

Pathogenic micromycete species functioning in the rhizosphere of sick pot-plants growing in peat substrate

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Abstract. During 1994–2005 investigations were carried out on 53 taxa of ornamental pot-plants belonging to 26 cultivars, 48 species, 35 genera, and 15 families. From the rhizosphere of 43% plants kept under unfavourable growth conditions plant pathogens were isolated from the following genera: *Fusarium* (8 species), *Pythium* (6 species), *Verticillium* (5) and *Sclerotinia sclerotiorum*, *Thielaviopsis basicola*, *Rhizoctonia solani*. Simultaneously on each sick plant rhizosphere there functioned several species of pathogenic micromycetes: from *Aechmea fasciata* – *Fusarium equiseti*, *F. oxysporum* and *Pythium irregulare*; from *Dieffenbachia seguine* – *Fusarium oxysporum*, *Pythium aristosporum*, *P. debaryanum*, from *Dracaena fragrans* – *Fusarium oxysporum* and *Pythium irregulare*; from *Dracaena marginata* – *Fusarium oxysporum* and *Pythium flavoense*; from *Alocasia x amazonica* – *Fusarium oxysporum* and *Verticillium nubilum*.

Key words: sick pot-plants, rhizosphere, plant pathogens

INTRODUCTION

At present, many ornamental pot-plants are being exported from the Netherlands and other countries (Juronis et al., 2001); some are very susceptible to environmental factors (Saakov, 1983; Snieškienė et al., 2004). Under their influence plants get weaker (Cristensen et al., 1987; Juronis et al., 2001; Snieškienė et al., 2004) because micromycetes functioning in substrata and excreting secondary metabolites into the surrounding soil often determine the development and growth of these plants. The influence of micromycetes is especially evident on plants weakened for various reasons (Fletcher, 1987; Bilaj et al., 1988). Under those conditions, propagules of pathogenic fungi that have occurred in the substratum start to dominate and inhibit other micro-organisms (Beckman, 1988). The effect of pathogens on plants is unfavourable: they injure roots, stems, and leaves. A real danger for plants can occur due to spreading and intensive development of pathogens in the rhizosphere.

The aims of the work were to determine and compare pathogenic micromycete species functioning in the rhizosphere of injured pot-plants growing more than 1 month under conditions unfavourable for their growth.

MATERIALS AND METHODS

During the years (1994–2005) of investigation, research was carried out on 53 taxons of ornamental pot-plants belonging to 26 cultivars, 48 species, 35 genera, and

15 families. These plants had been growing for more than 1 month under unfavourable conditions (in stores, shops) and showed injuries in their aboveground parts. Soil samples were taken from the rhizosphere of the investigated sick plants growing in peat substrate. Pathogenic fungi were identified according to the descriptors of cultural and morphological characteristics (Domsch et al., 1980; Filippov et al., 1980; Gerlach & Nirenberg, 1982; Plaats-Niterink, 1981). The index of spreading occurrence frequency (A%) was calculated according to T. G. Mircink (1988).

RESULTS AND DISCUSSION

When pot-plants were returned to a supply source from trade networks after a month or longer, some of them had been damaged: leaves were spotty, slightly dried, yellowed, tended to fall. The rhizosphere of 43% of investigated plants was infected with intensively developing fungi – agents of root rot. After about 2 months under unfavorable conditions *Sclerotinia sclerotiorum* Lib. DC By. (A 9.43%) was isolated from the rhizosphere of plants (*Schefflera arboricola* ‘Sonette’, *Ficus pumila* ‘Sunny’, *Ferocactus pilosus*, *Carnegiea gigantea*, *Dudleya virens*). In the *Araceae* and *Crassulaceae* family of plants root injurant *Rhizoctonia solani* J. C. Kuhn (according to W. Brandenburger, 1985) was isolated. This pathogen (A 5.66%) was detected in *Schefflera arboricola* ‘Sonette’, *Caralluma subulata*, and *Echeveria laui*, which were logged for a longer time. Rarely detected was the agent of black dry-rot *Thielaviopsis basicola* (Berk et Br.) Ferraris (A 1.89%) from the rhizosphere of *Dracaena deremensis*, the roots and the aboveground parts of which were injured significantly. In the rhizosphere of the investigated plants the dominant pathogenic species belonged to *Fusarium* Link (A 52.83% – 8 species), *Pythium* Ness (37.73% – 6 species) and *Verticillium* Ness (22.64% – 5 species) genus (Table 1).

Table 1. Micromycetes of the *Fusarium*, *Pythium* and *Verticillium* genus isolated from rhizosphere of sick pot-plants.

Micromycete species	Plants host
1	2
<i>Fusarium culmorum</i> (W. G. Sm.) Sacc.	<i>Ficus pumila</i> ‘Dorte’, <i>Echeveria laui</i> , <i>Crassula fascicularis</i>
<i>F. equiseti</i> (Corda) Sacc.	<i>Aechmea fasciata</i> ‘Morgana’, <i>Agava americana</i> , <i>Dracaena margina</i> ‘Magenta’, <i>Ficus pumila</i> ‘Sunny’, <i>Guzmania lingulata</i> ‘Rondo’, <i>Philodendron erubescens</i> ‘Red Emerald’
<i>F. verticillioides</i> (Sacc.) Nirenberg	<i>Carnegiea gigantea</i> , <i>Crassula perforata</i> , <i>Cycas revoluta</i> , <i>Dudleya virens</i> , <i>Ficus pumila</i> ‘Sunny’, <i>Gymnocalicion mostii</i> , <i>Schlumbergera</i> sp.
<i>F. nivale</i> (Fr.) Sorauer	<i>Aechmea fasciata</i> ‘Morgana’, <i>Dracaena fragrans</i> ‘Lemon Lime’
<i>F. oxysporum</i> Schltdl.	<i>Aechmea fasciata</i> ‘Morgana’, <i>Alocasia x amazonica</i> , <i>Anacampseros filamentosa</i> , <i>Calathea makoyana</i> , <i>Carnegiea gigantea</i> , <i>Cyclamen persicum</i> , <i>Dieffenbachia seguine</i> ‘Camilla’, <i>Dracaena fragrans</i> ‘Yellow Stripe’, <i>Echeveria laui</i> , <i>Ficus pumila</i> ‘Dorte’, <i>F. pumila</i> ‘Sunny’, <i>Maranta leuconeura</i> ‘Fascinator’, <i>Pleiospilos compactus</i>
<i>F. redolens</i> Wollenw.	<i>Aechmea fasciata</i> ‘Morgana’, <i>Anacampseros filamentosa</i> , <i>Ficus pumila</i> ‘Dorte’
<i>F. sambucinum</i> Fuckel	<i>Aechmea fasciata</i> ‘Morgana’, <i>Camellia japonica</i> , <i>Dracaena fragrans</i> ‘Yellow Stripe’, <i>Ficus pumila</i> ‘Sunny’

1	2
<i>F. solani</i> (Mart.) Sacc.	<i>Astrophytum</i> sp., <i>Carnegiea gigantea</i> , <i>Philodendron erubescens</i> 'Red Emerald'
<i>Fusarium</i> sp.	<i>Calathea picturata</i> 'Argentea', <i>Dracaena marginata</i> 'Magenta', <i>Ficus pumila</i> 'Sunny'
<i>Pythium aristosporum</i> Vanter.	<i>Dieffenbachia seguine</i> 'Camilla', <i>Dracaena deremensis</i> , <i>D. fragrans</i> 'Lemon Lime', <i>Guzmania lingulata</i> 'Rondo', <i>Philodendron erubescens</i> 'Red Emerald'
<i>P.debaryanum</i> R.Hesse	<i>Dieffenbachia seguine</i> 'Camilla', <i>Vriesea splendens</i> 'Christiane'
<i>P. dissimile</i> Vaartaja	<i>Calathea roseapicta</i> , <i>Peperomia obtusifolia</i>
<i>P. flavoense</i> Plaäts-Nit	<i>Dracaena reflexa</i> 'Song of India', <i>D. fragrans</i> 'Yellow Stripe', <i>Yucca elephantipes</i>
<i>P.irregulare</i> Buisman	<i>Aechmea fasciata</i> 'Morgana', <i>Agava americana</i> , <i>Calathea lancifolia</i> , <i>C. lancifolia</i> 'Ornata', <i>C. roseapicta</i> , <i>Camellia japonica</i> , <i>Dracaena deremensis</i> , <i>D. fragrans</i> 'Lemon Lime', <i>D. marginata</i> 'Magenta', <i>Ficus benjamina</i> 'Natasja', <i>Guzmania lingulata</i> 'Rondo', <i>Schefflera arboricola</i> 'Sonette', <i>Yucca elephantipes</i>
<i>P. uncinulatum</i> Plaäts-Nit. & I. Blok	<i>Calathea roseapicta</i>
<i>Pythium</i> sp.	<i>Astrophytum</i> sp., <i>Ctenanthe pilosa</i> 'Golden Mosaic', <i>Dracaena marginata</i> 'Magenta', <i>Ficus pumila</i> 'Sunny', <i>Guzmania lingulata</i> 'Rondo', <i>Peperomia</i> sp., <i>Yucca elephantipes</i>
<i>Verticillium alboatrum</i> Reinke et Berthold	<i>Pleiospilos compactus</i>
<i>V. album</i> (Preuss) Pidopl.	<i>Aechmea fasciata</i> 'Morgana', <i>Alocasia x amazonica</i> , <i>Calathea picturata</i> 'Argentea', <i>C. zebrina</i> 'Humilor', <i>Dracaena marginata</i> 'Magenta', <i>D. reflexa</i> 'Song of India', <i>Cycas revoluta</i>
<i>V. dahliae</i> Kleb.	<i>Echeveria laui</i>
<i>V. nigrescens</i> Pethybr.	<i>Alocasia x amazonica</i>
<i>V. nubilum</i> Pethybr.	<i>Alocasia x amazonica</i> , <i>Camellia japonica</i> , <i>Ficus benjamina</i> 'Starlight'

Micromycetes of 5 species from *Fusarium* genus were isolated from the injured root-neck of *Aechmea fasciata* 'Morgana' plants and from the injured root of *Ficus pumila* ('Sunny' and 'Dorte') at different times (Table 1). Roots of 26.42% of investigated plants were injured by pathogen *Fusarium oxysporum*. According to literature data *Pythium* micromycetes often injure plants of *Dracaena* genus (Brandenburger, 1985; Fletcher, 1987). In all investigated taxons of *Dracaena* genus plants (5 taxons), which had impaired growth and leaf chlorosis at different times, there functioned 3 species of this pathogen (Table 1). In the rhizosphere of plants which had lived under unfavourable conditions for less than 1 month, there functioned micromycetes of *Verticillium* genus detected in the plant rhizosphere of 12 taxons. Mostly injured were *Alocasia x amazonica* (*Araceae* family) plants: 3 species were isolated at different times (Table 1). In rhizospheres of plants, especially those sensitive to unfavourable growth conditions and rather rapidly losing their ornamental quality (Saakov, 1983), several species of pathogenic micromycetes functioned in each sick plant rhizosphere at the same time. From one sample of decayed plants the following pathogens were isolated: from *Aechmea fasciata* – *Fusarium equiseti*, *F. oxysporum* and *Pythium irregulare*; from *Dieffenbachia seguine* 'Camilla' – *Fusarium oxysporum*, *Pythium aristosporum*, *P. debaryanum*, from *Dracaena fragrans* 'Yellow Stripe' –

Fusarium oxysporum and *Pythium.irregulare*; from *Dracaena marginata* 'Magenta' – *Fusarium oxysporum* and *P. flavoense*; from *Alocasia x amazonica* – *Fusarium oxysporum* and *Verticillium nubilum*. In order to avoid damages in floriculture an important task is to detect the spreading of micromycete species, especially those characterized as parasites, as well as to detect the determinative factors of their active functioning.

CONCLUSIONS

1. From the rhizosphere of sick pot-plants, fungi from *Fusarium* (8 species), *Pythium* (6) and *Verticillium* (5) genera and 3 species of *Sclerotinia sclerotiorum*, *Thielaviopsis basicola*, *Rhizoctonia solanis* were isolated.

2. In the rhizosphere of sick pot-plants *Fusarium* genus species dominate and the frequency of occurrence reached 52.83%. This pathogen mostly injured *Aechmea fasciata* and *Ficus pumila* plants. Most often *F. oxysporum* species (from 13 plant taxons) were isolated.

3. *Pythium* genus micromycetes are potential root injurants of *Dracaena* genus plants. In the rhizosphere of these plants, 3 species – *P. aristosporum*, *P. flavoense* and *P.irregulare*. were identified at different times.

4. In the rhizosphere of seriously injured plants (*Aechmea fasciata*, *Dieffenbachia seguine*, *Dracaena fragrans*, *Alocasia x amazonica*, 2–3 pathogenic species from *Fusarium*, *Pythium*, *Verticillium* genus were functioning at the same time.

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