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Erysiphales and their hyperparasite, *Ampelomyces quisqualis*, of the Drawsko Landscape Park, Poland

BEATA CZERNIAWSKA, TADEUSZ MADEJ, IWONA ADAMSKA, JANUSZ BŁASZKOWSKI, and MARIUSZ TADYCH

Department of Plant Pathology, Agricultural Academy in Szczecin
Słowackiego 17, PL-71-434 Szczecin, Poland
e-mail: jblaszkowski@agro.ar.szczecin.pl

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Results of 3-year investigations of the occurrence of fungi of the order *Erysiphales* and their hyperparasite, *Ampelomyces quisqualis*, in the Drawsko Landscape Park (N-Poland) are presented. Among the fungi found, 26 species belonging to 7 genera were identified. Many of the causal agents of the powdery mildews revealed were previously rarely found in Poland. *Microsphaera vanbruntiana* var. *sambuci-racemosae* parasitizing *Sambucus nigra* is a fungus new to the Mycota of Poland. *Ampelomyces quisqualis* was found associated with *Microsphaera symphoricarpi* colonizing *Symphoricarpos albus* and with *Sphaerotheca mors-uvae* parasitizing *Ribes nigrum*; these powdery mildew fungi are fungal hosts of *A. quisqualis* not recorded in the literature to date.

Key words: *Erysiphales*, *Ampelomyces quisqualis*, Poland.

INTRODUCTION

There is no mycological record from the Drawsko Landscape Park (DLP). Therefore, in 1996, investigations of the occurrence of fungi of the order *Erysiphales* and their hyperparasites on plants of DLP were undertaken.

The Drawsko Landscape Park is situated in the south of the Western-pomerania Voivodeship of Poland (Fig. 1). The dominant plant communities of DLP are pet bogs, beech woods, and pine forests (Fijałkowski et al. 1994). The forest trees most frequently occurring are *Pinus sylvestris* (45%), *Fagus sylvatica* (25%), *Betula verrucosa* (12%), as well as *Quercus*

petrea and *Q. robur* (4%). Additionally, there occur meadows, wayside plant communities, and plants attached to a homestead. The flora of DLP comprises 695 species.

Climatically, DLP is under the influences of the Baltic Sea and the Atlantic Ocean (F i j a ł k o w s k i et al. 1994). Winters are relatively warm, and summers cold. Mean annual temperature ranges from 7.0 to 7.3°C. The number of hot days (> 25°C) ranges from 18 to 22. The vegetative period begins between 7 and 10 April. The lowest rainfalls occur in May and the highest in July. The mean annual air relative humidity is 81% and is highest in autumn months.

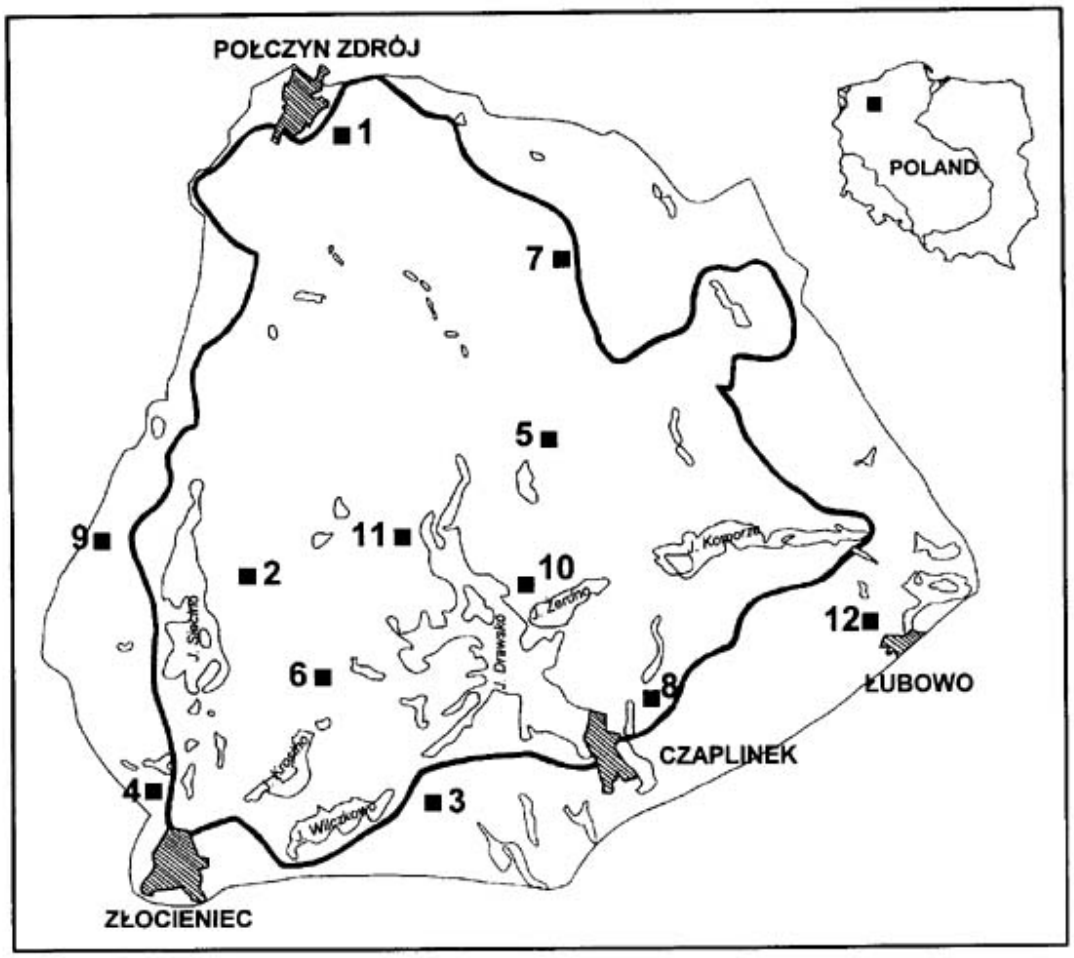
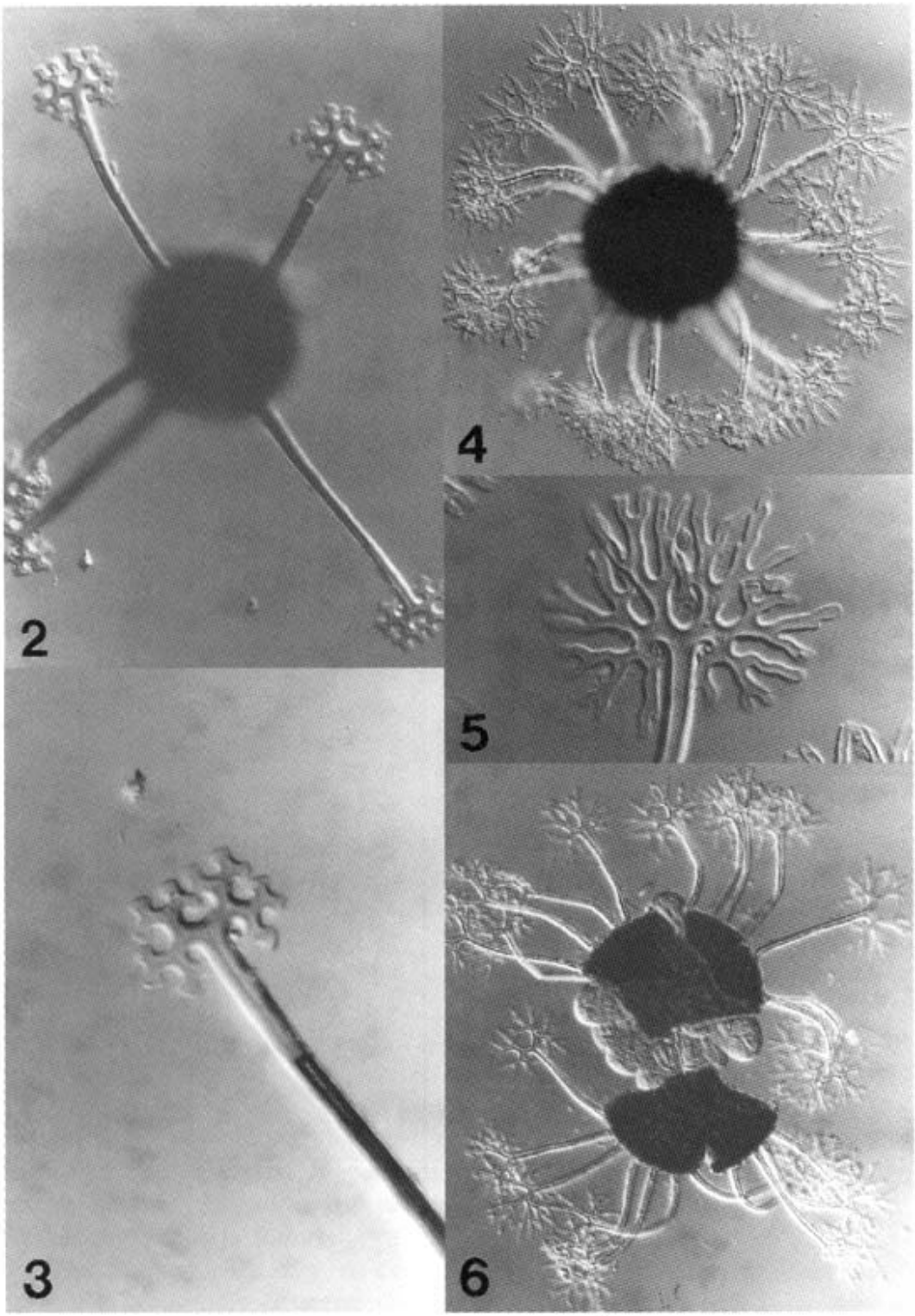
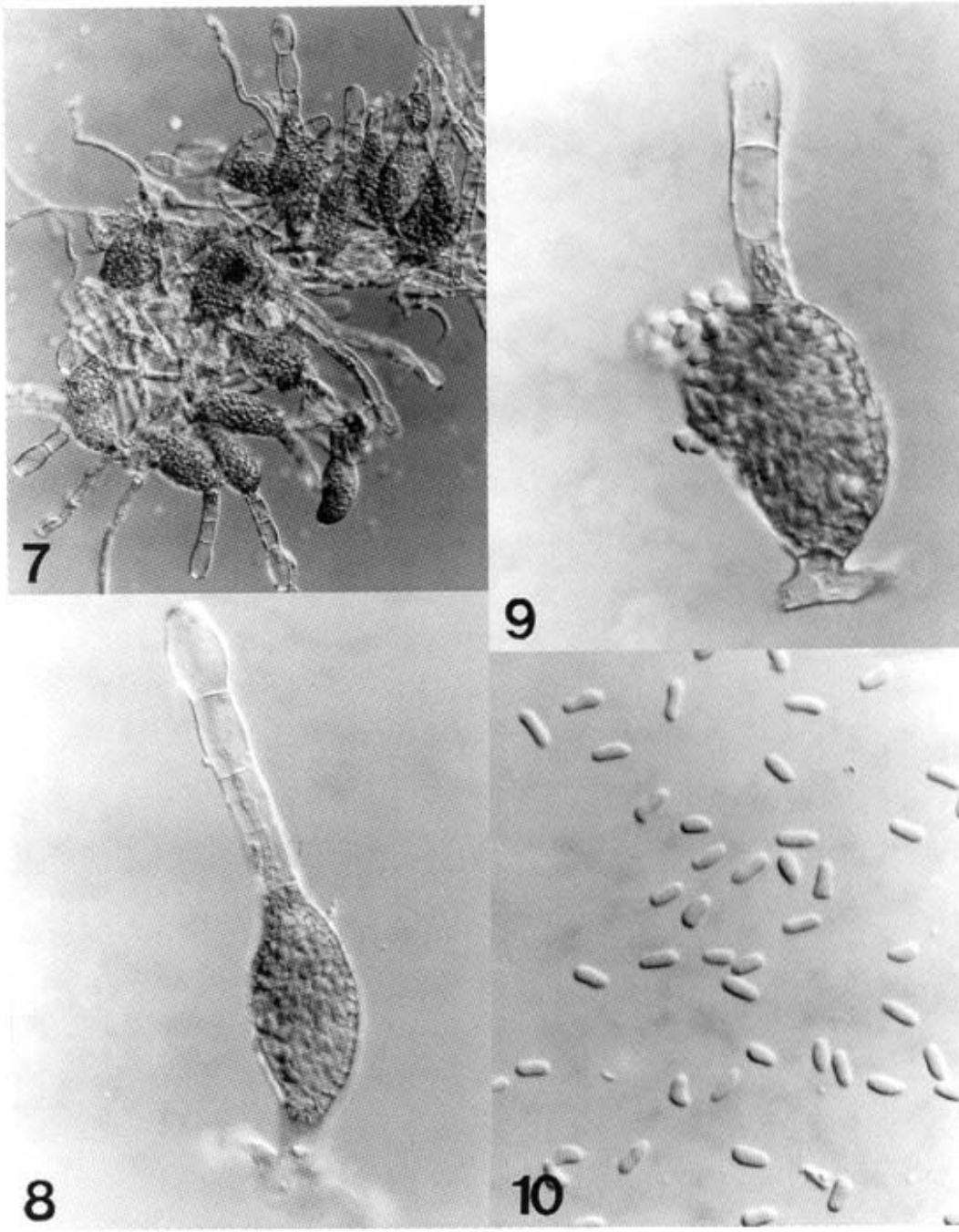


Fig. 1. The areas of the Drawsko Landscape Park and sites of collection of the plant material investigated: 1 – Połczyn Zdrój, 2 – Stare Worowo, 3 – Stare Kaleńsko, 4 – Złocieniec, 5 – Kluczewo, 6 – Rzepowo, 7 – Kocury, 8 – Czaplinek, 9 – Ostrowice, 10 – Stare Drawsko, 11 – Warniłęg, 12 – Łubowo, 13 – Rakowo



Figs 2–6. *Podosphaera clandestina* var. *aucupariae*. Figs 2, 4. Cleistothecia with appendages, ×306 and ×148, respectively. Figs 3, 5. Dichotomously branched appendages, both ×520. Fig. 6. Crushed cleistothecium with asci, ×146. All differential interference contrast (DIC)



Figs 7–10. *Ampelomyces quisqualis*. Fig. 7. Highly colonized mycelium and oidia of *Erysiphe cichoracearum* var. *cichoracearum*, ×134. Figs 8, 9. Pycnidia associated with oidia, ×614 and ×685, respectively. Fig. 10. Conidia, ×878. All DIC

MATERIALS AND METHODS

Investigations of the occurrence of fungi of the order *Erysiphales* and their hyperparasites were conducted from late spring to late autumn of the years 1996–1997. The plants and associated fungi came from 12 permanent plots, each of an area of ca 1 ha (Fig. 1). Both cultivated and uncultivated plants were studied. The frequency of occurrence of fungi and the degree of damage of plants were determined. The frequency of occurrence of fungi was assessed based on a 4-degree scale proposed by Durska (1974): + – sporadic (1 plant damaged), ++ – rare (single plants damaged), +++ – frequent (50% of plants damaged), ++++ – very frequent (> 50% of plants damaged). The damage of plants was determined according to a 9-degree graphic scale given by Püntener (1981): 9° – healthy plant, 8°–1% of the plant area diseased, 7°–2% of the plant area diseased, 6°–5% of the plant area diseased, 5°–10% of the plant area diseased, 4°–15% of the plant area diseased, 3°–20% of the plant area diseased, 2°–30% of the plant area diseased, 1°–50% of the plant area diseased. The fungi found were recognized according to Braun (1987). Plants were identified after Szafer, Kulczyński and Pawłowski (1969), and their nomenclature follows that of Mirek et al. (1995).

RESULTS

In the plant material collected, a total of 46 species in 7 genera of the order *Erysiphales* (*Erysiphe*, *Microsphaera*, *Sphaerotheca*, *Podosphaera*, *Phyllactinia*, *Oidium* and *Uncinula*) (Figs 2–6) were identified. The fungi most frequently found were members of the genus *Erysiphe* (21 species). The fungal species most frequently occurring was *Erysiphe cichoracearum* DC. var. *cichoracearum*. It was especially frequently associated with *Solidago canadensis* and *Tanacetum vulgare*. The fungi most rarely found were species of the genera *Uncinula* and *Phyllactinia*. Of the fungi rarely recorded in Poland so far (Adamska et al. 1999; Dynowska, Fiedorowicz and Kubiak 1999; Mułenko 1988; Sałata 1985), *Erysiphe cynoglossi* was found on *Myosotis arvensis*, *Podosphaera clandestina* var. *aucupariae* on *Sorbus aucuparia* and *E. galeopsidis* on *Melissa officinalis*. Additionally, a new host of *Microsphaera vanbruntiana* var. *sambucini-racemosae*, i.e., *Sambucus nigra*, was found.

The fungus frequently co-occurring with the powdery mildew fungi found was *Ampelomyces quisqualis* (Figs 7–10). It parasitized 12 species of the order *Erysiphales*, i.e., *E. aquilegiae* var. *ranunculi*, *E. artemisiae* Grev., *E. buhrii* U. Braun, *E. cichoracearum* var. *cichoracearum*, *E. heraclei*, *E. magnicellulata* U. Braun var. *magnicellulata*, *E. polygoni* DC., *E. sordida* Junell, *O. chrysanthemi* Rabenh., *P. leucotricha* (Ell. et Ev.) Salmon, *S. fusca*,

S. pannosa (Wallr.: Fr.) Lév. *Microsphaera symphoricarpi* Howe affecting *Symphoricarpos albus* and *Sphaerotheca mors-uvae* associated with *Ribes nigrum* were new fungal hosts of *A. quisqualis.*

OCCURRENCE OF MORE INTERESTING MEMBERS OF THE ERYSIPHALES FOUND IN THE DRAWSKO LANDSCAPE PARK

Erysiphe aquilegiae DC. var. *ranunculi* (Grev.) Zheng at Chen. on *Delphinium elatum*: Złocieniec 4++, Połczyn Zdrój 1++, Kocury 7+++++.

E. biocellata Ehrenb. on *Mentha arvensis*: Łubowo 12+, Kluczewo 5++; on *Mentha aquatica*: Stare Drawsko 10++.

E. cichoracearum DC. var. *cichoracearum* on *Achillea millefolium*: Czaplinek 8+ and Złocieniec 4+; on *A. ptarmica*: Stare Kaleńsko 3+; on *Cichorium intybus*: Ostrowice 9+++, Połczyn Zdrój 1+; on *Helianthus tuberosus*: Czaplinek 8++++, Złocieniec 4+++, Połczyn Zdrój 1+++; on *Mycelis muralis*: Kluczewo 5++; on *Solidago canadensis*: Rzepowo 6+++, Czaplinek 8++, Kocury 7++; on *Tragopogon pratensis*: Złocieniec 4+++, Ostrowice 9++, Stare Drawsko 10+++.

E. convolvuli DC. var. *convolvuli* on *Calystegia sepium*: Łubowo 12+, Stare Kaleńsko 3++.

E. cruciferarum Opiz ex Junell on *Berteroa incana*: Stare Worowo 2+, Kluczewo 5+; on *Capsella bursa-pastoris*: Złocieniec 4+.

E. cynoglossi U. Braun on *Anchusa officinalis*: Warniłęg 11++, Kluczewo 5+, Rakowo 13++; on *Myosotis arvensis*: Czaplinek 8+++, Stare Drawsko 10+, Ostrowice 9++; on *M. hispida*: Złocieniec 4+.

E. galeopsidis DC. on *Lamium amplexicaule*: Kluczewo 5+; on *Melissa officinalis*: Złocieniec 4++.

E. graminis DC. [*Blumeria graminis* (DC.) Speer.] on *Deschampsia caespitosa*: Rakowo 13++, Stare Worowo 2+++.

E. heraclei DC. on *Chaerophyllum temulum*: Stare Kaleńsko 3+; on *Petroselinum sativum*: Złocieniec 4++, Połczyn Zdrój 1+.

E. pisi DC. var. *pisi* on *Lathyrus montanus*: Stare Worowo 2++, Rzepowo 6+; on *Pisum sativum*: Złocieniec 4++, Warniłęg 11+++, Kocury 7+++; on *Vicia hirsuta*: Kluczewo 5+.

Microsphaera alphitoides Griff. at Maubl. var. *alphitoides* on *Quercus sessilis*: Czaplinek 8++, Stare Drawsko 10+++, Stare Kaleńsko 3+++, Ostrowice 9+++.

M. berberidis (DC. ex Mérat) Lév. on *Berberis vulgaris*: Czaplinek 8+++, Złocieniec 4++, Połczyn Zdrój 1++.

M. ornata U. Braun var. *europaea* on *Betula pubescens*: Stare Drawsko 10++, Łubowo 12+.

M. siringae (Schw.) Magn. on *Syringa vulgaris*: Złocieniec 4+.

M. vanbruntiana Gerard var. *sambuci-racemosae* U. Braun on *Sambucus racemosa*: Kocury 7++, Kluczewo 5++; on *Sambucus nigra*: Złocieniec 4+++, Ostrowice 9+. This paper for the first time informs of the occurrence of this fungus in Poland. This fungus forms gossamery mycelium with conidiophores and conidia on the upper side of leaves. The mycelium covers the whole leaf area, although it is more compact near veins. *Conidia* are ellipsoid or cylindric, $24-28\times8-10$ μm. *Cleistothecia* are dark brown, $110-150$ μm diam, evenly distributed on leaves or grouped in aggregates. They contain $17-28$ appendages. Appendages are hyaline, with no septa, $4-5$ times dichotomously branched with stright tips; they are positioned in an equatorial plane. *Asci* $4-6$, ellipsoid, $60-70\times45$ μm, with $3-5$ ascospores. Ascospores ellipsoid, $25\times12-14$ μm.

Podosphaera clandestina (Wallr.: Fr.) Lév. var. *aucupariae* (Erikss) U. Braun on *Sorbus aucuparia*: Ostrowice 9+, Rzepowo 6+++. This fungus forms powdery to gossamery mycelium with conidiophores and conidia. *Conidia* are cylindric to ellipsoidal, $18-25\times12$ μm. *Cleistothecia* (Figs 2, 4) dark brown, $60-70$ μm diam, present on the lower side of leaves. Appendages $3-4$, with $3-5$ septa at the base, hyaline, several times dichotomously branched at the tip, 2 times longer than the cleistothecial diameter (Figs 2–5). *Asci* widely ellipsoidal or almost globose, $37-55$ μm diam (Fig. 6). *P. clandestina* (Wallr.: Fr.) Lév. var. *clandestina* on *Crataegus monogyna*: Złocieniec 4++, Czaplinek 8+++.

Phyllactinia guttata (Wallr.: Fr.) Lév. on *Carpinus betulus*. Połczyn Zdrój 1++, Rakowo 13+.

Sphaerotheca aphanis (Wallr.) U. Braun var. *aphanis* on *Alchemilla pastoralis*: Stare Drawsko 10++++, Stare Kaleńsko 3+++, Złocieniec 4+++++; on *Geum urbanum*: Stare Worowo 2+; on *Potentilla erecta*: Złocieniec 4++, Ostrowice 9+; on *Rubus idaeus*: Kluczewo 5+.

S. epilobii (Wallr. ex Link) Sacc. on *Epilobium hirsutum*: Stare Kaleńsko 3++, Stare Drawsko 10+++; on *E. roseum*: Stare Kaleńsko 3++.

S. euphorbiae (Cast.) Salmon on *Euphorbia helioscopia*: Ostrowice 9+, Łubowo 12+.

S. fusca (Fr.) Blumer on *Lapsana communis*: Warniłęg 11++; on *Crepis paludosa*: Złocieniec 4+++, Rakowo 13++.

S. mors-uvae (Schw.) Berk. et Curt. on *Ribes nigrum*: Złocieniec 4++, Kluczewo 5+.

S. plantaginis (Cast.) Junell on *Plantago lanceolata*: Czaplinek 8+++, Kluczewo 5+++.

Uncinula adunca (Wallr. ex Fr.) Lév. on *Salix aurita*: Rakowo 13+.

Uncinula bicornis (Wallr.: Fr.) Lév. [*Sawadea bicornis* (Wallr.: Fr.) Homma)] on *Acer campestre*: Ostrowice 9+, Połczyn Zdrój 1+++, Czaplinek 8++, Kluczewo 5+.

REFERENCES

Adamska I., Madej T., Czerniawska B., Błaszkowski T. 1999. Parasitic and saprotrophic fungi from Słowiński National Park. Acta Mycol. 34: 97–103.

Braun U. 1987. A monograph of the *Erysiphales* (powdery mildews). Berlin-Stuttgart.

Durska B. 1974. Studia nad grzybami pasożytniczymi roślin występujących w litoralu zbiorników wodnych Pojezierza Mazurskiego. Acta Mycol. 10: 73–139.

Dynowska M., Fiedorowicz G., Kubiak D. 1999. Contributions to the distribution of Erysiphales in Poland. Acta Mycol. 34 (1): 79–88.

Fijałkowski A., Gutowska E., Karnecki R., Wesołowski S. 1994. Drawski Park Krajobrazowy. Infor. Przy. Turyst. Zarząd Drawskiego Parku Krajobrazowego.

Mirek Z., Piękoś-Mirkowa H., Zając A, Zając M. 1995. Vascular plants of Poland. A checklist. Polish Bot. Stud., Guidebook 15, Kraków.

Mułenko W. 1988. Mikroskopowe grzyby fitopatogeniczne Pojezierza Łęczyńsko-Włodawskiego. II. Acta Mycol. 26: 125–171.

Pünteneer W. 1981. Podręcznik doświadczalnego polowego w ochronie roślin. Ciba-Geigy AG, Bazylea, Szwajcaria.

Sałata B. 1985. Flora Polska. Grzyby (*Mycota*) 15: Erysiphales. PWN. Warszawa–Kraków.

Szafer W., Kulczyński S., Pawłowski B. 1988. Rośliny polskie. PWN. Warszawa.

Erysiphales i ich nadpasożyt, *Ampelomyces quisqualis*, z Drawskiego Parku Krajobrazowego

Streszczenie

Przedstawiono wyniki 3-letnich badań nad występowaniem grzybów rzędu *Erysiphales* i ich nadpasożyta, *Ampelomyces quisqualis*, w obrębie Drawskiego Parku Krajobrazowego. Wśród znalezionych sprawców mączniaka prawdziwego zidentyfikowano 26 gatunków z 7 rodzajów. Najliczniej byli reprezentowani przedstawiciele rodzaju *Erysiphe* (10 gatunków). Wiele z rozpoznanych grzybów dawniej rzadko znajdywano w Polsce. *Microsphaera vanbruntiana* var. *sambuci-racemosae* z *Sambucus nigra* jest gatunkiem w Polsce zanotowanym po raz pierwszy. Stwierdzono też fakt pasożytowania *Ampelomyces quisqualis* na nowych żywicielach, *Microsphaera symphoricarpi* i na *Sphaerotheca mors-uvae*.