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Incidence of brown rot blossom blight caused by *Monilinia laxa* in organic sour cherry production in Hungary

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Summary: Brown rot blossom blight incidence was evaluated on two sour cherry cultivars (Kántorjánosi, Újfehértói fürtös) in an organic sour cherry orchard in Hungary in 2003 and 2004. Trees were grown according to the organic fruit production guidelines. Blossom blight incidence was similar in both cultivars in both years. In 2003, blossom blight incidences were low even in the untreated plots (less than 15 %). In 2004, brown rot blossom blight incidence reached almost 30 % in the untreated plots. Blossom blight incidence was significantly lower in the conventionally treated plots in both cultivars.

Key words: sour cherry, organic fruit production, *Monilinia laxa*, blossom blight

Introduction

Brown rot blossom blight, caused by *Monilinia laxa* (Aderhold & Ruhland) is an important disease of sour cherry (*Prunus vulgaris* Mill.) in several countries all over the world (*Batra*, 1991). In rainy springs, blossom blight has been resulting in severe crop losses on sour cherry fruits in Hungary (*Soltész*, 1997; *Holb*, 2003). Therefore, depending on weather conditions, blossom blight is prevented with one to three applications of protectant or/and systemic fungicides during the flowering period in conventionally grown stone fruit orchards (*Osorio* et al., 1994). Concerns about pesticide residues have generated a great interest in organic fruits (Holb *et al.*, 2003; *Tamm* et al., 2004). However, in contrast to conventional fruit production, only natural products, such as stable manure, compost, soluble rock powder, copper and sulphur compounds, botanical soaps, botanical insecticides, sanitation practices and biological products are permitted in organic fruit growing (*Anon.*, 2000). From these options, copper, elemental and lime sulphur as well as sanitation practices can be used sufficiently against brown rot blossom blight. Copper, an effective protectant fungicide, was in use until the beginning of the twentieth century against brown rot blossom blight of apricot and sour cherry (*Rudolph*, 1925; *Berend*, 1957). However, these sprays were phytotoxic to blossoms (*Rudolph*, 1925; *Berend*, 1957). In organic stone fruit production, three applications of elemental sulphur are advised against brown rot blossom blight during the blossom period (*McLaren & Fraser*, 2000) but its efficacy is doubtful. In the past, it was shown that efficacy and phytotoxicity of lime sulphur were similar to those of copper fungicides (*Goldsworthy*, 1928) and recently an acceptable brown rot blossom blight control was reported with lime sulphur (*Holb & Schnabel*, 2005).

The objective of this two-year-study was to evaluate the effectiveness of sprays of copper and sulphur sprays against brown rot blossom blight on two sour cherry cultivars in an organic sour cherry orchard.

Materials and methods

Orchards and plant materials

The study was conducted in an organic sour cherry orchard at Eperjeske (Hungary), during two consecutive years from 2003 to 2004. The experimental orchard (3 ha) consisted of 15 rows with a plant density of 6 x 4 m. The orchard was planted in 1997 with three sour cherry cultivars: five rows of cultivar (cv.) 'Újfehértói fürtös', of cv. 'Érdi bőtermő' and cv. 'Kántorjánosi'. Cultivars were grafted on *Prunus mahaleb* rootstock. Trees have been grown according to the IFOAM guidelines (*Anon.*, 2000). Guidelines have been applied since planting of the orchard in 1997 and continued until 2004. The orchard soil type was sandy, brown forest soil. Trees were ca. 3–3.5 m tall during the two-year assessment period. Intra-row spacing between branches in the crown of adjacent trees was ca. 0.1–0.3 m and between adjacent rows was ca. 2.6 m. Bare soil, 0.5 m wide, was maintained in the rows and grass was grown in the spacings between rows. The orchard was not irrigated. Treatments and observations were made on cvs 'Újfehértói fürtös', and cv. 'Kántorjánosi'. Rainfall (mm day^{-1}) was recorded during the test periods in 2003 and 2004.

Fungicide treatments

The first fungicide spray was copper hydroxide (Funguran-OH 50 WP) at dormant bud stage in early spring.

Then, three sprays of 0.5 % wettable sulphur (Microthiol Special) were applied at closed blossom, fully open blossom, and petal fall stages. All treatments received 0.5 % micronized wettable sulphur (Microthiol Special) at 7–16 day intervals, depending on weather conditions, after fruit set until the middle of July. Final spray applied in mid-August was 0.2 % copper hydroxide (Funguran-OH 50 WP) in all treatments in both years and for all cultivars. With 10 trees (replicated 4 times), an unsprayed and a conventionally treated plot with 3 sprays of vinclozoline (Ronilan DF) during bloom were also prepared for evaluating the efficacy of the organic plant protection treatment.

Assessments and statistical analyses

For each treatment, year and cultivar, disease assessment was based on the percentage of blighted twigs two weeks after the petal fall application. 10 trees (replicated 4 times) were assessed and 100 randomly selected twigs of each tree were examined for disease symptoms. For brown rot incidence data sets, significant F-tests ($P < 0.05$) were followed by an LSD-test for pair-wise comparison of fungicide treatment means using $LSD_{0.05}$ values.

Results and discussion

In each year, both blossom blight incidences were not significantly different at $P < 0.05$ between cvs. Újfehértói fürtös and Kántorjánosi (*Figures 1 and 2*). However, on each cultivar, blossom blight incidence was significantly lower at $P < 0.05$ for 2003 compared to 2004 (analysis not shown). Precipitation during spring months was much less in 2003 compared to 2004 (*Figure 3*). The conventional fungicide treatment gave the best brown rot blossom blight control. Wettable sulphur treatments applied thrice during bloom gave significantly better control ($P < 0.05$) than the unsprayed plots (*Figures 1 and 2*). In 2003, blossom blight incidences were low even in the untreated plots (less than 15 %). In 2004, brown rot incidence reached almost 30 % for blossom blight in the untreated plots.

This study, in agreement with Chandler (1974) and Zehr *et al.* (1984), clearly demonstrated that brown rot could not be effectively controlled under high disease pressures with wettable sulphur alone.

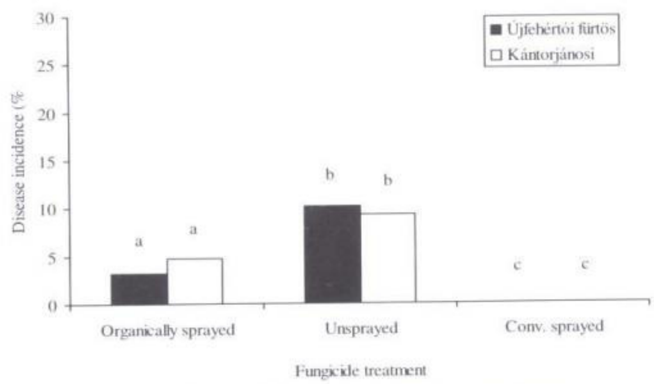

Figure 1 Brown rot blossom blight incidence (%) on sour cherry cvs. Újfehertói fürtös and Kántorjánosi in an organic sour cherry orchard (Eperjeske, Hungary, 2003).

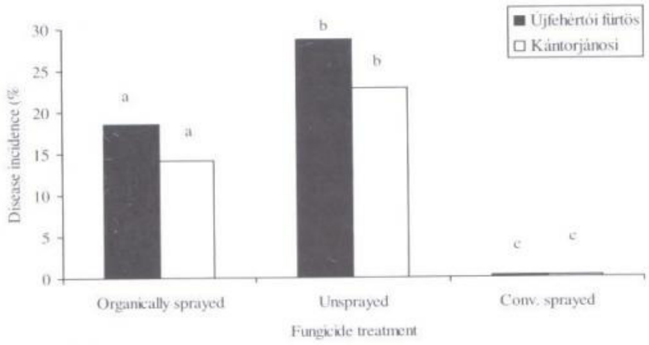

Figure 2 Brown rot blossom blight incidence (%) on sour cherry cvs. Újfehertói fürtös and Kántorjánosi in an organic sour cherry orchard (Eperjeske, Hungary, 2004).

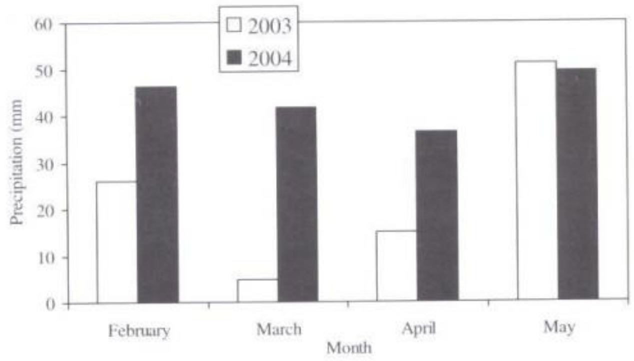

Figure 3 Rainfall (mm day^{-1}) recorded in an organic sour cherry orchard from February to May (Eperjeske, Hungary, 2003 and 2004).

Earlier studies advised three applications of elemental sulphur against brown rot blossom blight during the flowering period in organic sweet cherry and apricot productions (*Tamm* et al., 2004; *McLaren & Fraser*, 2000; *Holb*, 2004). They recommended that the first spray has to be applied at pre-bloom phenological stage and this needs to be repeated twice at seven-day intervals, especially if rain occurs. According to the results of our study, we agree with the three spray applications in organic sour cherry orchards, but elemental sulphur should be replaced by a more efficient product in organic sour cherry production.

Results clearly demonstrated that spring weather condition is a key element for *Monilinia laxa* infection. Several studies demonstrated that blossom blight control can be inefficient even in conventional production if weather is rainy during blooming period (*Paszternák* et al., 1982; *Schweigert*, 1996, *Holb & Schnabel*, 2005). Our study implies that good blossom blight control cannot be achieved in organic sour cherry production on brown rot susceptible sour cherry cultivars

Conclusion

In summary, efficacy of organic sour cherry protection against *M. laxa* with sulphur is quite low in a wet year compared to conventional fungicides. Moreover, sulphur-based products can hardly prevent blossom blight under high disease pressures. The results indicate that a complex control strategy is needed against brown rot blossom blight in organic sour cherry production. Other control methods (e.g. effective biological products, tree resistance inducers) in combination with sanitation and/or sprays may provide a more adequate control in the future against *M. laxa* in organic sour cherry production.

Acknowledgements

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