International Journal of Horticultural Science 2009, 15 (1–2): 91–93
Agroinform Publishing House, Budapest, Printed in Hungary
ISSN 1585-0404

Some biological features of cherry leaf spot *(Blumeriella jaapii)* with special reference to cultivar susceptibility

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Summary: In this review, some important features of biology are summarised for cherry leaf spot (*Blumeriella jaapii*). In the first part of the review, the geographical distribution of the pathogen and the causal organism are described. Disease symptoms and disease cycle of cherry leaf spot are also shown. Special attention is given to hosts and then several cherry cultivars are described in relation to their susceptibility to cherry leaf spot.

Key words: *Blumeriella jaapii*, symptoms, hosts, disease susceptibility, disease cycle

Introduction

Cherry leaf spot is a widely-spread disease in most sour and sweet cherry growing areas all over the world. Under humid climate, the disease causes severe leaf defoliation in the second half of the season. The early leaf defoliation during summer weakens the tree and increases frost susceptibility of the fruit-bearing parts of the tree. In order to avoid these negetive effects, fungicide control programmes are initiated from petal fall stage of blossom and continued on a 7–10-day schedule. Five to seven fungicide applications per season can control effectively the disease (*Jenser & Véghelyi*, 2003; *Holb & Veisz*, 2005).

The aim of this review was, first, to describe some biological features of cherry leaf spot with special regards to cultivar susceptibility of sour and sweet cherries.

Geographical distribution

The disease was first described in the USA in 1878. A few years later (1885), the disease was reported from Europe and it spread quickly. In Hungary, the first occurence of the disease was observed in a sour cherry nursery in 1939. By the 1960s, the disease became an economically important disease in fruit bearing sweet and sour cherry orchards too (*Glits*, 1962). Nowadays, it is a widely-spread disease in most Hungarian sour and sweet cherry orchards.

Causal organism

The most commonly used legitim name is *Blumeriella jaapii* (Rehm) Arx [teleomorph] and *Cylindrosporium padi* P. Karst. [anamorph] (*Eisensmith* et al., 1982ab). The most commonly used English name is cherry leaf spot, cherry leaf blight (USA), and cherry anthracnose (USA) (*Garcia & Jones*, 1993). On the other hand, several other scientific names are known (*Table 1*).

Symptoms

Cherry leaf spot results in small, pinpoint lesions on the leaves. The first spots appear in the spring but new spots can appear from spring until late summer. In the upper surface of the leaves, the spot or lesion rapidly enlarges, becoming brown or purple, and dies from the center out. In the lower leaf surface, light pink to white masses appear in the center. These are the fruiting bodies (acervuli) of the fungus and contain masses of spores. Spots merge together to kill large areas of the leaf. Diseased leaf tissue may also separate from

Table 1: Most common scientific names used for identifying cherry leaf spot pathogen

Blumeriella jaapii (Rehm) Arx	*[teleomorph]*
Cylindrosporium padi P. Karst.	*[anamorph]*
Coccomyces hiemalis B.B. Higgins	*[teleomorph]*
Higginsia hiemalis (B.B. Higgins) Nannf.	*[teleomorph]*
Coccomyces prunophorae B.B. Higgins	*[teleomorph]*
Coccomyces lutescens B.B. Higgins	*[teleomorph]*
Pseudopeziza jaapii Rehm	*[teleomorph]*
Sporonema feurichii (Budák) Höhn.	*[teleomorph]*
Phloeosporella padi (Lib.) Arx	*[anamorph]*
Ascochyta padi Lib.	*[anamorph]*
Cylindrosporium hiemalis (B.B. Higgins) Sacc.	*[anamorph]*
Septoria padi (Lib.) Thüm.	*[anamorph]*
Septoria padi Lasch	*[anamorph]*
Cylindrosporium prunophorae B.B. Higgins	*[anamorph]*
Cylindrosporium lutescens B.B. Higgins	*[anamorph]*
Cylindrosporium tubeufianum Allesch.	*[anamorph]*

healthy tissue, drop out, and give the leaf a shothole appearance. Leaves with multiple infections turn light green, then yellow, and drop from the tree (*Figure 1*). Early defoliation caused by leaf spot delays acclimatization of wood in the autumn, and bud survival and fruit set are reduced for at least two seasons as a result. The disease can attack fruit stems, and these infections sometimes girdle the stem to cause a fruit drop. Fruit also can be infected but it is less common than infection of foliage (*Eisensmith* et al., 1982ab; *Holb & Veisz*, 2005).

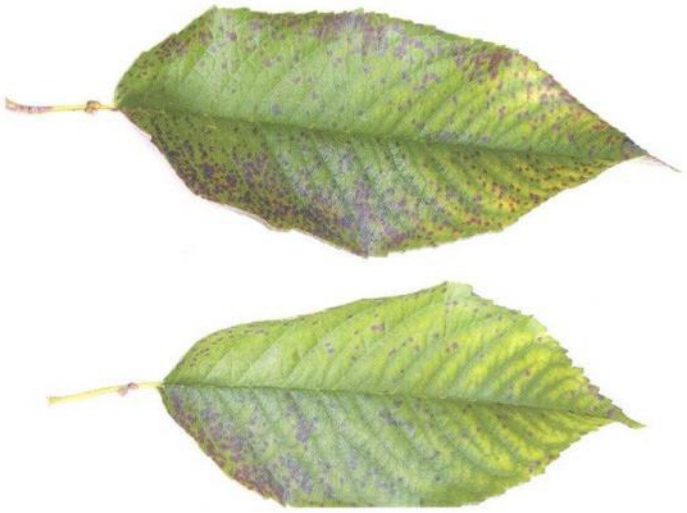

Figure 1: Severely infected sweet cherry leaves caused by *Blumeriella jaapii* (Photo by Imre Holb)

Disease cycle

The inoculum source of the disease is the fallen infected leaves. The fungus overwinters on fallen infected leaves on the orchard floor. Asexual fruiting bodies (acervulus) overwinter in the leaf tissue. Mild winter helps the successful overwintering of the fungus on the orchard floor. In spring, both apothecium and acervulus can be produced in the overwintered leaf surface. Ascospores start to discharge from mid-April and this process can last for two months. Peak of the spore dispersal occurs at mid-May. In spring, the acervulus produces conidia. Conidia can be released earlier compared to ascospores (late March) and the first infection can occur in the beginning of April. Spread of spores is supported by wind and rain splash. In a cold and rainy spring, the spores land on the leaf surface and then germinate and infect the leaf tissue throughout the stomata (*Niederleitner & Zinkernagel*, 1999). Leaf susceptibility to the disease decreases by age. A wet period of only a few hours can be sufficient for spore germination and infection (*Eisensmith* et al., 1982ab). Development of visible symptoms occurs after 1–2 weeks of latent periods. Infection can take place again depending on weather conditions. Secondary spread and infection by conidia continues in repeated cycles. Summer epidemics highly correlate with the frequency of rain events. If multiple infection occurs, the leaves fall. These infected leaves will overwinter on the orchard floor (*Sjulin* et al., 1989).

Hosts and cherry susceptibility

The disease is economically important on sweet and sour cherry but also affects almond, dwarf Russian almond, apricot, mahalen, chokecherry, cherry laurel and wild plums (*Kaszonyi*, 1955). The *Prunus* species, *P. canescens*, *P. incisa*, *P. kurilensis*, *P. maackii*, *P. nipponica*, *P. sargentii*, *P. serrulata* ssp. *spontanea*, *P. subhirtella* showed a resistant reaction type to the leaf spot fungus but the species *P. dawyckensis* was susceptible (*Shuster & Tobutt*, 2004).

According to the Hungarian literature, clones of Pándy are very susceptible to leaf spot. Sour cherry cultivars Csengődi and Akasztói are known to be resistant to the disease (*Apostol* et al., 2000; *Rozsnyai & Apostol*, 2005). *Apostol* et al. (2000) showed that test crossings with female parents: 'Érdi bőtermő, 'Meteor korai', 'Erdi nagygyümölcsű', 'M 221' 'III-43/60', 'IV-2/152', and with male parents: 'Csengődi', 'Erdi bőtermő', 'Meteor korai: and 'IV-2/152' resulted in some resistance to the disease. In the case of sweet cherry, *Benedek* et al. (1990) demonstrated that cv. Germersdorfi is the least, while cv. Bigarreau Burlat is the most susceptible cultivar. Studies on rootstocks for sweet and sour cherry showed that selections of Sajmeggy C-500, Sajmeggy SL-64, MxM-97 and MxM-14 have considerable resistance to leaf spot (*Hrotkó*, 1997). In a recent research, *Király & Szentpéteri* (2006) showed that the least sensitive cultivar was Linda while the most sensitive cultivars were Early Müncheberg, Biggareau burlat and Solymári to cherry lef spot.

In the international literature, preliminary studies suggested that the interspecific cherry hybrid GiSelA (GI) 148-1 (syn. GI 6) (*P. cerasus* cv. Schattenmorelle × *P. canescens*) bred in Germany was resistant to cherry leaf spot and may be a source of resistance (*Schmidt & Gruppe*, 1988). *Sjulin* et al. (1989) showed that cultivars Yellow Glass, Schmidt and Emperor Francis sweet cherries were the lowest and Montmorency sour cherry and Krassa Severea duke cherry were the greatest in disease defoliation caused by *B. jaapii* among 25 cultivars tested in the field.

Among cherry cultivars, relatively resistant to leaf spot were cvs. Hindenburg and Kampesur and rather susceptible to leaf spot were cv. Kristiina and selection Tommu (*Janes* et al., 2000). Cultivar Lati-Leedu Madalkirss was the least susceptive to cherry leaf spot. No stone fruit cultivars were found to be resistant to leaf spot (*Janes & Kahu*, 2000).

Wolfram (2000) released four new cultivars: Karneol (Koroser x Schattenmorelle), Morina (Koroser x Rheinhardts Ostheimer), Safir (Schattenmorelle × Fanal) and Topas (Fanal × Kelleriis16) that were more resistant to brown rot (*Monilinia* spp), and leaf spot (*Blumeriella jaapii*) compared to cv. Schattenmorelle.

Wharton & Iezzoni (2005) developed a rapid detached leaf screening assay to maximize the use of the limited plant material available and to collect fungal isolates from various varieties of sour cherry.

Budan et al. (2005) estimated the level of the field susceptibility to leaf spot of 100 accessions in the Romanian

Sour Cherry Germplasm Collection to choose parents for breeding programs. Cultivars were classified according to the average frequency of injured leaves and severity of infection. The results showed that none of the genotypes have immunity to leaf spot, but some of them have only a low level of infection and can be used as potential donors for transferring polygenic resistance.

Schuster & Wolfram (2005) showed that cultivars Rubellit, Achat, Jade and Spinell were more resistant to diseases compared to cv. Schattenmorelle.

Christov et al. (2008) showed that Elite No 5645 is a very early ripening and productive cultivar. The cultivar produces a good fruit mass and is only moderately susceptible to cherry leaf spot (*Blumeriella jaapii*). Cultivar Ranochnaya had very low susceptibility to cherry leaf spot, whereas cultivars Sovetskaya, Merchant and Bing were highly susceptible to cherry leaf spot.

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