authors were deposited in KR (some duplicates in the private herbarium of the first author). Permanent slides were made using Hoyer's medium (Cunningham 1972). If possible, fresh material was studied, but for study of outer cell wall ornamentation of conidia only dried material was used according to Bélanger et al. (2002).

The species concept and nomenclature follows Braun (1999) and Braun & Takamatsu (2000). The host plants are named according to the Flora Europaea (Tutin et al. 1964–80).

Taxonomic descriptions

Species on *Papaveraceae* (incl. *Fumariaceae*)

Erysiphe macleayae R.Y. Zheng & G.Q. Chen PLATE 1

SPECIMENS STUDIED — On *Macleaya cordata* R. Br.: Germany, Brandenburg, Potsdam-Bornim, Am Raubfang, (MTB 3544/3/3), 8 Nov. 2004, leg. V. Kummer (KR 0021921 and herbarium A. Schmidt no. KM 203) (host species cf.) (fresh); Sachsen, Görlitz, Sonnenstr. 17, front garden of Dunger house of Staatliches Museum für Naturkunde, 25 Oct. 2005, leg. et det. H. Boyle as «cf. *Erysiphe macleayae* R.Y. Zheng & G.Q. Chen» (HAL 2209 F = GLM F070246), with hyperparasite *Ampelomyces quisqualis*; Brandenburg, Teltow, Lichterfelde direction, Lenaustr., 18 Sep. 2009, leg. et det. V. Kummer as «cf. *Erysiphe macleayae* R.Y. Zheng & G.Q. Chen» (HAL 2133 F) (dry). On *Meconopsis cambrica* (L.) Vig.: Germany, Niedersachsen, Hannover, Zoo, Adenauerallee 3, wayside (MTB 3624/2/1), 55 m, 9 Oct. 2009, leg. J. Kruse, det. U. Braun, anamorph + teleomorph with mature ascomata on stem (mixed infection with *Peronospora meconopsidis* Mayor, det. M. Scholler) (herbarium J. Kruse no. E 0293) (dry).

Mycelium conspicuous, dense, either covering the whole surface or around leaf veins, whitish to slightly brownish, amphigenous, but predominantly epiphyllous; sterile hyphae hyaline, branched, smooth, 3.5–7 µm wide; hyphal appressoria lobed or nipple-shaped, singly or in pairs; epiphyllous conidiophores 45–90 µm, 5.5–11 µm wide, attenuated toward base, lowermost cell up 8 µm, uppermost cell up to 11 µm wide, 3-celled, rarely 2- or 4-celled, foot-cell, longest cell of conidiophores, 25–40 µm long, often curved; conidia formed singly, ellipsoid to cylindrical (-doliiform), 26.5–44.0(–47.5) × (10–) 14.5–18.5(–20) µm, length/width ratio 1.8–3, average 2.4 (dry material) or 2.1–3.4, average 2.5 (fresh), wrinkling pattern of outer wall angular, of end wall fibrillar; germ tubes subapically inserted, non- to two-septate, short to long, 20–115 × 2.5–6.0 µm, germ tubes terminating simply or in a club-shaped or rarely in a lobed appressorium, sometimes branching.

Erysiphe cf. ***macleayae*** R.Y. Zheng & G.Q. Chen on *Chelidonium majus* PLATE 2

SPECIMENS STUDIED — On *Chelidonium majus* L.: Germany, Brandenburg, Potsdam, Lennéstr./Carl-von-Ossietzky-Str., 4 Oct. 2004, leg. V. Kummer (KR 0021909 and

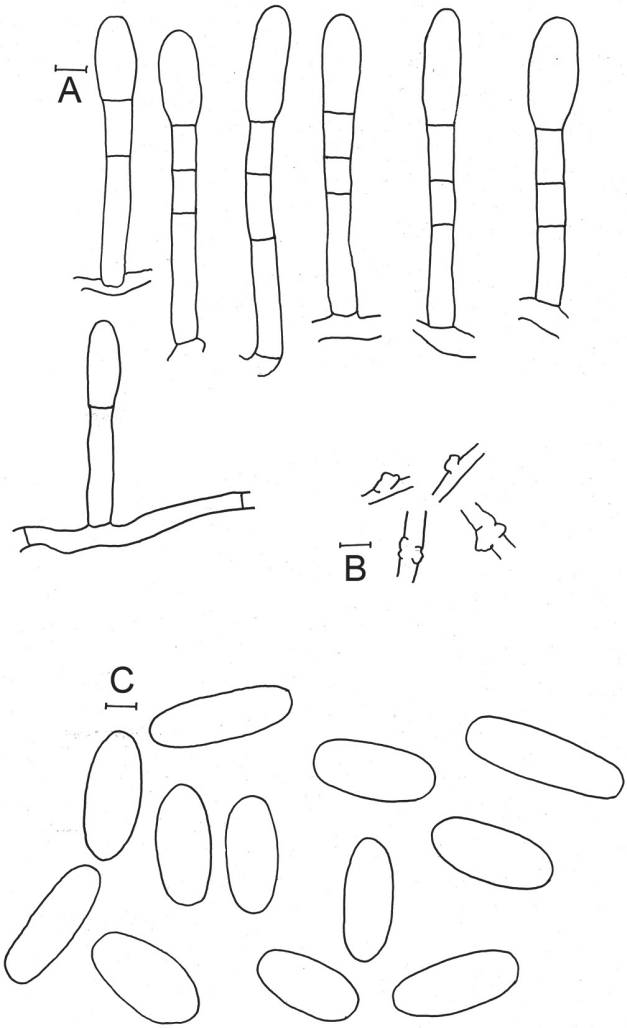

Plate 1. *Erysiphe macleayae* on *Macleaya* cf. *cordata* (KR 0021921 = KM 203). A. Conidiophores (epiphyllous), B. Appressoria, C. Conidia. Bar = 10 µm; drawings by A. Schmidt.

herbarium A. Schmidt no. KM 202) (fresh); Brandenburg, Potsdam, Maulbeerallee 2, 25 Sep. 2005, leg. V. Kummer (KR 0021933 and herb. A. Schmidt no. KM 212) (fresh); Thüringen, Jena, near University, Institut für Ökologie, near Dornburger Straße, 18 Oct. 2005, leg. V. Kummer (KR 0021934 and herbarium A. Schmidt no. KM 215); Thüringen, Bad Frankenhausen, on town wall between Fritz-Brather-Str. and Franz-Winter-Str., 14 Oct. 2007, leg. A. Schmidt (KR 0002945 and herbarium A. Schmidt no. KM 250) (fresh); Baden-Württemberg, Karlsruhe, Grünwinkel, Albsiedlung, Silcherstr., slope, 110 m, 13

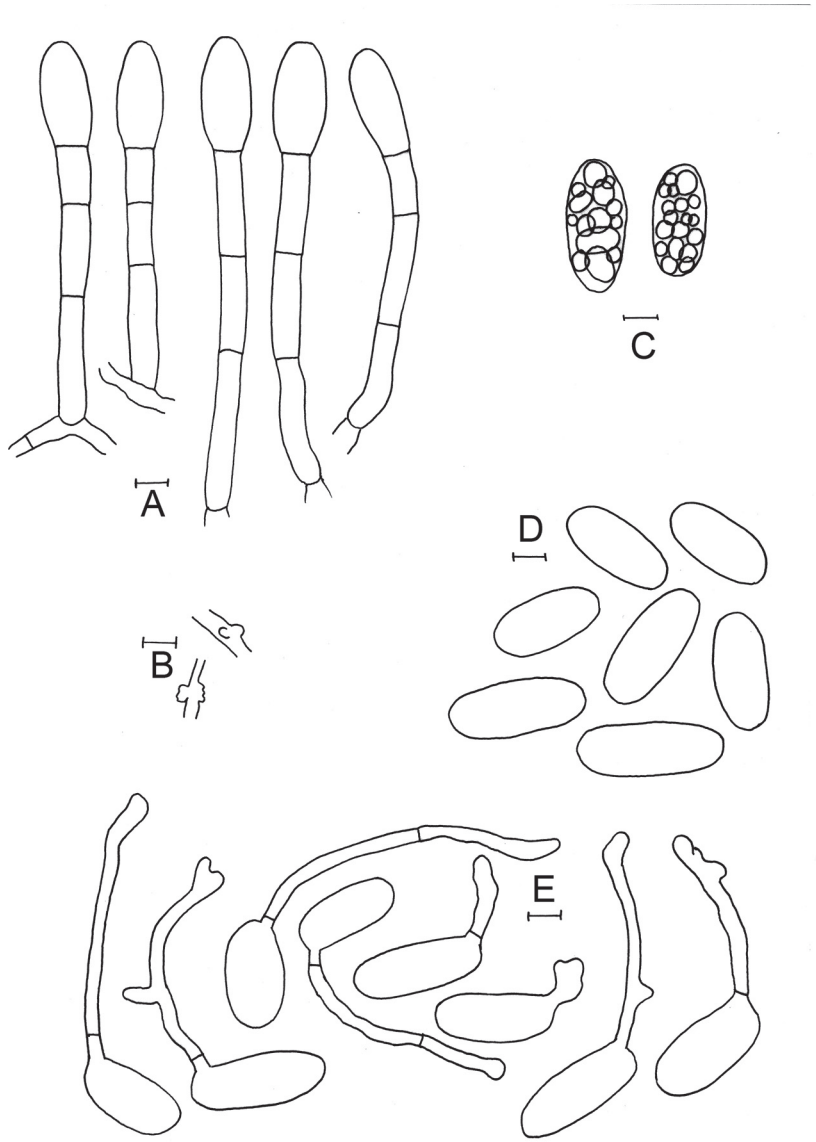

Plate 2. *Erysiphe* cf. *macleayae* on *Chelidonium majus*. A. Conidiophores (epiphyllous) (KR 0021909 = KM 202), B. Appressoria (KR 0021934 = KM 215), C. Conidia with oil drops (KR 0004850), D. Conidia (KR 0021909 = KM 202), E. Germinated conidia after 24 h in moist chamber cultures (KR 0021909 = KM 202). Bar = 10 µm; drawings 2A, B, D, E by A. Schmidt, 2C by M. Scholler.

Sep. 2009, leg. M. Scholler (KR 0004850) (fresh). Hungary, Martonvásár, 9 Sep. 2004, leg. et det. T. Jankovics (2007) as «*Oidium* sp. » (HAL 1842 F) (dry).

Mycelium not conspicuous, not dense, arachnoid, whitish, amphigenous, predominantly epiphyllous, often around leaf veins and leaf margins; sterile hyphae superficial, hyaline, sparingly branched, smooth, 3.5–6 µm wide; hyphal appressoria rarely formed, lobed or nipple-shaped, single or sometimes in pairs; epiphyllous conidiophores 60–115 µm, 7–10.4 µm wide, sometimes slightly attenuated toward base, with uppermost cell widest, 3-celled, rarely 2-celled, foot-cell, longest cell of conidiophore, 31–70 µm, often curved, uppermost cell often shortest; conidia formed singly, ellipsoid, partly cylindrical, (28–) 31–40(–46.5) × (11.5–)12.5–17.5(–18.5) µm, length/width ratio 2.1–3 (average 2.4), wrinkling pattern of outer wall with angular ridges, partly without ridges; germ tubes subapically inserted, non- to two-septate, first septum close to conidium, germ tubes short to long, 15–125 × 3.5–6.0 µm, terminating simply or in a club-shaped or, if in short germ tubes, then in a lobed appressorium, sometimes branching.

Erysiphe cruciferarum Opiz ex L. Junell PLATE 3

SPECIMENS STUDIED — On *Eschscholzia californica* Cham.: Germany, Niedersachsen, Soltau, Heidepark, wayside (MTB 2925/3), 57 m, 23 Sep. 2009, leg. J. Kruse (herbarium J. Kruse no. E 0279, mixed infection with *Acroconidiella eschscholziae* (Harkn.) M.B. Ellis) (dry).

Mycelium not conspicuous, sparse, whitish, amphigenous, mainly hypophyllous and caulicolous; sterile hyphae superficial, hyaline, sparingly branched,

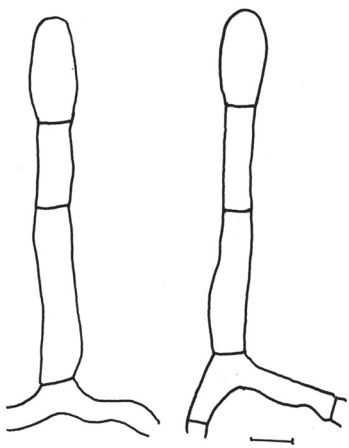

PLATE 3. *Erysiphe cruciferarum* on *Eschscholzia californica* (herb. J. Kruse no. E 0279). Conidiophores (hypophyllous). Bar = 10 µm; drawings by M. Scholler.

smooth, 4–10 µm wide; hyphal appressoria lobed; hypophyllous conidiophores central on mother cell, 55–70(–100) µm, 7.5–9.5 µm wide, sometimes slightly attenuated, 2–3(–4)-celled, foot-cell, longest cell of conidiophore, straight or rarely slightly curved; conidia formed singly, cylindrical to ellipsoid, 37.5–52.5 × (12.5–)14.5–18.5 µm, length/width ratio 2–3.9 (average 2.9), wrinkled wall surface angular; germ tubes inserted subapically, non- to one-septate, 20–55 × 3.5–5.5 µm, terminating simply or in a club-shaped appressorium.

Oidium sp.

Specimens studied — On *Pseudofumaria lutea* (L.) Borkh. (≡ *Corydalis lutea* (L.) DC.): Germany, Brandenburg, Potsdam-Bornim, Florastr. 4, 2 Oct. 2004, leg. et det. V. Kummer as «cf. *E. werneri*» (HAL 2123 F) (dry); Germany, Sachsen-Anhalt, Tangermünde, "Roßfurth", Elbtor, shady wall, 8 Oct. 2004, leg. et det. H. Jage as «*Oidium*» (HAL 2124 F) (dry, scanty material).

Mycelium conspicuous, dense, whitish, amphigenous, predominantly hypophyllous; sterile hyphae hyaline, branched, smooth, 4–6.5 µm wide; hyphal appressoria lobed or nipple-shaped in pairs; conidiophores 65–130 µm long; epiphyllous 65–75 µm, hypophyllous 95–125 µm, uniformly 5.5–9 µm wide, not attenuated toward base, (2–)3(–4)-celled, foot-cell, longest cell of conidiophore, straight or sinuous; conidia formed singly, cylindrical to ellipsoid, 29.5–50.0 × 9–12(–13) µm, length/width ratio 2.3–5.3 (average 3.6), wrinkled outer wall angular; germ tube subapically inserted, non-septate, 20.5 × 3 µm, terminating simply.

Species on *Hydrangeaceae*

Oidium hortensiae Jørst. Plate 4

Specimens studied — On *Hydrangea macrophylla* (Thunb.) Ser.: Germany, Berlin, Lichterfelde, Hortensienstr., balcony, flower-pot, 27 Jun. 1993, leg. M. Scholler (KR 0003726) (fresh); Hamburg-Nienstedten, Cordsstr. 3, Cords nursery, flower-pot, 26 Jun. 2009, leg. A. Schmidt (KR 0024164, herbarium A. Schmidt no. KM 275) (fresh).

Mycelium not conspicuous, not dense, arachnoid, whitish, in small patches on violet spots, amphigenous; hyphal appressoria numerous, lobed, in pairs, often in sequences of several pairs (up to 4); epiphyllous and hypophyllous conidiophores about central on mother cell, 40–130 µm long, 7–10 µm wide, mostly 2–3-celled, rarely 4–5-celled, foot-cell 17–45(–50) µm long, mostly straight, sometimes attenuated toward base or curved, 4–5-celled conidiophores occur on both sides of the leaf, conidiophores longer and slightly narrower below; conidia formed singly, ellipsoid to cylindrical, partly doliiform or ovoid, (25–)27–40(–45) × (11.5)–13–22 µm, length/width ratio 1.7–3.1 (average 2.2), wrinkling pattern of outer wall with mainly longitudinal, slightly angular ridges; germ tubes subapically inserted, one-septate, 20–88 × 2–5 µm, germ

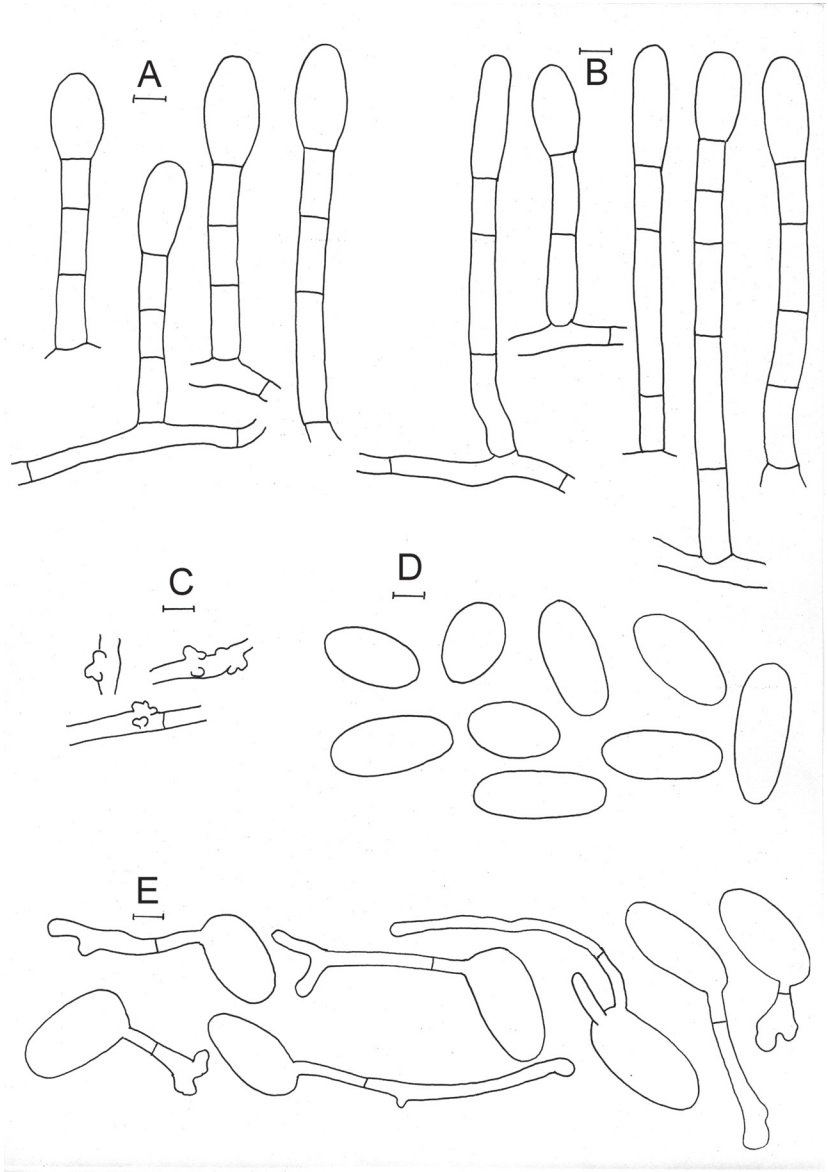

Plate 4. *Oidium hortensiae* on *Hydrangea macrophylla* (KR 0024164 = KM 275). A. Conidiophores (epiphyllous), B. Conidiophores (hypophyllous), C. Appressoria, D. Conidia, E. Germinated conidia after 24 h in moist chamber cultures. Bar = 10 μm; drawings by A. Schmidt.

tubes short to long, rarely terminating simply, mostly in a club-shaped or lobed appressorium, sometimes branched, often germinating with two or three germ tubes per conidium.

Erysiphe deutziae (Bunkina) U. Braun & S. Takam. on *Deutzia* PLATE 5

SPECIMENS STUDIED — On *Deutzia* cf. *scabra* Thunb.: Germany, Hamburg-Nienstedten, Wesselhoeftpark, 27 Jun. 2009, leg. A. Schmidt (KR 0024165, herbarium A. Schmidt no. KM 276/1) (fresh); Hamburg-Nienstedten, Wesselhoeftpark, 18 Jul. 2009, leg. A. Schmidt (KR 0024168, herbarium A. Schmidt no. KM 276/2) (fresh).

Mycelium not conspicuous, not dense, whitish, epiphyllous, low rate of infection; hyphal appressoria numerous, lobed, in pairs; epiphyllous conidiophores 55–65 µm long, 8–10 µm wide, sometimes slightly attenuated toward base, 2–3-celled, foot-cell 25–35 µm long, straight or sometimes curved; conidia formed singly, mostly ellipsoid, partly ovoid or doliiform, 26.5–36(–40) × (16.5–) 18–20 µm, length/width ratio 1.4–2.2 (average 1.7), fresh conidia with numerous small conspicuous droplets beside large oil drops, wrinkling pattern of outer cell wall irregular with interrupted longitudinal and angular ridges; germ tubes subapically inserted, always one-septate, septum distant from conidium, mostly about middle of germ tube, germ tubes short to moderately long, 25–125 × 3.0–4.5 µm, terminating in a mostly lobed or club-shaped appressorium.

Erysiphe deutziae (Bunkina) U. Braun & S. Takam. on *Philadelphus* PLATES 6–8

SPECIMENS STUDIED — On *Philadelphus* cf. *coronarius* L. (cult.): Germany, Nordrhein-Westfalen, University campus, 20 Mar. 2003, leg. G. Feige & N. Ale-Agha (published as *Oidium* cf. *hortensiae*, see Ale-Agha et al. 2008), Baden-Württemberg, Karlsruhe-Grünwinkel, Silcherstr. 25, garden, 20 Aug. 2008, leg. M. Scholler (KR 0025921, herbarium A. Schmidt no. KM 269/1) (fresh); Baden-Württemberg, Karlsruhe-Grünwinkel, Silcherstr. 25, garden, 26 Aug. 2008, leg. M. Scholler (KR 0025922, herbarium A. Schmidt no. KM 269/2) (fresh).

Mycelium not conspicuous, not dense, whitish, arachnoid, amphigenous and on fruits; hyphal appressoria numerous, lobed, mostly in pairs; epiphyllous conidiophores 50–75 µm long, 8.5–12.0 µm wide, slightly attenuated toward base, 2–3-celled, upper cell sometimes slightly swollen, foot-cell 21–31 µm, straight or sometimes slightly curved, hypophyllous conidiophores not different in length; conidia formed singly, mostly ellipsoid, partly ovoid or doliiform, 24–34.5 × (16.5–)17.5–20(–22) µm, length/width ration 1.3–1.9 (average 1.6), fresh conidia with numerous small conspicuous oil drops beside large oil drops, wrinkling pattern of outer cell wall with mainly longitudinal ridges; germ tubes subapically inserted, non- to one-septate, septum distant from conidium, about middle of germ tube, germ tubes short to long, 20–84 × 3.5–5.5 µm, terminating simply, in a lobed or club-shaped appressorium.

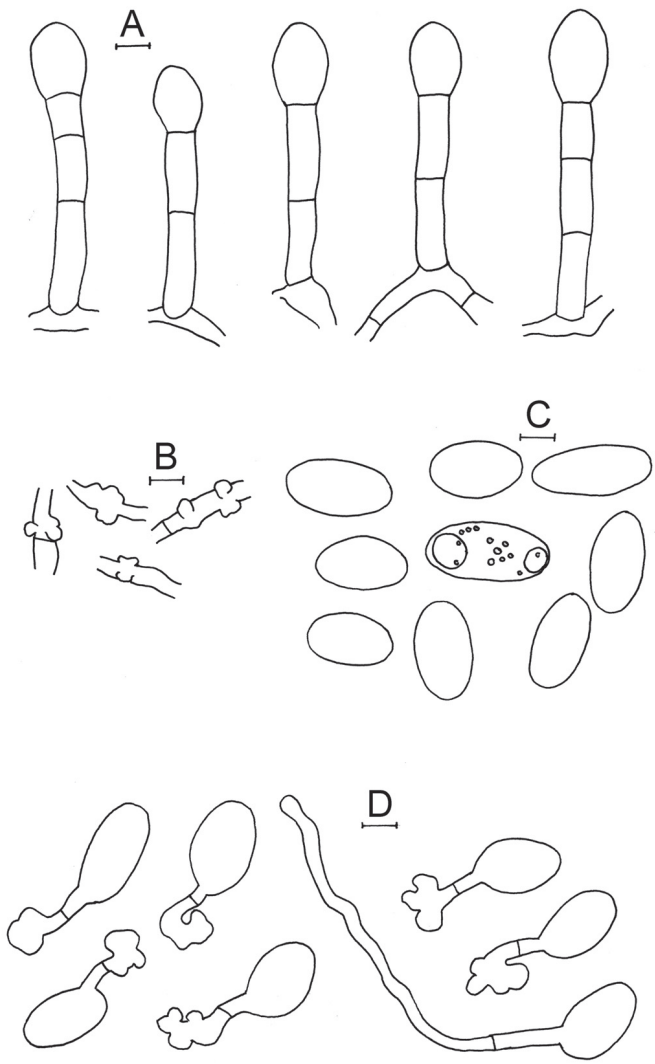

Plate 5. *Erysiphe deutziae* on *Deutzia* cf. *scabra* (KR 0024165 = KM 276/1). A. Conidiophores (epiphyllous), B. Appressoria, C. Conidia, D. Germinated conidia after 24 h in moist chamber cultures. Bar = 10 µm; drawings by A. Schmidt.

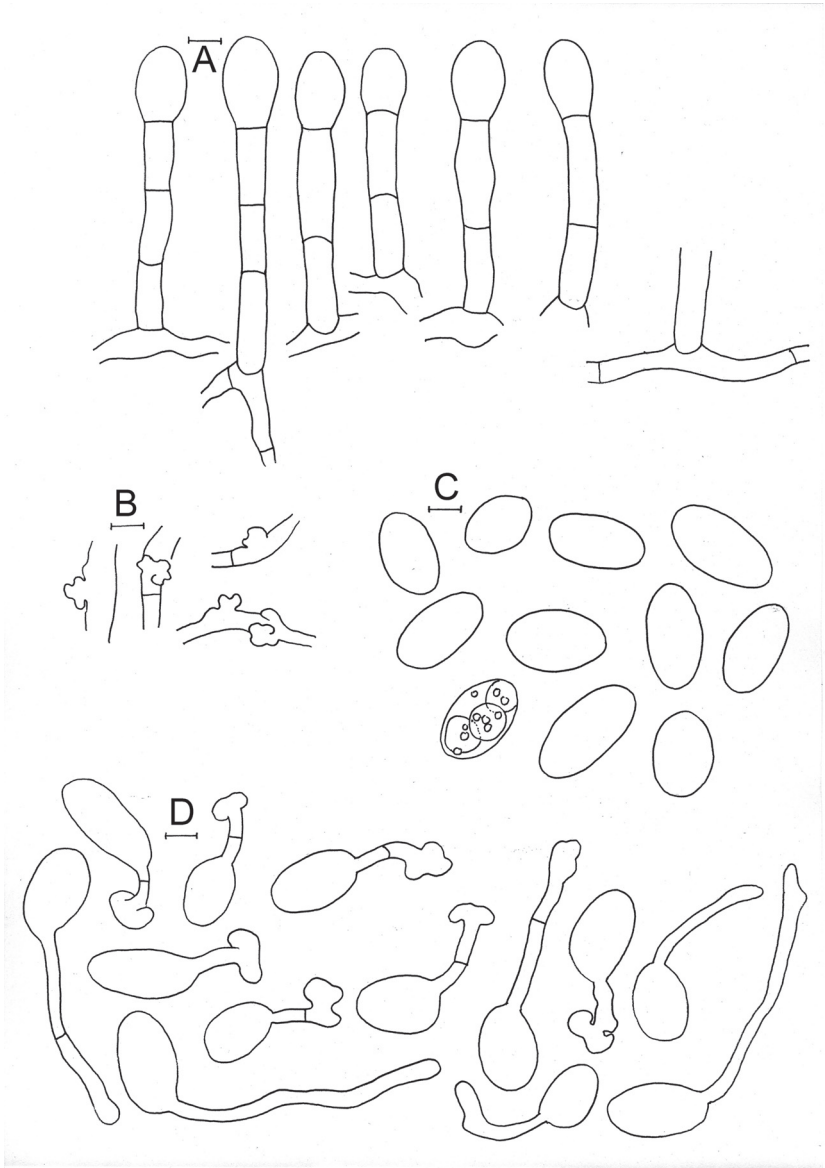

Plate 6. *Erysiphe deutziae* on *Philadelphus* cf. *coronarius*. A. Conidiophores (epiphyllous) (KR 0025921 = KM 269/1), B. Appressoria (KR 0025921 = KM 269/1), C. Conidia (KR 0025921 = KM 269/1), D. Germinated conidia after 24 h in moist chamber cultures (KR 0025922 = KM 269/2). Bar = 10 µm; drawings by A. Schmidt.

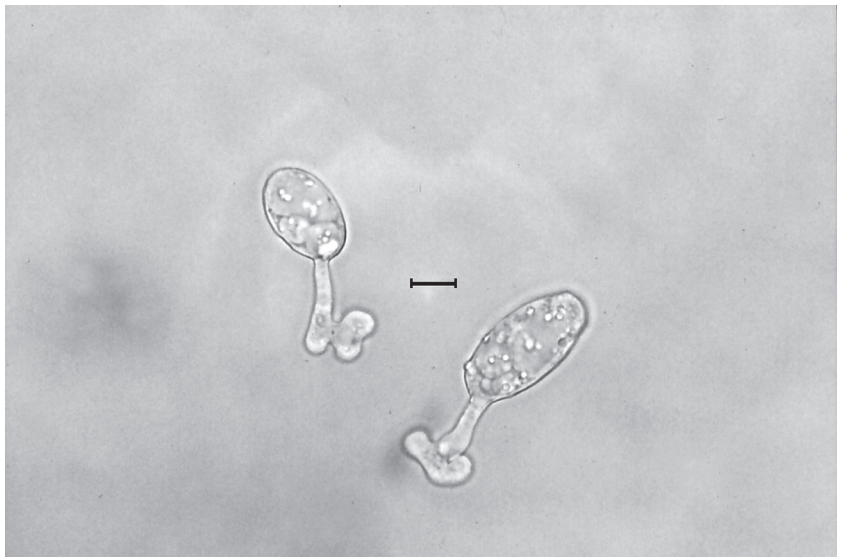

Plate 7. Germinating conidia of *Erysiphe deutziae* on *Philadelphus* cf. *coronarius* (KR 0025922 = KM 269/1). Bar = 10 µm; photograph by A. Schmidt.

Plate 8. Anamorph of *Erysiphe deutziae* on fruits of *Philadelphus* cf. *coronarius* in a garden in Karlsruhe. 24 Aug. 2008; photograph by M. Scholler.

Key to anamorphs of powdery mildew species recorded or expected in Germany

On *Papaveraceae* (incl. *Fumariaceae*)

1a. Conidia formed in chains; on *Papaver rhoeas* . . . . . ***Golovinomyces orontii***

1b. Conidia formed singly **2**

2a. Mycelium internal and external; conidiophores mostly emerging through stomata; conidia distinctly dimorphic, primary conidia lanceolate, apically attenuated, secondary conidia ellipsoid-cylindrical; on *Glaucium* spp., *Papaver* spp. . . . . ***Leveillula taurica***

2b. Mycelium external; conidiophores arising from superficial hyphae; conidia ± ellipsoidal **3**

3a. Conidiophore foot-cells usually straight, rarely sinuous; on *Eschscholzia californica*, ?*Fumaria officinalis*, *Glaucium flavum*, *Papaver argemone*, *P. dubium*, *P. nudicaule*, *P. orientale*, *P. rhoeas*, *P. somniferum* . . . . . ***Erysiphe cruciferarum***

3b. Foot-cells often sinuous, on other hosts **4**

4a. Mycelium predominantly hypophyllous, average length/width ratio of conidia about 3.5; on *Pseudofumaria lutea* . . . . . ***Oidium*** sp.

4b. Mycelium predominantly epiphyllous, average length/width ratio of conidia below 3.5 (2 to 3); on other hosts **5**

5a. Conidiophores mostly 60–115 µm long, often attenuated toward base; on *Chelidonium majus* . . . . . ***Erysiphe*** cf. ***macleayae***

5b. Conidiophores shorter, mostly 50–85 µm, often attenuated toward base; on *Macleaya cordata, Meconopsis cambrica* . . . . . ***Erysiphe macleayae***

On *Hydrangeaceae*

1a. Conidia formed in chains; on *Hydrangea* spp. . . . . ***Golovinomyces orontii***

1b. Conidia formed singly **2**

2a. Conidiophores 2–3-celled, rarely 4–5-celled, conidia without small oil drops, conidia often germinating with two or three germ tubes per conidium; on *Hydrangea macrophylla* . . . . . ***Oidium hortensiae***

2b. Conidiophores only 2–3-celled, conidia with numerous small oil drops, generally germinating with only one germ tube per conidium; on *Deutzia* ×*magnifica*, *D. scabra* and *Philadelphus coronarius* . . . . . ***Erysiphe deutziae***

Discussion

Species on *Papaveraceae*

Erysiphe macleayae is an introduced species native of Asia (Braun 1987) that was previously reported from Germany by Ale-Agha et al. (2008) on *Macleaya cordata*. The anamorph of this species is reported here from Germany on *Macleaya* (HAL 2133 F, KR 0021921) and *Meconopsis* .The features of the anamorph and only ascomata on *Meconopsis* (herb. J. Kruse no. E 0293) agree

with the short description of *E. macleayae* on *Macleaya cordata* by Braun (1987). The specimen HAL 2209 F on *Macleaya* is heavily infested by the hyperparasite *Ampelomyces quisqualis* Ces., which obscures the morphological characters of the powdery mildew. HAL 2133 F contains many germinated conidia. *Meconopsis cambrica* is a new host genus and species for *E. macleayae*. *Erysiphe cruciferarum* has previously been listed on this host (Braun 1987: 204) but the specimens may belong to *E. macleayae*. A powdery mildew reported from Bulgaria on *Papaver somniferum* L. was identified as *E. macleayae* (Fakirova 1991) but U. Braun studied this material and determined that it belongs to *E. cruciferarum* (Braun 1995).

A powdery mildew on *Chelidonium majus* was first recorded in Italy by Ciferri & Camera (1962). This material is not available, so we do not know whether it is conspecific with the fungus on this host in Central Europe. The *Chelidonium* powdery mildew may be related to or even conspecific with *E. macleayae*. Minor differences are: number of septa in the conidial germ tubes, one versus up to two on *Chelidonium*; and conidiophore foot-cells up to 40 µm versus up to 70 µm on *Chelidonium*.

Jage et al. (2010) identified specimens HAL 2123 F and HAL 2124 F on *Pseudofumaria lutea* as *E. cruciferarum*. We re-studied this material and it differs from the anamorph of *E. cruciferarum* by: 1) often sinuous foot cells, 2) an extraordinarily high length/width ratio – 3.6, and 3) formation of predominantly hypophyllous mycelium. Braun (1987) reports a "larger than 2" l:w ratio for *E. cruciferarum* and in the specimens we studied this averaged between 2.4 and 2.9. Braun (1987) also reported that in *E. cruciferarum* the mycelium is formed amphigenously. Therefore, it is doubtful that the *Pseudofumaria* powdery mildew is conspecific with *E. cruciferarum*.

One other species, *E. werneri* U. Braun, occurs on *Papaveraceae* (*Corydalis* s. str.). The anamorph of this species bears some resemblance to the oidial state on *Pseudofumaria*. Based on the protologue, *E. werneri* forms large conidia (48–63 × 15–23 µm). In a recent description of *E. werneri* from Korea, Shin (2000) reported conidia 35–48 × 13–18(–20) µm with single hyphal appressoria and mainly two-celled conidiophores. This agrees with the German material except that it is not as wide, 9–12 (–13) µm, has hyphal appressoria, and mainly three-celled conidiophores.

Species on Hydrangeaceae

The anamorph *Oidium hortensiae* occurs on *Hydrangea* (Blumer 1967; Braun 1987, 1995). Described as straight, cylindrical, we determined that the conidiophores may also be attenuated toward base or curved. In contrast to Braun (1987, 1995), we did not find conidiophores producing conidia rarely in short chains. Our germination experiments indicated that germ tubes mostly produced a club-shaped or lobed terminal appressorium. Simple germ tubes

without any appressoria were rare. In this respect, our observations agree with those of Blumer (1967) but disagree with Braun (1987) who stated that the species was "without terminal lobed appressorium". According to Braun (1995), *Hydrangea macrophylla* may be infected by another powdery mildew, *Golovinomyces orontii*. This species is known from Switzerland and may be expected in Germany.

A detailed description of the anamorph of the Asian *Erysiphe deutziae* on *Deutzia* spp. in Europe was provided by Bolay et al. (2005). Our observations agree with their description and provide additional information on the mode of germination and germ tube morphology. However, Bolay et al. (2005) described the conidia as 12.5–15 µm wide while the German specimens were (16.5–)17.5–20(–22) µm wide. This difference may be because Bolay et al. (2005) measured dried stained conidia whereas we measured only fresh conidia. In his monograph, Braun (1987) described them as 14–20 µm wide. An important diagnostic feature of *E. deutziae* is the formation of numerous small refractive droplets in the conidia; these are clearly visible in fresh conidia. The smaller droplets are formed in addition to larger oil drops that are common in most powdery mildews. Interestingly, in contrast to the large drops, the small drops are visible even in dried conidia (when rehydrated in water). The anamorph on *Philadelphus* agrees with *E. deutziae* on *Deutzia* and we therefore consider them to belong to the same species. This also applies to HAL 2138 F, which was previously published as *Oidium* cf. *hortensiae* (Ale-Agha et al. 2008). The typical *Oidium hortensiae* differs from *E. deutziae* by several morphological characters, e.g. by not forming small droplets. Also infection experiments reported by Blumer (1928, cited after Blumer 1933) support our results. This study reports that *Oidium hortensiae* infects various *Hydrangea* species but not *Deutzia* and *Philadelphus* species.

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