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CHARACTERISTICS OF *AMPELOMYCES QUISQUALIS* MYCOPARASITE IDENTIFIED ON ROMANIAN ROSES INFECTED WITH POWDERY MILDEW

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Abstract: *Ampelomyces quisqualis* was identified on roses infected with powdery mildew from the "Alexandru Borza" Botanical Garden in Cluj-Napoca (Romania).

Ampelomyces quisqualis pycnidia vary in shape and size depending on the *Sphaerotheca pannosa* var. *rosae* fungus organ in which they develop. The pycnidia are pear-shaped in the case of conidiophores, spindle-shaped in the case of hyphae and almost spherical in the case of cleistothecia.

The pycnidiospores are one-celled, hyaline, and smooth, with round or curved tips.

So far, *Ampelomyces quisqualis* has not been identified and described as a mycoparasite of the *Sphaerotheca pannosa* var. *rosae* fungus in Romania.

Introduction

Different hyperparasitic and antagonistic fungi are used in the biological control of plant mycoses. As biological control fungi, we report the use of *Trichoderma viride* Pers., *Trichoderma harzianum* Rifai, *Trichothecium roseum* (Pers.) Link, *Coniothyrium minitans* W.A. Campbell and *Ampelomyces quisqualis* Ces. ex Schlecht.

The *Ampelomyces quisqualis* hyperparasite has pear-shaped or spherical pycnidia without an ostiole, although they sometimes seem to be papillate. They are (0.05-) 0.1 x 0.03 (-0.05) mm in size, often displaying short golden-brown hyphal branches at ends. Conidia (5-9 x 2-4 μm) are hyaline or pale brown, smooth, without septa, with rounded, straight or slightly curved ends [3].

Ampelomyces quisqualis is a very common fungus found on the mycelia of powdery mildew fungi [3]. It may be a parasite for over 64 fungic species of *Brasilomyces*, *Erysiphe*, *Leveillula*, *Microsphaera*, *Phyllactinia*, *Podosphaera*, *Sphaerotheca* and *Uncinula* genera, as well as of the anamorphic genera *Oidium* and *Oidiopsis* [4].

Material and Method

Ampelomyces quisqualis mycoparasite was identified on roses infected with powdery mildew from the "Alexandru Borza" Botanical Garden in Cluj-Napoca (Romania).

Roses infected with powdery mildew were observed in different stages over a period of five years (1998-2003).

Mycologic samples were collected from rose branches attacked by *Sphaerotheca pannosa* (Wallr.: Fr.) Lév var. *rosae* Woronich. and examined under light microscope. The microscope slides were stained with acid fuchsin and photographed.

The mycologic material with *Ampelomyces quisqualis* on powdery mildew rose (New Dawn hybrid) branches was included in the "Alexandru Borza" Botanical Garden Herbarium from Cluj-Napoca and was recorded under registration number CL 656 074.

Results

Rose powdery mildew occurs yearly in the "Alexandru Borza" Botanical Garden from Cluj-Napoca. Powdery mildew attacks rose hybrids such as New Dawn, Paul's Scarlet Climber, Albertaine, Dorothy Perkins, Casino, etc.

Between 1998-2003, *Ampelomyces quisqualis* was identified yearly on rose branches with powdery mildew.

Apart from *Sphaerotheca pannosa* var. *rosae* conidia, *Ampelomyces quisqualis* pycnidia were also identified on the microscope slides.

Ampelomyces quisqualis pale golden brown pycnidia have different shapes depending on the *Sphaerotheca pannosa* var. *rosae* fungus organ in which they develop and act as parasites.

Ampelomyces quisqualis pear-shaped pycnidia (50-) 100 x 30 (-60) μm develop in the *Sphaerotheca pannosa* var. *rosae* conidiophores whereas spindle-shaped pycnidia (50-) 100 x 20 (-50) μm develop in the fungus' hyphae.

The mycoparasite conidia (4-) 9 x 2 (-4) μm are hyaline and smooth, with round, straight or slightly curved ends.

Other microscope slides with *Ampelomyces quisqualis* isolated from roses with powdery mildew revealed the presence of spherical pycnidia (80-110 μm). These pycnidia appeared in the case of *Sphaerotheca pannosa* var. *rosae* cleistothecia parasitism. The mycologic samples were collected from rose branches in October 2003.

Over the research period (1998-2003) we found that *Sphaerotheca pannosa* var. *rosae* fungus did not form cleistothecia on roses under the environmental conditions of the "Alexandru Borza" Botanical Garden. The occurrence of *Sphaerotheca pannosa* var. *rosae* cleistothecia is affected by the presence of *Ampelomyces quisqualis* hyperparasite.

Discussion

Literature data emphasize the importance of the *Ampelomyces quisqualis* mycoparasite in limiting powdery mildew attack on plants.

Experimentally, it has also been shown that *Ampelomyces quisqualis* mycoparasite can significantly reduce powdery mildew symptoms caused by *Sphaerotheca fusca* in cucurbit, when applied in the early stages of the infection [6].

It has also been established that *Ampelomyces quisqualis* affects powdery mildew caused by *Sphaerotheca fusca* (Fr.) Blumer by cell wall degradation [7].

Important results were obtained, experimentally, in controlling **Erysiphaceae** such as *Sphaerotheca fuliginea* (Schlecht.: Fr.) Poll. on greenhouse-grown cucumber plants [5].

It was also noticed that *Ampelomyces quisqualis* tolerates certain fungicides. Good results were obtained in cucurbit powdery mildew control in greenhouses, by using *Ampelomyces quisqualis* fungus supplemented with one-third of the usual quantity of triforine [9].

Different information about **Erysiphaceae** from Romania exist in some monographic papers [2, 8].

In Romania, *Ampelomyces quisqualis* mycoparasite was described from different Erysiphaceae fungi, such as *Erysiphe aquilegiae* DC. ex Mérat, *E. artemisiae* (Wallr.) Grev., *E. asperifoliorum* Grev., *E. biocellata* Ehrenb., *E. cichoracearum* DC. ex Mérat, *E. communis* (Wallr.) Lk., *E. cruciferarum* Opiz ex L. Junell, *E. depressa* (Wallr.) Schlecht., *E. galeopsidis* DC. ex Mérat, *E. galii* (Fuck.) Blum., *E. graminis* DC. ex Mérat, *E. heraclei* DC. ex St. Amans, *E. lythri* Junell, *E. martii* Lév., *E. montagnei* Lév., *E. pisi* DC. ex St. Amans, *E. polygoni* DC. ex St. Amans, *E. polygoni* DC. ex St. Amans f. *rumicis* Fuck., *E. ranunculi* Grev., *E. salviae* (Jacz.) Blum., *Leveillula labiatarum* Golov., *L. labiatarum* Golov. f. *teucriti* (Jacz.) Golov., *Microsphaera alphitoides* Grif. et Maubl., *M. astragali* (DC. ex Mérat) Trev., *M. baeumleri* Magn., *M. berberidis* (DC. ex Mérat) Lév., *M. divaricata* (Wallr. ex Lk.) Lév., *M. evonymi* (DC. ex Mérat) Sacc., *M. penicillata* (Wallr. ex Fr.) Lév., *M. umbilici* Komarov f. *sedii* Pospelov,

Oidium euphorbiae (Cast.) Salm., *O. evonymi-japonici* (Arc.) Sacc., *O. hormini* Farn., *O. hyssopei* Erikss., *O. verbenae* Thüm. et Bolle, *O. viciae-fabae* Sandu-Ville, *Phyllactinia mespili* (Cast.) Blum., *Podosphaera clandestina* (Wallr. ex Fr.) Lév., *P. leucotricha* (Ell. et Ev.) Salm., *Sphaerotheca erigerontis-canadensis* (Lév.) L. Junell, *S. euphorbiae* (Cast.) Salm., *S. ferruginea* (Schlecht. ex Fr.) Junell, *S. fuliginea* (Schlecht. ex Fr.) Pol., *S. macularis* (Wallr. ex Fr.) Magn., *S. savulescui* Sandu-Ville, *Uncinula adunca* (Wallr. ex Fr.) Lév., *U. bicornis* (Wallr. ex Fr.) Lév. și *U. necator* (Schw.) Burr. [1].

The research showed that rose cultivars from the "Alexandru Borza" Botanical Garden Cluj-Napoca have a different resistance to *Sphaerotheca pannosa* var. *rosae* fungus' attacks.

New Dawn, Paul's Scarlet Climber, Albertine, Dorothy Perkins, Casino, etc., cultivars are sensitive to powdery mildew. Other cultivars such as Simphonia, Grand Prix, Queen Elisabeth, Sutter's Gold, Mainzer Fastnacht, etc., are resistant to the attack of the *Sphaerotheca pannosa* var. *rosae* fungus.

In the "Alexandru Borza" Botanical Garden from Cluj-Napoca *Ampelomyces quisqualis* mycoparasite was identified only on roses attacked by powdery mildew. *Ampelomyces quisqualis* has not been identified and described yet as a mycoparasite of the *Sphaerotheca pannosa* var. *rosae* fungus in Romania.

Furthermore, this species has not been included yet in the Herbarium Mycologicum Romanicum.

Ampelomyces quisqualis forms (pear-shaped, spindle-shaped, spherical) pycnidia in hyphae, conidiophores and cleistothecia of the *Sphaerotheca pannosa* var. *rosae* fungus.

After infection, when the mycoparasite forms pycnidia, the *Sphaerotheca pannosa* var. *rosae* hyphae and conidiophores swell to several times their normal diameter.

Ampelomyces quisqualis pycnidia are different in shape and size, depending on the organ of the *Sphaerotheca pannosa* var. *rosae* fungus, in which they develop. In the case of conidiophores parasitism, the pycnidia are pear-shaped, in the case of hyphae they are spindle-shaped and in the case of cleistothecia they are almost spherical.

Pear-shaped and spindle-shaped pycnidia are formed first. Then, spherical pycnidia appear at the end of the mycoparasite development cycle.

The cleistothecia of the *Sphaerotheca pannosa* var. *rosae* fungus were not identified on roses with powdery mildew over the research period (1998-2003). Therefore, we consider that the appearance of mature cleistothecia of the *Sphaerotheca pannosa* var. *rosae* fungus is affected by the *Ampelomyces quisqualis* hyperparasite.

We believe that *Ampelomyces quisqualis* is an important mycoparasite which limits the attack of powdery mildew on roses under the above-mentioned experimental conditions.

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CARACTERIZAREA MICOPARAZITULUI *AMPELOMYCES QUISQUALIS* IDENTIFICAT PE TRANDAFIRI ATACAȚI DE FĂINARE DIN ROMÂNIA

(Rezumat)

Micoparazitul *Ampelomyces quisqualis* a fost identificat pe trandafiri din Grădina Botanică "Al. Borza" Cluj-Napoca, atacați de făinare.

Picnidiile de *Ampelomyces quisqualis* variază ca formă și dimensiune, în funcție de organul ciupercii *Sphaerotheca pannosa* var. *rosae* în care se dezvoltă.

În cazul parazitării conidioforilor, picnidiile sunt piriforme, în cazul hifelor sunt fusiforme, iar în cazul cleistoteciilor sunt aproape sferice.

Materialul micologic cu *Ampelomyces quisqualis* pe ramuri detrandafir (New Dawn) atacați de făinare a fost inclus în Herbarul Grădinii Botanice "Al. Borza" din Cluj-Napoca și a fost înregistrat cu numărul CL 656074.

În România, specia *Ampelomyces quisqualis* nu a fost identificată și descrisă ca micoparazit al ciupercii *Sphaerotheca pannosa* var. *rosae*.