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Some biological properties of new sweet cherry cultivars in Bulgaria and their susceptibility to *Blumeriella jaapii*

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Summary: Investigations were made on 12 sweet cherry cultivars ('13-S-22-8', 'Sunburst', 'Kozerska', 'NY 13791', 'Royalton', 'NY 13688', 'Hartland', 'Sumerset', 'Pollax', 'Patriotka Krima', 'Castor', and 'Lapins') in an experimental orchard of cherry cultivar collection in the Institute of Agriculture at Kyustendil, Bulgaria during the period of 1997-2003. The trees were planted in 1996. All cultivars were grafted on *Prunus mahaleb*. Four biological properties of the cultivars were assessed such as blooming time, resistance to late spring frost, fruit ripening and fruit mass. Among cultivars, a good resistance to late spring frost was observed on cultivar 'Sunburst'. The fruit mass varied between 4.2 g (cv. 'Patriotka Krima') and 8.5 g (cv. 'Sunburst'). The susceptibility of the cherry cultivars to cherry leaf spot caused by *Blumeriella jaapii* was assessed in mid-September in each year. The estimation of the rate of attack was made according to the grade of Townsend and Heuberger. All cultivars showed symptoms of cherry leaf spot but the degree of susceptibility was different. Cultivar 'Patriotca Krima' was the least susceptible, while cultivar 'Sumerset' was the most susceptible to *Blumeriella jaapii*.

Key words: cherry cultivars, qualities, cherry leaf spot, *Blumeriella jaapii*

Introduction

The conditions in Bulgaria are favourable for cheap production of high quality sweet cherries, especially in Kyustendil region where 1/3 of the cherry orchards of Bulgaria are located. For the last 45–50 years, intensive work has been started towards the improvement of the sweet cherry assortment in two directions – breeding of new Bulgarian sweet cherry cultivars and introduction of foreign cultivars (*Georgiev*, 1997; *Christov*, 2002). As a result of the efforts, 10 new sweet cherry cultivars were created, 7 by the Institute of Agriculture, Kyustendil. During the above mentioned period more than 130 foreign cultivars were introduced and investigated as the aim was to select cultivars for integrated fruit production.

A lot of fungi attack cherry, but cherry leaf spot *(Blumeriella jaapii)* is the key disease. All commercially important cultivars of cherry are susceptible to cherry leaf spot (*Syrovatko & Blazkova*, 1986; *Sjulin* et al., 1989; *Borovinova & Hristov*, 1995ab; *Janes & Kahu*, 2000; *Holb & Veisz*, 2005) and it is controlled by 2–4 fungicide applications (*Borovinova & Sredkov*, 2003; *Holb* et al., 2005). There are not any cherry cultivars resistant to cherry leaf spot but their susceptibility is very different. Growing of cultivars with weak susceptibility allows to decrease number of fungicide applications for control of cherry leaf spot.

The aim of our study was to investigate some biological properties of new sweet cherry cultivars in Bulgaria and their susceptibility to *Blumeriella jaapii*.

Materials and methods

Investigations were made on 12 sweet cherry cultivars ('13-S-22-8', 'Sunburst', 'Kozerska', 'NY 13791', 'Royalton', 'NY 13688', 'Hartland', 'Sumerset', 'Pollax', 'Patriotka Krima', 'Castor', and 'Lapins') in an experimental orchard of cherry cultivar collection in the Institute of Agriculture at Kyustendil, Bulgaria during the period of 1997–2003. The trees were planted at a spacing 6 x 5 m in 1996. All cultivars were grafted on *Prunus mahaleb*. Every year the trees were sprayed 2 or 3 times with dodin and ergosterol biosynthesis inhibitors at the approved dosage of fungicide application. Insecticide treatments were applied when necessary.

Four biological properties of the cultivars were assessed such as blooming time, resistance to late spring frost, fruit ripening and fruit mass. Damages from late spring frost were reported in April, 2003 after the air temperature sank to minus 8° C.

The susceptibility of the cherry cultivars to cherry leaf spot caused by *Blumeriella jaapii* was assessed in mid-September 1997, 1998, 1999, 2002 and 2003 which indicated the full season epidemic progress of *B. jaapii* together with the effectiveness of the annual disease management program. Six trees of each cultivar were estimated taking an average sample of 50 leaves from the four sides of each tree. The estimation of the rate of attack (percentage of disease incidence) was made according to the grade of Townsend and Heuberger (*Kremer & Unterstenhofer*, 1967) and of

Holb et al. (2003). Four susceptibility groups of cherry leaf spot were also created: high, moderate, low and very low susceptibility. Classification of susceptibility groups was made according to the methods of *Holb* (2000) for apple scab.

Results and discussion

From the twelve assessed cultivars, the blooming was the earliest at 'Patriotka Krima', 'Hartland' and 'Royalty'. Blooming started the latest at cultivars 'Lapins', 'Sumburst', 'NY13791' and '13-S-22-8' (*Table 1*). After the air temperature sank to minus 8° C, significant damage of the flower organs was observed. Relatively few damage was assessed on the cultivars 'NY 13791', 'Hardland', 'Patriotka Krima' and 'Sunburst'.

The ripening of the fruits begins the earliest at the cultivars 'Patriotka Krima', 'Pollax' and 'Hartland'. Cultivars with the latest ripening were 'Sunburst', 'Kozerska' and '13-S-22-8'. The rest of the cultivars are of intermediate ripening (*Table 1*).

Table 1. Date of the beginning of the full flowering, fruits maturing, frost damage of flowers and mean mass of damages by frost and mean mass of fruits (Kyustendil, Bulgaria, 1997–2003)

Cultivars	Beginning of the full flowering	Fruits maturing	Frost damage of flowers (%)	Mean mass of fruits (g)
Patriotka Krima	9.04.	29.05.	77.36	4.20
Pollax	14. 04.	5.06.	80.34	4.50
Hartland	12. 04.	13.06.	77.05	5.90
Royalton	12.04.	17.06.	87.74	7.80
NY 13688	13.04.	17.06.	87.00	6.50
Sumerset	13.04.	18.06.	86.94	8.00
Lapins	18. 04.	19.06.	86.64	7.40
Castor	21. 04.	19.06.	79.75	7.60
NY 13791	20.04.	19.06.	75.00	6.80
Sunburst	19.04.	21.06.	78.60	8.50
Kozerska	16.04.	21.06.	88.61	7.30
13-S-22-8	21.04.	22.06.	92.00	4.60

It was found that cultivars 'Sunburst', 'Sumerset', 'Royalton', 'Castor', 'Lapins' and 'Kozerska' had the biggest fruit weight. The smallest were the fruits of 'Patriotka Krima', 'Pollax', and '13-S-22-8'. It should be noticed that the greatest portion of the cherry plantations in Bulgaria are grown without irrigation.

Climatic conditions for development of cherry leaf spot were favorable during all investigated years. The numbers of wetting periods for infections from petal fall to the end of August were min. 18 in 1997 and max. 48 in 1999. Cherry leaf spot vas controlled by 1 or 4 fungicide sprays. The last spraying was made 14–20 days before harvest except for 2002 when the last spray was made at 20 August. During July and August, after stopping the sprays min 9 (1998) and max 20 (1999) wetting periods for infections were recorded. The high rate of attack of late secondary infection enabled us to estimate susceptibility of cultivars. All the evaluated

Table 2. Rate of attack of leaves of cherry leaf spot caused by *Blumeriella jaapii* (Kyustendil, Bulgaria, 1997–2003)

Cultivars	1997	1998	1999	2002	2003
13-S-22-8	1.66[1]	18.10	28.40	10.27	16.07
Sunburst	0.08	4.89	–	3.92	38.60
Kozerska	2.36	6.04	14.40	19.20	17.80
NY 13791	0.16	20.03	9.60	0.90	12.90
Royalton	1.47	10.84	22.60	3.70	13.90
NY 13688	5.56	12.35	12.93	1.87	17.50
Hartland	2.42	8.68	21.20	8.27	3.27
Sumerset	4.16	14.59	31.80	8.80	29.40
Pollax	3.37	9.83	15.86	11.20	9.15
Patriotka Krima	0.08	3.66	1.10	–	–
Castor	0.60	4.85	7.00	7.87	16.50
Lapins	5.13	2.05	22.4	12.00	14.04

[1]Rate of attack – percent of the surface of leaves infected by *Bumeriella. jaapii*

cultivars were infected by *Blumeriella jaapii* but the rate of attack greatly varied in each season (*Table 2*, *Figure 2*). The highest disease incidence was found on cv. 'Sunburst' in 2003 and on cv. 'Sumerset' in 1999 and 2003. The lowest rate of attack was found on cv. 'Patriotka Krima' in most years. Classification of leaf spot susceptibility for the mean data of all years showed that cultivars 'Patriotka Krima', 'Castor', 'NY 13791' and 'Hartland' are of low susceptibility, cultivars 'Pollax', 'NY 13688', 'Royalty', 'Lapins', 'Sunburst' and 'Kozerska' are moderately susceptible and the most susceptible are cultivars 'Sumerset' and '13-S-22-8' (*Table 3*).

Concerning the climatic conditions in Bulgaria especially in the region of Kyustendil, late flowering sweet cherry cultivars are of great interest because the probability of damages by late spring frost on the flower organs is lower. For this reason the cultivars of interest for this region are 'Lapins', 'Sunburst', 'NY 13791' and '13-S-22-8'. Because of the requirements of the international market, the late ripening cultivars, such as 'Sumburst', 'Kozerska' and '13-S-22-8' are of great interest for Bulgaria. The resistance to the late spring frost is of critical importance for the normal fruiting of the cherry cultivars. The established lower susceptibility of the cultivars 'NY 13791', 'Hartland', 'Patriotka Krima' and 'Sunburst' define them as more productive under such conditions. The quality of the fruits,

Table 3. Susceptibilty groups of cherry leaf spot caused by Blumeriella jaapii for 12 cherry cultivars (Kyustendil, Bulgaria, 1997–2003)

Susceptibility[1]			
High	Moderate	Low	Very low
Sumerset 13-S-22-8	Sunburst Kozerska Royalton NY 13688 Pollax Lapins	NY 13791 Hartland Castor	Patriotka Krima

[1]Susceptibility groups were made for the average disease incidence data from 1997–2003 according to *Holb* et al. (2000): high (> 13.3%), moderate (8.8–13.3), low (4.4-8.8), very low (< 4.4%).

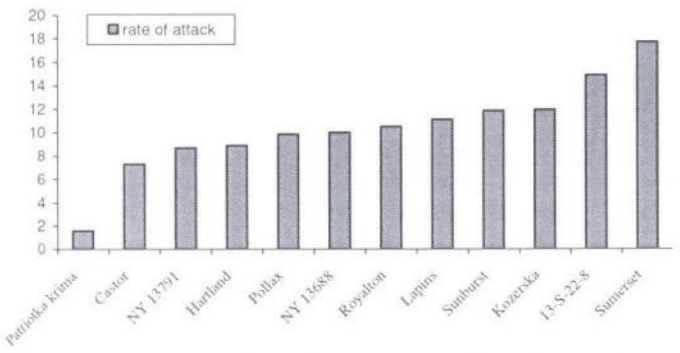

Figure 1. Rate of attack of leaves by cherry leaf spot (annual means during the period 1997–2003)

including the fruits mass, determine their market value to a great extent. For this reason, the cultivars 'Sunburst', 'Sumerset', 'Royalton', 'Castor', 'Lapins' and 'Kozerska' are of great interest. Regarding leaf spot susceptibility, cultivars 'Patriotka Krima', 'Castor', 'NY 13791' and 'Hartland' can be recommended for decreasing fungicide applications in integrated disease management programs.

In conclusion, all of the investigated cultivars are susceptible to the cherry leaf spot but the rate of attack is different. From the early cultivars 'Patriotka Krima' is recommended for the sweet cherry breeding because it is of high resistance to late spring frosts and with very weak susceptibility to the cherry leaf spot. The cultivars 'Sunburst', 'Sumerset', 'Royalton', 'Castor', 'Lapins' and 'NY 13791' are suitable for the Kyustendil region taking into consideration the mass of fruits, good resistance to late spring frosts and the medium susceptibility to the cherry leaf spot.

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