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Harmful Effect of Cherry Leaf Spot (*Blumeriella jaapii*) on Sour Cherry and Influence on Fruit Yield

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Abstract

The experiment was carried out in 2007-2012 in a sour cherry orchard with three cultivars – 'Oblachinska', 'Schattenmorelle' and 'Heiman Ruby'- established in the region of the town of Hisar. In 2007 the control of cherry leaf spot (*Blumeriella jaapii*) was conducted at improper time and inaccurate rates. That induced leaf defoliation in August. In the next vegetation periods (2008-2012) the control of cherry leaf spot was carried out by applying fungicides at definite rates at the most critical time for the host-pathogen system. During the next years (2009-2012) the trees of 'Oblachinska' cultivar yielded normally – 1300 kg/dekar, while the trees of the other two cultivars started improving their health status and the yield gradually increased, reaching up to 1600 kg/dekar(da) for 'Heiman Ruby' and 1100 kg/da for 'Schattenmorelle'.

Key words: sour cherry cultivars, fungicides, fungal disease

Introduction

Cherry leaf spot is a fungal disease in sour cherry, spread in all the regions of the world where the fruit species is grown (Jones, 1996; Gelvonauskiene, 2004; Todorovic, 2009; Pfeiffer, 2010; Pedersen, 2012).

The pathogen (*Blumeriella jaapii* (Rehm) Arx*, Cylindrosporium hiemalis* (Higgins) Sacc.) overwinters in fallen leaves and in the spring produces apothecia. The optimum temperature for fruiting bodies development is 15-17^0 C. Ascospores may be discharged during and shortly after rainfall. Low numbers of acervuli may also be produced in old infected leaves. First infection is initiated in humid weather. A large number of small reddish-brown spots appear on the leaves, followed by premature leaf abscission. The attacked shoots and the buds located on them do not ripen and they are usually frost bitten in winter. That causes a yield decrease in the next years.

Many authors recommend several treatments with different fungicides after the flowering period for control of cherry leaf spot (Jones, 1996; Pedersen, 2012). First spraying is usually applied after petal fall and it attacks the infection caused by ascospores. Next treatments are carried out every 10-15 days depending on the meteorological conditions and the cultivars grown in the orchards.

Jones and Ehret (1993) carried out trials in sour cherry plantations with the following chemicals: myclobutanil, tebuconazole, fenarimol and chlorothalonil, applying from 5 to 7 treatments. Myclobutanil and tebuconazole showed the best result and fenarimol had a weaker effect. Chlorothalonil is not recommended to be used throughout the vegetation period. It should be applied at the early stages of tree development and in post-harvest treatments.

Chlorthalonil and copper-containing fungicides were also recommended to be included in the schemes for control of cherry leaf spot by other authors (McManus, 2007). However, tebuconazole and trifloxystrobine are highly efficient and have a good curative effect. Borovinova (2007) recommended post-infection treatments with highly efficient fungicides based on bitertanol, tebuconazole, myclobutanil, difenoconazole and dodine.

The aim of the present study was to follow up the development of cherry leaf spot (*Blumeriella jaapii*) in a sour-cherry orchard for a five-year period, the effect of the disease on the yield and its control.

Material and Methods

The study was carried out in 2007-2012 in a sour-cherry orchard established on 4 ha in the region of Hisar town. The following sour-cherry cultivars were grown in the plantation: 'Oblachinska', 'Schattenmorelle'

and ‘Heiman Ruby’. The fruit yield obtained from each cultivar was reported at the end of the harvest period and it was presented per dekar.

The infection rate of cherry leaf spot was determined on 500 leaves sampled from all the four directions and the centre of the tree crown of labelled trees, at the end of vegetation (in August). The rate of the disease development was calculated by McKinney index formula (Josefovich, 1956).

The rate of the attacks on the leaves was reported following the disease rating scale of Andreevski and Richter (1976):

0 – no symptoms of the disease;
1 – up to 5% of the leaf area is infected;
2 – 6-25% of the leaf area is infected;
3 – 26-50% of the leaf area is infected;
4 – 51-75% of the leaf area is infected;
5 – over 76% of the leaf area is infected.

Results and Discussion

In 2007 seven fungicide treatments were carried out in the sour cherry orchard at improper time and inaccurate rates (Table 1). As a result of that, cherry leaf spot (*Blumeriella jaapii*) developed at a high rate and induced premature defoliation up to 90% in August in ‘Heiman Ruby’ cultivar (Fig. 1), and 70% in ‘Schattenmorelle’. In ‘Oblachinska’ the infestation rate of the disease was 42%, no leaf fall was observed (Table 2). The fruit yield obtained was good only from the trees of ‘Oblachinska’ cultivar – 1200 kg/da, while from the other two cultivars the yield was unsatisfactory – 500 kg/da from ‘Schattenmorelle’ and 600 kg/da from ‘Heiman Ruby’, respectively (Table 3). The improper plant protection activities carried out in 2007 led to epiphytoty development of cherry leaf spot in ‘Heiman Ruby’ and ‘Schattenmorelle’ cultivars. Due to immaturity of wood, during the next vegetation period 5% of the trees of ‘Heiman Ruby’ died and in the other cultivars the two-year old shoots were defoliated.

Tab. 1. Fungicidal treatments (2007-2012)
Tretmani fungicidima (2007-2012)

Treat-meant *Tretman*	2007		2008		2009		2010		2011		2012	
	Date *Dat.*	Fungicide dose % *Doza fungicida*	Date *Dat.*	Fungic. dose % *Doza fungic.*	Date *Dat.*	Fungici. dose % *Doza fungici.*	Date *Dat.*	Fungic.. dose % *Doza fungic.*	Date *Dat.*	Fungici. dose % *Doza fungic.*	Date *Dat.*	Fungicide dose % *Doza fungic.*
Winter-spring *Zima-proljeće*	March 12th	Cupper hydroxide /0.3/	Februar y 29th	Cupper hydroxide /0.3/	March 16th	Cupper hydroxide /0.3/	March 20th	Cupper hydroxide /0.3/	March 14th	Cupper hydroxide /0.3/	March 21st	Cupper hydroxide /0.3/
Pre-blossom *Predcvjet.*					April 10th	Mancoceb /0,3/	April 9th	Thiram /0.3/	April 11th	Myclobutanil /0.03/+Thira m /0.3/	April 8th	Dithianon /0.05/
Blossom *Cvjetanje*	April 21st	Thiram /0.3/	April 7th	Tiophanate methyl /0.15/	April 18th	Ciprodinil /0.05/	April 15th	Tiophanate methyl /0.15/	April 18th	Tiophanate methyl /0.2/	April 12th	Flusilazole +carbendaz im /0,0075/
I after blossom I *nakon cvjet.*			April 19th	Promicido n /0.15/	April 28th	Tiophanate methyl /0.2/	April 23rd	Tebuconaz ole /0.1/	May 7th.	Diphenocona zol /0.02/	April 23rd	Tiophanate methyl /0.2/
II after blossom *II nakon cvjet.*			April 29th	Tiophanate methyl /0.2/	May 8th	Tebucona zole /0.1/	May 10th	Chlortalon yl /0.03/	May 19th	Tebucona zole /0.1/	May 21st	Myclobuta nil /0,02/
III after blossom *III nakon cvjet.*	May 11th	Tebuconazol e /0.075/	May 11th	Tebuconaz ole /0.1/	June 10th	Tebuco nazole /0.06/	May 25th	Tiophanate methyl /0.08/	June 8th	Tiophanate methyl /0.15/		
IV after blossom *IV nakon cvjet.*	May 30th	Cupper hydroxide /0.3/	May 30th	Tebucona zole /0.1/								
Post-harvest *Nakon berbe*	July 3rd	Dodine /0.1/	June 26th	Dithianon /0.05/					July 11th	Tebucona zole /0.075/		
Summer.	August 22nd	Tebuconazol e /0.075/										

Tab. 2. Degree of assault by *Blumeriella jaapii* in end of august
Stepen napada od strane Blumeriella jaapii krajem avgusta

Variety *Sorta*	Degree of assault % *Stepen napada %*											
	2007		2008		2009		2010		2011		2012	
		Control		Control		Control		Control		Control		Control
Heimanns Rubin	90*	-	5	60*	2	73*	1,2	67*	1	62*	1	67*
Schattenmorelle	70*	-	4,3	53*	2,1	48*	0,3	45*	0,2	37*	0,5	40*
Oblachinska	42	-	2,5	29	1,5	30	0	27	0	25	0	22

* - fall of leaves, %
* *-% opalog lišća*

Fig. 1. Defoliation tree of 'Heiman Ruby' (August 8th, 2007).
Defolijacija stabla 'Heiman Rubi' (8. avgust, 2007.)

In 2008 seven fungicide treatments were applied (Table 1) - one in winter-spring, one during the flowering, four in the post-flowering period and one after harvest. Spraying during the flowering period was carried out against early brown rot (*Monilia laxa* (Ehrenb.) Sacc. & Voglino). For the post-flowering treatments, the pathogen biology and the effect of the

chemicals used were taken into account in order to prepare the proper spraying solution. At the end of the vegetation period the disease infestation rate was 5% in 'Heiman Ruby' cultivar, 4,3% in 'Schattenmorelle' and 2,5 % in 'Oblachinska' (Table 2). In that year the tree growth was strongly depressed and although the level of the cherry leaf spot attack was low, the yield was very low: 420 kg/da from 'Schattenmorelle' and 400 kg/da from 'Heiman Ruby'. A slight yield increase was reported only for 'Oblachinska' cultivar – 1300 kg/da (Table 3). In untreated sour cherry orchards from the same location, the attacks of cherry leaf spot caused 50-60% of early leaf abscission in 'Heiman Ruby' in August and the disease index of the leaves remaining on the shoots was 67%; in 'Schattenmorelle' the disease index was 53% and in 'Oblachinska' – 29% (Table 2).

Tab. 3.Yield sour cherries (2007-2012)
Prinos višnje (2007-2012)

Variety *Sorta*	Yield kg/da *Prinos kg/da*					
	2007	2008	2009	2010	2011	2012
Oblachinska	1200	1300	1300	1300	1300	1450
Schattenmorelle	500	100	560	800	1060	1100
Heimanns Rubin	600	400	660	1000	1560	1600

During the next vegetation seasons (2009-2012) the control of cherry leaf spot was carried out by applying fungicides at definite rates at the most critical time for the host-pathogen system (Table 1). The disease index was reduced to 1-2%, while the index was high in the control trees, varying from 22 to 73% and premature leaf abscission was observed (Table 2). During those years the trees of 'Oblachinska' cultivar yielded normally – 1300 kg/da, while the trees of the other two cultivars started improving their health status and the yield gradually increased, in 2012 reaching up to 1600 kg/da for 'Heiman Ruby' and 1100 kg/da for 'Schattenmorelle'.

Conclusion

Cherry leaf spot (*Blumeriella jaapii*) is an economically important disease in sour cherry, leading to early leaf abscission and dying of the trees. An important factor for obtaining high yields is to carry out chemical

treatments taking into consideration the cultivar susceptibility, the pathogen biology, the effect of the chemicals and the time of application.

In 2007 the studied orchard was severely infected by cherry leaf spot and the yield was unsatisfactory: 600 kg/da from 'Heiman Ruby' cultivar, 500 kg/da from 'Schattenmorelle' and 1200 kg/da from 'Oblachinska". In 2012 the tree health status was excellent and the yield significantly increased: 1600 kg/da for 'Heiman Ruby' cultivar, 1100 kg/da for 'Schattenmorelle' and 1300 kg/da for 'Oblachinska".

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Štetan efekat prouzrokovača pjegavosti lista višnje i trešnje (*Blumeriella jaapii*) na višnju i uticaj na prinos voća

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Sažetak

Eksperiment je izveden u periodu 2007-2012. godine u zasadu višnje sa tri sorte - 'Oblachinska', 'Schattenmorelle' i 'Heiman Rubi' regionu grada Hisar. U 2007. godini kontrola prouzrokovača pjegavosti lista višnje i trešnje (*Blumeriella jaapii*) je sprovedena u neodređeno vreme i u netačnim terminima. Do indukovane defolijacija listova došlo je u avgustu. U narednim vegetacionim periodima (2008.-2012.godine) kontrola je izvršena primenom fungicida u određenim fazama u najkritičnijem trenutku za sistem domaćin-patogen. Tokom narednih godina (2009-2012. godine), stabla sorte 'Oblachinska' su imala normalan prinos (1300 kg/dekar), dok su stabla druge dvije sorte počela pokazivati poboljšanje njihovog zdravstvenog stanja i postepeno povećanje prinosa koje je dostiglo 1600 kg/da kod 'Heiman Ruby' i 110kg/da kod sorte 'Schattenmorelle'.

Ključne reči: sorte višnje, fungicidi, gljivične bolesti

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