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In vitro sensitivity of *Monilinia laxa* to fungicides approved in integrated and organic production systems

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Summary: The aim of this study was to test the *in vitro* sensitivity of two isolates of *Monilinia laxa* to fungicides approved in integrated and organic production systems. *In vitro* efficacy of 7 fungicides (Champion 50 WP, Kocide 2000, Nordox 75 WG, Olajos rézkén, Kumulus S, Rézkén, Rézoxiklorid) and another 6 fungicides (Score 25 EC, Efuzin 500 SC, Systane, Folicur Solo, Zato Plusz, Rovral) approved in organic and integrated production systems, respectively, were tested against brown rot of sour cherry. The three isolates showed differences in sensitivity to fungicides. Fungicides (with active ingredients of copper and sulphur) applied in organic production showed relatively high percent growth capacity of *M. laxa*. Rézkén and Kocide 2000 showed the highest and Kumilus S the lowest efficacy against brown rot. Fungicides applied in integrated production showed relatively low percent growth capacity of *M. laxa*. Score 25 EC showed the lowest and Rovral and Folicur solso the highest efficacy against *M. laxa*.

Key words: brown rot, *Monilinia laxa,* organic, integrated, *in vitro*, fungicides

Introduction

Disease and pest management practices in integrated and organic production differ markedly from those in conventional production (*Anon*., 2000; *Cross & Dickler*, 1994). Synthetic products are restricted in integrated and banned in organic apple production. In organic apple growing, only natural products such as compost, soluble rock powder, sulphur and copper compounds, fungicidal and botanical soaps, traps and biological methods are permitted against fungal diseases and pests according to IFOAM (International Federation of Organic Agriculture Movements) standards (*Anon*., 2000), while many synthetic pesticides can be used in integrated production.

Brown rot blossom blight, caused by *Monilinia laxa* (Aderhold & Ruhland) Honey, is a devastating disease of stone fruit. The disease is endemic in Europe and causes epidemics in stone fruit orchards (*Wormald*, 1954; *Byrde & Willetts,* 1977; *Tamm* et al., 1995; *Holb & Schnabel*, 2005). In rainy springs, blossom blight causes severe crop losses in sour cherry orchards in Hungary (*Holb*, 2003, *Soltész*, 1997). Depending on weather conditions, blossom blight can be controlled with one to three applications of protectant or systemic fungicides during the bloom period in conventionally grown stone fruit orchards. Severe rain events before harvest can cause cracking of fruit and therefore sour cherry trees require one to two fungicide applications to avoid brown rot of matured fruit (*Holb*, 2004).

Variation in cultural characteristics of *M. laxa* isolates is known (*Batra*, 1991). Variation in growth rate, colony margin (lobbed, partly lobbed, and not lobbed), and culture colour (gray, buff, brownish, and several combination these colours) was reported among *M. laxa* isolates (*Holb*, 2003).

The aim of this study was first to test the *in vitro* sensitivity of two isolates of *M. laxa* to fungicides approved in integrated and organic production systems.

Materials and methods

Two isolates of *M. laxa* was used for this study which were collected from sour cherry orchards. One isolate was used from one separate year (2009 and 2010). Isolates were identified on the basis of morphological traits. Single-spore isolates were maintained on potato dextrose agar (PDA) in Petri dishes in the dark at 18 to 22 °C. Short-term storage was at 4°C on PDA.

In vitro efficacy of 7 fungicides (Champion 50 WP, Kocide 2000, Nordox 75 WG, Olajos rézkén, Kumulus S, Rézkén, Rézoxiklorid) and another 6 fungicides (Score 25 EC, Efuzin 500 SC, Systane, Folicur Solo, Zato Plusz, Rovral) approved in organic and integrated production systems, respectively, were tested against apple scab. Fungicides were admended in PDA media. Two dosages were used: i) 1 x dosage recommended by the manufacturer and ii) 0.5 x dosage of the recommended dosage. Conidia of *M. laxa* were placed on Petri dishes admended with fungicides. Dishes were incubated for 24 hours at near saturation humidity at 18 °C. Germination of conidia was evaluated after 24 hours incubation and percent growth capacity (GC) of the fungus was evaluated as $GC = X / Y \times 100$, where 'X' is percent germination of conidia in a fungicide plate, and 'Y' is the percent germination of conidia in control plate.

Results and discussion

Manufacturer dosages of fungicides

Fungicides (with active ingredients of copper and sulphur) applied at 1 x dosage recommended by the manufacturer in organic production showed relatively high percent growth capacity of *M. laxa* (16–53%) (*Figure 1a,b*).

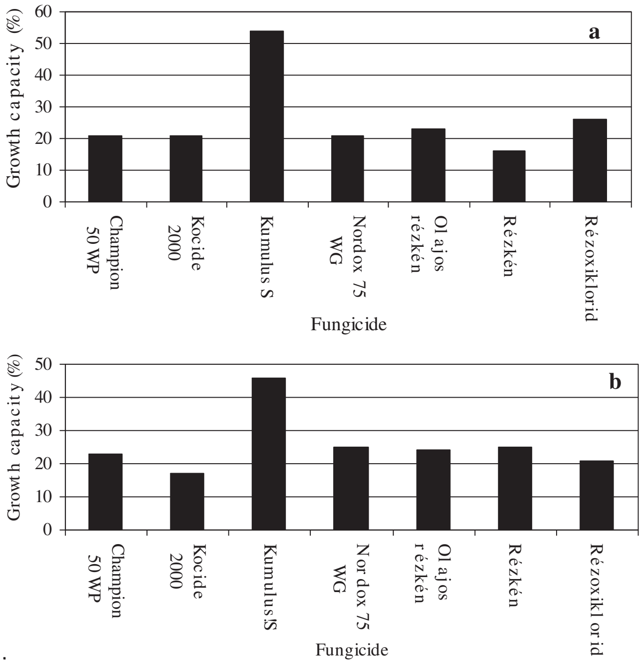

Figure 1. Percent growth capacity of two *Monilinia laxa* isolates (a and b) for 7 fungicides (organically approved) admended on PDA plates at 1 x dosage recommended by the manufacturer.

The two isolates showed differences in sensitivity to fungicides. Especially sulphur had low *in vitro* effeciacy against brown rot. Rézkén and Kocide 2000 showed the highest and Kumilus S the lowest efficacy against *M. laxa*.

Fungicides applied at 1 x dosage recommended by the manufacturer in integrated production showed relatively low percent growth capacity of *M. laxa* (1–14%) (*Figure 2a,b*). Again the two isolates showed differences in sensitivity to fungicides. Rovral and Folicur solo showed the highest efficacy against *M. laxa* isolates.

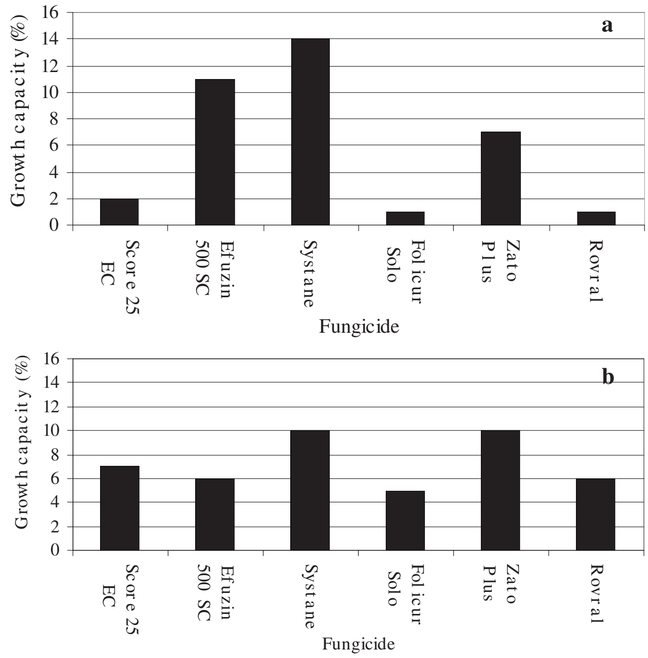

Figure 2. Percent growth capacity of two *Monilinia laxa* isolates (a and b) for 6 fungicides (approved in integrated production) admended on PDA plates at 1 x dosage recommended by the manufacturer.

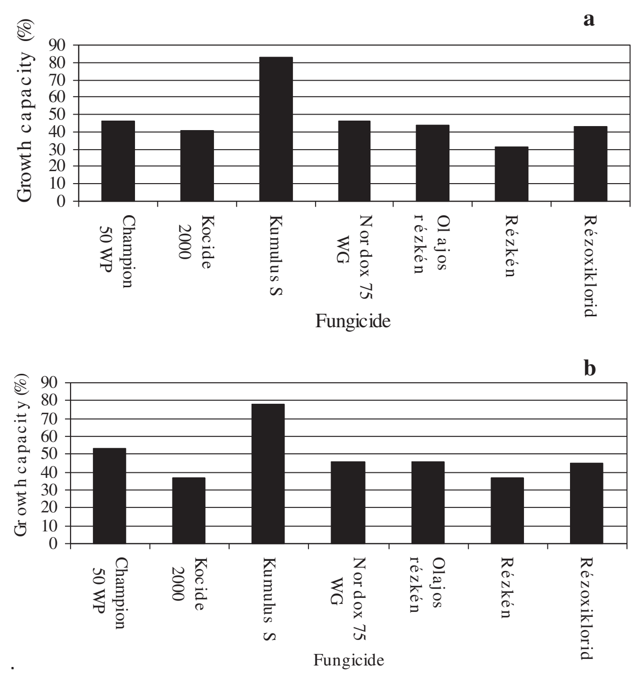

Figure 3. Percent growth capacity of two *Monilinia laxa* isolates (a and b) for 7 fungicides (organically approved) admended on PDA plates at 0.5 x dosage recommended by the manufacturer .

Half dosages of fungicides

Fungicides (with active ingredients of copper and sulphur) applied at 0.5 x dosage recommended by the manufacturer in organic production showed relatively high percent growth capacity of the brown rot fungus (31–83%) (*Figure 3a,b*). Again the two isolates showed differences in sensitivity to fungicides. Again sulphur had very low *in vitro* effeciacy against brown rot. Again, Rézkén showed the highest and Kumilus S the lowest efficacy against brown rot.

Fungicides applied at 0.5 x dosage recommended by the manufacturer in integrated production showed relatively low percent growth capacity of the brown rot fungus (3–27%) (*Figure 4a,b*). Again the two isolates showed differences in sensitivity to fungicides. Again, Rovral and Folicur solo showed the highest efficacy against brown rot.

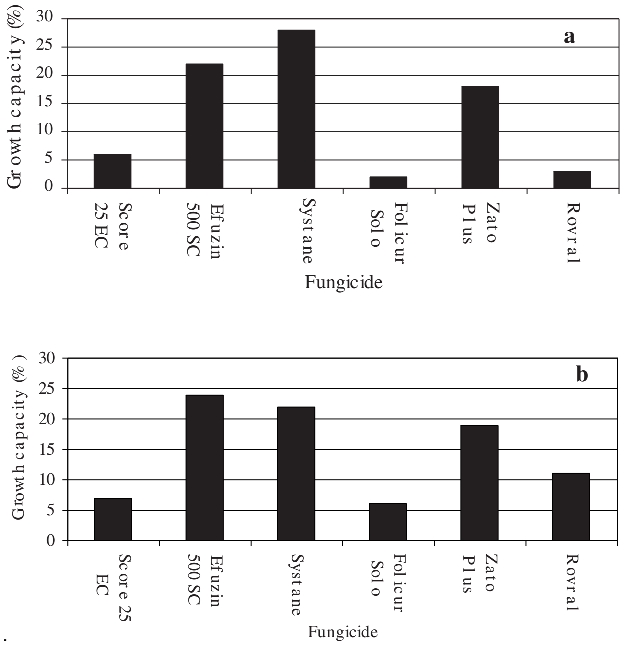

Figure 4. Percent growth capacity of two *Monilinia laxa* isolates (a and b) for 6 fungicides (approved in integrated production) admended on PDA plates at 0.5 x dosage recommended by the manufacturer.

Acknowledgements

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