Micromycetes infecting stone fruit trees

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Micromycetes infecting stone fruit trees were established by mycobiotic investigation of stone fruit trees under different climatic conditions of Lithuania in 1995–1999. Micromycetes of 71 species infecting leaves, fruits and lignified organs of fruit trees were established. A greater diversity of fungal species was found on stone fruit trees on an extensive agrobackground. Pathogenic species of micromycetes are uniformly abundant in all districts of Lithuania. Infectious wilting of stone fruit trees is induced by a high prevalence of fungal diseases – cherry leaf spot, monilia leaf blight, silver leaf disease. A higher prevalence and injury by septoria leaf spot (*Septoria pallens* Sacc.), plump scab (*Cladosporium carpophillum* Thum.), silver leaf disease (*Stereum purpureum* (Pers. ex Fr.) Fr.) and phylosticta leaf spot (*Phyllosticta* sp.) were observed.

Key words: stone fruits, micromycetes, species, leaves, fruits, twigs, bark

INTRODUCTION

In agrocenoses, regulates the amount of biogenic elements, though so far efforts to break the ties between plants and fungi–parasites have been ineffective. Under these conditions the pathogens are competitors that take away part of the yield. Plant protection against pathogens is difficult, because artificially increasing the plant population density and homogeneity man acts against the factors that regulate the interaction of a plant-host and a parasite. The biotic environment is being formed around a plant, in which microorganisms occupy an important place. According to the interaction with plants they can be subdivided into pathogens, epiphytes, symbionts and indifferents. Among microorganisms there are only 1% of pathogens, but their harm, depending on a plant type and environmental conditions, ranges from 5 to 40% and in epiphytotic years to 90% [1, 2].

The changing ecological factors affect negatively the plant immune system and induce disease pathogens, therefore it is very important to establish the specific composition of micromycetes of stone fruits and to find out their role in fruit-tree pathogenesis. The aim of the work was to investigate and establish mycobiota diversity of stone fruit trees grown under different agroclimatic conditions of Lithuania.

METHODS

Micromycetes infesting stone fruit trees were established by investigating the mycobiota of stone fruit trees under different agroclimatic conditions of Lithuania in 1995–1999. Collected micromycetes were identified at the Plant Protection Laboratory, LIH, according to external traits by classical methods of microbiology [3–4]. At variety testing stations, diseases were recorded in spring when symptoms of monilia leaf blight and bark diseases were most prominent, and in the second half of summer when leaf diseases were well defined.

RESULTS AND DISCUSSION

Seventy-one species of micromycetes infesting leaves, fruits and lignified organs of stone fruit trees were established (Table). Pathogenic micromycete species dominated in all analyzed samples. No essential differences of stone fruit mycobiota were established in various agroclimatic zones. This can be explained by the fact that an orchard is an agrocenosis in which a human being regulates the quantity of biogenic elements. By artificially increasing the population density and homogeneity, man challenges the factors regulating the interaction of a plant-host and a parasite in natural ecosystems. A greater diversity of fungi was found on stone fruits on an extensive agrobackground.

Other authors [5] have examined the dependence of stone fruit microflora on a planting scheme – in denser plantings the quantity of fungi increased 7–10-fold, however, the planting scheme did not affect the prevalence intensity of mold and bacterial microphytes. Fungicide treatment of fruit trees re-

Table. **Micromycetes infecting stone fruit**

Micromycetes	Fruit tree	Infected part
1	*2*	*3*
Acladium conspersum Link ex Pers.	sour cherry, sweet cherry	bark
Acremonium charticola (Lindau) W. Gams	sour cherry	leaves
Alternaria cerasi Pot.	sour cherry, sweet cherry	leaves
Alternaria tenuis Nees	plum, sour cherry, sweet cherry	leaves
Aposphaeria cava Sacc. et Schulz.	plum, sour cherry, sweet cherry	leaves, twigs, bark
Ascochyta chlorospora Speg.	plum, sour cherry, sweet cherry	leaves, twigs
Arbuscula eugeniae Bat et Peres	sour cherry, sweet cherry	leaves
Artrinium phaeospermum (Corda) M. B. Ellis	sour cherry, sweet cherry	leaves
Auerobasidium sp.	sour cherry, sweet cherry	leaves
Arthrobotrys superba Corda	sour cherry, sweet cherry	leaves, bark
Aspergillus carbonarius (Bainier) Thom	plum, sour cherry, sweet cherry	leaves
Aspergillus niger Tiegh.	plum, sour cherry, sweet cherry	leaves, fruits
Aspergillus penicilioides Speg.	plum, sour cherry	leaves, fruits
Botrytis cinerea Pers. ex Fr.	plum	blossoms, fruits
Cercospora cerasella Sacc.	plum, sour cherry, sweet cherry	leaves
Cercospora circumscissa Sacc.	plum, sour cherry, sweet cherry	leaves
Cladosporium exoasci Lindau	plum, sour cherry, sweet cherry	leaves, fruit
Cladosporium herbarum (Pers.) Link ex Gray	plum	leaves
Cladosporium sphaerospermum Penz.	plum, sour cherry	leaves
Cladosporium cladosporioides (Fresen.) G. A. de Vries	pour cherry, sweet cherry	leaves
Cladosporium carpophilum Thum.	plum	fruits
Cytospora leucostoma Sacc.	plum, sour cherry, sweet cherry	bark
Cytospora personata Fr.	plum	twigs
Cylindrosporium hiemale Higg.	plum, sour cherry, sweet cherry	leaves
Clasterosporium carpophilum (Lev.) Aderh.	plum, sour cherry, sweet cherry	leaves, twigs, bark fruit
Coccomyces hiemalis Higg.	sour cherry, sweet cherry	leaves, fruits
Colletotrichum fructigenum (Berk.) Vassil.	plum, sour cherry	fruits
Fumago vagans (Pers. ex Sacc.) Fr.	plum, sour cherry, sweet cherry	leaves
Fusarium lateritium Nees	plum	fruits
Geotrichum candidum Link ex Pers.	plum, sour cherry, sweet cherry	fruits
Gymnoascus reesii Baran.	plum, sour cherry	bark
Gymnoascus roseus (Raillo) Apinis	plum, sour cherry	bark
Gloeosporium pruni Hallos	plum	fruits
Hendersonia foliorum Fuckel.	plum, sour cherry, sweet cherry	leaves
Humicola fuscoatra Traaen	plum, sour cherry, sweet cherry	leaves
Hendersonia cerasella Priel. et Delacr.	plum, sour cherry	dry twigs
Monilia cinerea Bon.	plum, sour cherry, sweet cherry	leaves, fruits
Monilia fructigena Pers. ex Fr.	plum	fruits
Mycosphaerella cerasella Aderh..	sour cherry	leaves
Macrosporium commune Aderh.	plum, sour cherry, sweet cherry	leaves, dry twigs
Myceliophtora sp.	sour cherry, sweet cherry	leaves
Nectria cinnabarina (Tode ex Fr.) Fr.	plum	twigs
Penicillium decumbens Thom	plum, sour cherry, sweet cherry	leaves
Penicillium diversum Raper et Fennell	sour cherry, sweet cherry	leaves, fruits
Penicillium fellutanum Biourge	sour cherry, sweet cherry	leaves
Penicilium ochro – chloron Biourge	plum, sour cherry, sweet cherry	leaves, fruits
Penicillium paxilli Bainier	plum, sour cherry, sweet cherry	leaves, fruits
Penicillium purpurogrnum Stoll	sour cherry, sweet cherry	leaves
Penicillium sclerotiorum van Beyma	sour cherry, sweet cherry	leaves, fruits
Penicillium expansum Link	plum, sour cherry, sweet cherry	fruits
Penicillium glaucum Link	plum	fruits
Penicillium italicum Wehmer	plum	fruits
Phoma herbarum Westend.	plum, sour cherry	leaves, twigs
Phoma glomerata (Corda) Wollenw. et Hochapfel	plum, sour cherry	leaves, twigs

Table continued

1	2	3
Phoma pomorum Thum.	plum	fruits
Phoma sp.	plum, sour cherry, sweet cherry	leaves, fruits
Phomopsis perniciosa Grove: Grove	plum, sour cherry, sweet cherry	fruits
Phomopsis mali Roberts	plum, sour cherry, sweet cherry	twigs
Phyllosticta circumscissa Cooke	plum, sour cherry, sweet cherry	leaves
Phyllosticta pruni – avium Allesch.	plum, sour cherry, sweet cherry	leaves
Phyllosticta prunicola (Opiz.) Sacc.	plum, sour cherry, sweet cherry	leaves
Pleospora vulgaris Niessl.	sour cherry, sweet cherry	leaves, dry twigs
Septoria pallens Sacc.	plum, sour cherry, sweet cherry	leaves
Sarcopodium circinatum Ehrenb. ex Schltdl.	plum, sour cherry, sweet cherry	bark, wood
Stereum purpureum (Pers. ex Fr.) Fr.	plum, sour cherry, sweet cherry	bark, wood, leaves
Taphrina cerasi (Fuck.) Sadeb.	plum, sour cherry, sweet cherry	leaves
Taphrina pruni Tul.	plum	leaves, fruits
Tranzschelia pruni – spinosae (Pers.) Dilt.	plum	leaves
Trichoderma hamatum (Bonord.) Bainier	plum, sour cherry, sweet cherry	leaves
Ulocladium chararum (Preuss) E. G. Simmons	sour cherry, sweet cherry	leaves, twigs
Mycelia sterilia	plum, sour cherry, sweet cherry	leaves

duces the amount of mold and fungal microorganisms.

Among micromycetes accompanying pathogens fungi are abundant. They destroy plant residues intensively and participate in the destruction of organic matter. The abundance of the genus *Penicillium* species (10) reveals their cosmopolitan nature and active participation in tissue maceration and organic matter destruction. *Penicillium decumbens, P. ochrocholor, P. paxilli* species were found on all leaves of investigated stone fruit (Table). These species are often encountered on various natural and synthetic substances. In addition, among *Penicillium* fungi there are pathogens (*P. expansum, P. glaucum, P. italicum*) that cause fruit rot.

Pathogenic micromycete species were encountered at the same abundance in all districts of Lithuania. Coccomycosis and moniliosis were established as most harmful diseases, the latter one being especially harmful in spring in the form of monilia leaf blight. In summer and autumn moniliosis results in fruit rot. Monilia leaf blight spreads in cool and wet springs. On average it reoccurs every 2–3 years; blossoms, unfolding leaves and sprouts of stone fruit, in particular of sour cherry, wilt. In wet weather, *i.e*. under favorable conditions, most susceptible are those sour cherry varieties whose fruits crack due to excessive moisture. In 1997 moniliosis severely injured sour cherry trees of the susceptible variety *North Star*. Moniliosis is a chronic disease, which can infect blossoms and shoots for a number of years and reduced more or less the yield. Cherry leaf spot is a sudden disease. It develops rapidly, leaves fall down, and next year the tree may die out. Sprouts from roots are even more susceptible to cherry leaf spot than the tree, since the infection arises from overwintered infected trees.

Numerous authors [6–8] indicate moniliosis as becoming a more active disease of stone fruit. In 1994 in Belarus [8] epiphytoty of this harmful disease was fixed, followed by extinction of sour cherry trees of breeding numbers with higher resistance to cherry leaf spot. Losses were high and the applied protection means had not been effective. It is difficult to select varieties characterized by a complex resistance alongside self-fertility and stable productivity. Many authors [6–8] indicate the lack of varieties immune to cherry leaf spot and monilia leaf blight. The geographic distribution of the disease without any doubt is related to climate and natural regions of stone fruit.

Our investigation data reveal that infectious wilting of stone fruit trees is induced by a high prevalence of fungal diseases such as cherry leaf spot, monilia leaf blight and silver leaf disease. The causal fungus of silver leaf disease (*Stereum purpureum*) first of all infects fruit trees, which become weaker because of unfavorable environmental conditions. The pathogen is severe on sweet cherry, plum and is becoming more severe on sour cherry as well, causing silver leaf and white rot of wood. The disease origin may be either infectious or non-parasitic. Silver leaf disease may be caused by boron deficiency, air humidity and soil moisture deficiency at intensive lightening, harsh pruning, regrafting, and gall mite injury. Disease symptoms do not inhabit new shoots after stress elimination. When the disease is noninfectious, the affected leaves usually preserve

green zones at main veins. More often the irreversible form of the disease is encountered, which can hold a long latent period, and the external symptoms can become evident only under the above-mentioned stresses. Exuded by the pathogen, toxins gradually penetrate the whole plant, leaf epidermis comes off, though the pathogen is not found in non-lignified soft parts of a plant. Cracking occurs on the bark of infected branches and trunks, which later are covered by mycothallus. Infectious silver leaf disease weakens the plant and it dies in 3–5 years.

Currently anthracnose started to spread, which is caused by *Colletotrichum fructigenum* (syn. *Gloeosporium fructigenum* Berk.). The disease is spreading mainly in household gardens and unsprayed orchards. Most varieties of the cultivated plum and sour cherry are susceptible, therefore the new disease is potentially harmful to stone fruit and under favorable conditions sour cherry and plum are severely damaged. In orchards of variety testing stations, 10–50% of sour cherry and 15–45% of plum fruits were infected with anthracnose. The prevalence of the disease proves that it is necessary to examine the biology of disease pathogen and to search for protection means.

Recently the prevalence of other diseases and increase of their harmfulness have been observed. They are septoria leaf spot (*Septoria pallens* (syn. *Gnomonia erytrostoma* (Pers.)Auersw.)), plum scab (*Cladosporium carpophillum*), silver leaf disease (*Stereum purpureum*), brown leaf spot, etc. Most of the diseases have spread only recently, therefore their biology has not been sufficiently studied.

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KAULAVAISIUS SODO AUGALUS PAŽEIDŽIANTYS MIKROMICETAI

Santrauka

Atliekant kaulavaisių vaismedžių mikobiotos tyrimus skirtingose Lietuvos agroklimatinėse zonose 1995–1999 m., nustatyti šiuos augalus pažeidžiantys mikromicetai. Identifikuota 71 rūšis mikromicetų, pažeidžiančių kaulavaisių lapus, vaisius bei sumedėjusius vaismedžius. Didesnė grybų rūšių įvairovė rasta ant kaulavaisių buvusiame ekstensyviame agrofone. Patogeninės mikromicetų rūšys yra vienodai gausiai išplitusios visuose Lietuvos rajonuose. Kaulavaisių vaismedžių nudžiūvimą skatina stiprus sergamumas grybinėmis ligomis – kokomikoze, monilioze, sidabraligе. Pastebėtas kaulavaisių lapų džiūsnos (*Septoria pallens* Sacc.), slyvų rauplių (*Cladosporium carpophillum* Thum.), sidabraligės (*Stereum purpureum* (Pers. ex Fr.) Fr.), rudmargių (*Phyllosticta* spp.) plitimas ir žalingumo didėjimas.