Preliminary Evaluation of the Effect of *Ampelomyces quisqualis* on the Degree of Plant Infestation with Selected *Erysiphales* Species Proposed as Potential Bioindicators

E. SUCHARZEWSKA and M. DYNOWSKA*

Department of Mycology, University of Warmia and Mazury in Olsztyn, 10-957 Olsztyn, Poland

**E-mail: ewko@uwm.edu.pl*

Abstract

In the year 2000 *Ampelomyces quisqualis* was noted, with various intensity, in north-eastern Poland on different species of *Erysiphales* selected as potential bioindicators of urban pollution. The results of observation of *Erysiphe sordida* (on *Plantago major*), *Sphaeroteca erigerontis-canadensis* (on *Taraxacum officinale*) and *Microsphaera hypophylla* (on *Quercus robur*) – susceptible species, and *Microsphaera palczewskii* (on *Caragana arborescens*) – a resistant species, suggest that *A. quisqualis* shows affinity to some hosts regardless of their individual reactions to the level and range of anthropopressure. It clearly prefers the genera: *Erysiphe* and *Sphaerotheca*. Its effect on the degree of host plant infestation with powdery mildew under natural conditions seems insignificant.

Keywords: *Ampelomyces quisqualis*; host plants; urban pollution; powdery mildew; lesions

INTRODUCTION

Ampelomyces quisqualis Ces.(= *Cicinnobolus cesatii* de Bary) is a micro-parasite whose attacks *Erysiphales* fungi at different development stages. The range of its occurrence is usually the same as that of powdery mildew. It is a thermophilous species, common in central and north-western Poland. In the year 2000 *A. quisqualis* was noted also in north-eastern Poland on different species of *Erysiphales* selected (on the basis of the disease index) as potential bioindicators of urban pollution.

Therefore, a question arises whether *Erysiphales* species do not lose their bioindicatory properties when colonized by *Ampelomyces quisqualis,* and to what degree the presence of a hyperparasite affects host plant infestation with powdery mildew?

MATERIALS AND METHODS

The studies carried out in the years 2000–2001 comprised 4 fungi species *Erysiphe sordida* Junell on *Plantago major* L., *Microsphaera hypophylla* Nevodovskij on *Quercus robur* L., *M. palczewskii* Jaczewski on *Caragana arborescens* Lam. and *Sphaerotheca erigerontis-canadensis* (Lev.) L. Junell on *Taraxacum officinale* Weber s.l., which demonstrated different sensitivity to urban pollution (DYNOWSKA 1994, 1996). Research stations were located in Olsztyn along the main communication routes and in places which are directly exposed to communication pollution. Assuming the degree of lesion of host plants as a criterion of fungi sensitivity, the disease index *R* was calculated from the Mc Kinney formula:

$$R = \frac{\sum(a \times b) \times 100}{N \times 4}$$

where: R – disease coefficient in percent (index)
$(a \times b)$ – sum of products obtained by multiplying the number of examined organs of a plant by their given grade of lesion severity
N – total number of examined plants (or leaves)
4 – maximal degree of lesion severity in a fivepoint scale of 0 to 4

The analysis of the mycelium colonization of some powdery mildew by *Ampelomyces quisqualis* was carried out assuming the percentage scale: + up to 10% of the contaminated mycelium, ++ up to 50%; +++ over 50%.

Table 1. Effect of *Ampelomyces quisqualis* on the degree of host infection by selected *Erysiphales* species (A, B, C, D) on the research area

A				B				C			
Suburban		Urban		Suburban		Urban		Suburban		Urban	
D.i. (%)	A.q.	D.i. (%)	A.q.	D.i. (%)	A.q.	D.i. (%)	A.q.	D.i. (%)	A.q.	D.i. (%)	A.q.
12	–	7	–	33	+ +	12	+ +	45	+	51	–
38	+ + +	14	+ +	57	+ + +	16	+ +	62	–	55	–
40	–	15	+ + +	60	+ + +	22	+ + +	65	–	62	–
44	+	20	+ +	62	+ +	24	+ + +	84	+	70	–
44	+ + +	20	+ +	64	+ + +	27	+	85	+	74	+
50	+ + +	21	+ +	65	+ +	29	+ + +	87	–	76	–
50	+ + +	22	+ +	67	+ +	31	+ + +	87	–	77	–
55	+ + +	23	+ + +	70	–	33	–	95	–	79	+
58	+ + +	24	+ +	70	+ +	35	+ + +			86	–
58	+ + +	24	+ + +	70	+ +	36	–			91	+
60	+ + +	24	+ +	72	–	42	+ +			92	–
60	+ +	25	+ +	72	+ +	43	+ + +			95	–
60	+	25	+ + +	72	+ +	47	+ +			95	+
60	+ +	27	+ + +	75	+ + +	50	+ + +			97	–
62	+ +	33	+	75	+	51	+			98	–
63	+ + +	35	+ +	76	+ +	56	+				
65	+ + +	36	+ +	76	+	58	+ +	D		D	
66	+ +	38	+	77	–	70	+ + +	D.i. (%)	A.q.	D.i. (%)	A.q.
66	+ + +	41	+ + +	79	+ + +	94	+	25	–	7	–
67	+ + +	41	+	80	+			28	–	12	–
70	+ +	44	++ +	82	+ + +			29	–	25	–
71	+ + +	45	–	82	+ + +			49	–	29	–
72	+ + +	48	+ + +	83	+ +			50	–	29	–
74	++ +	48	+ + +	83	+ + +			61	–	53	–
75	+	50	–	85	–			65	–	58	–
78	+ + +	51	+ + +	86	+ + +			68	–	64	+
81	++	53	+ + +	86	+ + +			69	–	72	–
84	+ +	55	+ + +	88	–			69	–	92	–
96	+ + +	55	+					75	–		
		56	–					80	–		
		59	+					87	–		
		64	+ + +					88	–		
		77	+ + +					91	–		
		81	+ + +					95	–		
		86	+ + +					97	–		

A – *Sphaerotheca erigerontis-canadensis* on *Taraxacum officinale*; B – *Erysiphe sordida* on *Plantago major*; C – *Microsphaera palczewskii* on *Caragana arborescens*; D – *Microsphaera hypophylla* on *Quercus robur*

D.i. (%) – Degree of host plant infection (%)

A.q. – Intensity of colonization by *Ampelomyces quisqualis*

\+ up to 10%

+ + up to 50%

+ + + over 50%

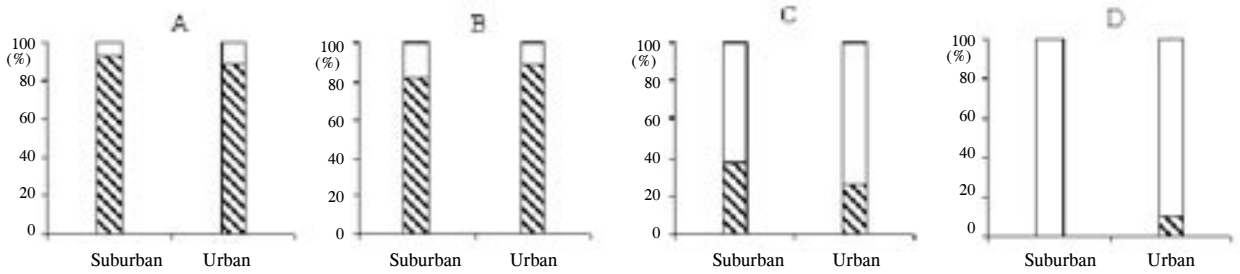

Figure 1. A comparison (%) of urban and suburban occurrence of *Ampelomyces quisqualis* on selected *Erysiphales* species
□ – absence of *Ampelomyces quisqualis;* ▨ – presence of *Ampelomyces quisqualis*

The fungi were identified according to BRAUN (1987) and SAŁATA (1985); the host plants according to RUTKOWSKI (1998).

RESULTS

The results of observation of *Erysiphe sordida* (on *Plantago major*), *Sphaeroteca erigerontis-canadensis* (on *Taraxacum officinale*) and *Microsphaera hypophylla* (on *Quercus robur*) – was considerated as susceptible species, and *Microsphaera palczewskii* (on *Caragana arborescens*) – a resistant species, suggest that *Ampelomyces quisqualis* shows affinity to some hosts regardless of their individual reactions to the level and range of anthropopressure. It clearly prefers the genera: *Erysiphe* and *Sphaerotheca* (Figure 1). Its effect on the degree of host plant infestation with powdery mildew under natural conditions seems insignificant (Table 1).

DISCUSSION

Phytopathological literature provides information that in polluted areas, subjected to aggressive anthropopressure, the activity of phytopathogens is considerably reduced, although they are often responsible for maintaining homeostasis at the level of biocenoses or ecosystems (BEVAN & GREENHALGH 1976; BURGIEŁ 1993).

An analysis of potential bioindicatory properties of powdery mildew allowed to distinguish some species susceptible to urban, especially traffic, pollution (DYNOWSKA 1994). In susceptible species an increase in the concentration of traffic pollution caused a significant decrease in the disease index. It was accompanied by accelerated growth of development of the mycelium; cleistothecia appeared and matured much earlier than outside the city (DYNOWSKA 1996).

It may seem that high resistance of *Microsphaera palczewskii* to traffic pollution excludes or limits the possibility of the mycoparasite's attack, but – on the other hand – high susceptibility of *M. hypophylla* also prevents the colonization by *A. quisqualis*. The reason for this situation is probably connected with the functioning of the whole system "host-phytopathogen-mycopathogen", with its specific types of reactions and close correlation between the parasite and host at all ecological levels, developed in the course of co-evolution. The results of the studies suggest that various reactions of *Erysiphales* to urban pollution are so strongly coded that even the presence of hyperparasites cannot change them.

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