

Blossom and twig blight caused by *Monilinia laxa* on European plum cultivars (*Prunus domestica* L.)

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Abstract

Monilinia spp. is a well-known pathogen affecting fruit production all over the world. *Monilinia laxa* (Aderhold & Ruhland) Honey is an important species causing blossom and twig blight on stone fruits. The infestation of blossoms and twigs by *M. laxa* was evaluated after natural infections in Holovousy (Czech Republic) in plum orchards in 2013. The total infestation of plum trees (scale 1–9; 1 - completely infested and 9 - without infestation) was evaluated. In total 63 European plum cultivars (*Prunus domestica* L.) were observed in this study. Different susceptibility of plum cultivars was recorded. Cultivars 'Zurna', 'Common prune', 'Colora' and 'Jubileum' were evaluated as the most resistant. Oppositely cultivars 'Topstar', 'Bluefre', 'Empress' and 'Tipala' were the most susceptible.

Keywords: *Monilinia laxa*, plum cultivars, infestation, *Prunus domestica* L., flowering time

Introduction

Climate conditions suitable for stone fruits stimulate development of fungal diseases, including brown rot blossom blight caused by *Monilinia laxa* (Aderhold & Ruhland) Honey. Brown rot blossom blight and twig blight caused by *M. laxa* is a devastating disease in stone fruit orchards (Byrde & Willetts, 1977; Weaver, 1950) including plums (Schlagbauer & Holz, 1990). The host plant as an important factor for the course of the infection was found (Dimova & Titjnov, 2013). The critical period for the development of the blossom infection extends from the "white bud" phenophase to the falling of the petals (finish blossoming). The most sensitive phase is the full blossoming phase when all parts of the blossom are susceptible to the infection (Dimova & Titjnov, 2013; Holb, 2008). *Monilinia* blossom blight causes reduction of the fruit set and also infection of young fruits, which even can cause decrease the yield (Zehr, 1985; Batra, 1991). A secondary effect of blossom blight is twig infection. The fungus from the infected blossom grows from the floral parts through the peduncles into the twigs. As a consequence, new infected source of inoculum are created for future infection (Ogawa *et al.*, 1980).

Material and Methods

The observation of *Monilinia* blossom blight on blossoms and twigs caused by *M. laxa* was done after natural infections in experimental plum orchard in Holovousy in 2013 (Czech Republic, Eastern Bohemia, average altitude 306 m, average temperature 8.1 °C and annual rainfall 655 mm). The total infestation of plum trees in scale 1–9 (1: > 90 % of tree affected, 2: intermediate, 3: ± 75 % tree flowers affected, 4: intermediate, 5: ± 50 % tree flowers affected, 6: intermediate, 7: ± 25 % tree flowers affected, 8: < 10 % tree flowers affected, 9: tree flowers without infestation) was evaluated in our orchard. Totally 63 European plum cultivars (*Prunus domestica* L.) were observed for this study.

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Results

Due to our results from meteorological observation we found very high air humidity during the flowering, which can cause high infection pressure. In spring 2013 the weather was warmer than usual with maximum temperature above 20 °C in days from 24.4. till 27.4. (table 1). Rainy days were 27.4., 28.4., 30.4., 2.5. and 3.5. Cultivars flowered from April 29th till May 3th.

Table 1: Weather conditions during flowering period of plums at site Holovousy (spring 2013).

Date	Temperature (°C)	t _{max.} (°C)	t _{min.} (°C)	Humidity (%)	Precipitation (mm)	Cultivars in flower
24.4.	13.1	21.5	4.3	71.5	0	None
25.4.	15.7	25.0	5.3	68.8	0	None
26.4.	18.4	26.3	9.1	60.2	0	None
27.4.	15.5	21.1	10.2	78.0	6.1	None
28.4.	9.0	11.2	7.9	100.0	0.7	None
29.4.	10.7	13.8	7.5	95.0	0	Victoria, Bellamira, Jojo, Ontario, Ruth Gerstetter, Early Blue, Sopernita, Kišiněvskaja ranaja, Čačanska rana, Sanctus Hubertus
30.4.	12.5	18.3	6.7	80.4	1.4	Topper, Mallard, Harbella, Topstar, Herman, Tegera, Hanita, Presenta, Wegierka Dabrowicka, Empress, Čačanska rodna, Orlita, President
1.5.	10.6	15.2	8.0	85.4	0	Bluefre, Felsina, Colora, Freya, Toppigant, Zelená renklóda, Vengerka krupnaja sladkaja, Valor, Topfirst, Excalibur, Oneida, Hamanova, Katinka, Zurna, Haganta, Jubileum, Čačanska najbolja, Pamjať kostinoi, Gras Romanesc, Tophit, Tipala
2.5.	11.9	17.3	8.3	97.0	6.5	Gras Ameliorat, Topking, Čačanska lepotica, Ašatan, Sentjabrskaja sliva, Okjabrskaja sliva, Common prune
3.5.	10.5	12.5	9.1	100.0	16.3	Anna Späth, Gabrovska, Topfive, Toptaste, Valery, Topend, Oulinska, Vlaška, Vangerka jubilejnaja, Carpatin, Elena, Valjevka

From total number of observation of infestation (2141) the highest absolute frequency at the infestation level 7 and 8 with more than 700 number of observations (trees) was found (figure 1). At the other hand at the infestation level 1 (completely infested) no observation (tree) was found and the least absolute frequency at the infestation level 2 and 3 with 11 respectively 37 number of observation (trees) was identified. In order to investigate the possible significant trends in interactions of factors the correlations were done. The correlation between *Monilinia laxa* infestation and blossoming time is shown (figure 2). Very weak correlation 0.07 was calculated.

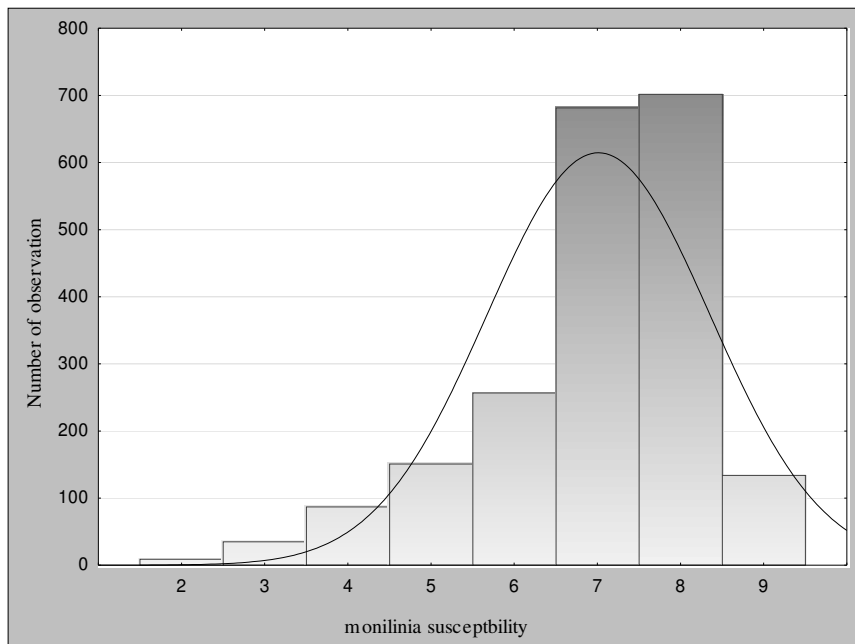


Figure 1: Total frequency of observation in infestation level (1–9).

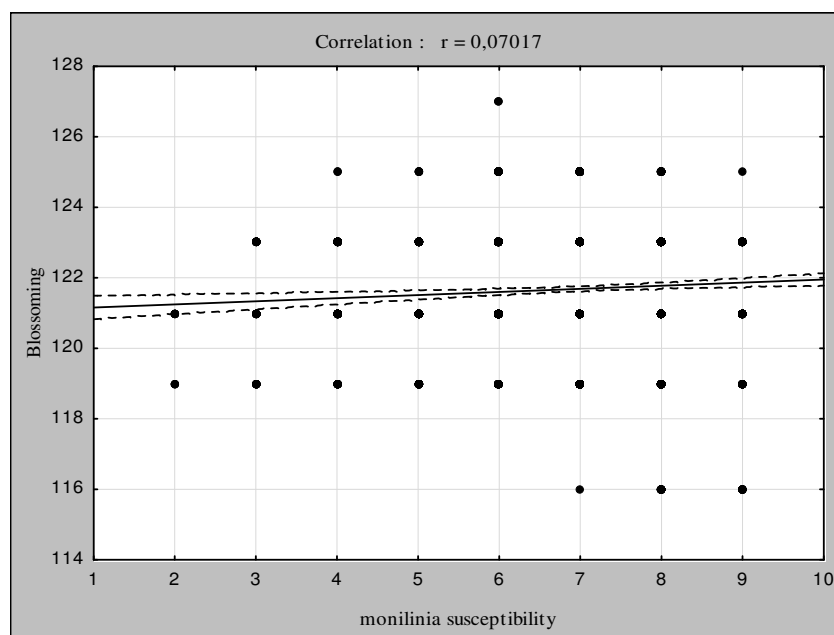


Figure 2: Correlation between *Monilinia laxa* susceptibility and blossoming time.

In the overall assessment (table 2), the most affected by *Monilinia* blossom blight were cultivars ‘Topstar’, ‘Bluefre’, ‘Tipala’ and ‘Empress’. On the contrary the least affected cultivars were ‘Zurna’, ‘Common Prune’, ‘Colora’ and ‘Jubileum’. Approximately 1400 (63 %) of total trees were evaluated on infestation level 7 and 8.

Table 2: Distribution of plum cultivars according to *Monilinia* ssp. infestation level.

Infestation level	Plum cultivars
Very sensitive 1 - 3	None
Sensitive 3.1 - 5	'Topstar', 'Bluefre', 'Tipala', 'Empress'
Moderately sensitive 5.1 - 7	'Haganta', 'Freya', 'Herman', 'Topfive', 'Toptaste', 'Valery', 'Topgigant', 'Early Blue', 'Čačanska rana, Čačanska najbolja', 'Topend', 'Weigerka Dobrowicka', 'President', 'Čačanska rodna', 'Zelená renklóda', 'Victoria', 'Mallard', 'Tegera', 'Jojo', 'Vengerka krupnaja sladkaja', 'Valor', 'Tophit', 'Harbella', 'Ruth Gertetter', 'Oulinska', 'Topper', 'Vlaška', 'Topking', 'Topfirst', 'Vangerka jubilejnaja', 'Sanctus Hubertus', 'Anna Späth'
Resistant 7.1 - 9	'Ašatan', 'Čačanska lepotica', 'Pamjat kostinoi', 'Kišiněvskaja ranaja', 'Sopernita', 'Excalibur', 'Orlita', 'Oneida', 'Valjevka', 'Oktjabrskaja sliva', 'Sentjabrskaja sliva', 'Carpatin', 'Bellamira', 'Gras Ameliorat', 'Hamanova', 'Gabrovska', 'Gras Romanesc', 'Hanita', 'Katinka', 'Presenta', 'Elena', 'Ontario', 'Felsina', 'Common Prune', 'Jubileum', 'Colora', 'Zurna'

Discussion

The results correspond with already published findings. Holb (2008) divided plum cultivars into three susceptibility categories (high susceptible, moderate susceptible and low susceptible). His evaluation is in agreement with our results, for instance cultivar 'Bluefre' - high susceptible, cultivars 'President' and 'Čačanska najbolja' – moderate susceptible. Nicotra *et al.* (1983) published monilinia blossom blight susceptibility of plum cultivars. Our results confirm inclusion of plum cultivars to susceptibility categories. We achieved the same results for instance in case of cultivars 'Gras Romanesc', 'Oneida' and 'Ontario' which are not susceptible to *Monilinia laxa* infestation according Nicotra.

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