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Brown rot blossom blight and fruit rot of apricot in Hungary

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Summary: The aim of our two-year study was to assess incidence of brown rot blossom blight and fruit rot caused by *Monilinia laxa* in 2003 and 2004. Assessments of incidence were made on cv. Bergeron (susceptible to brown rot) in a flatland and a hilly growing area (at Cegléd and Gönc, respectively). In both locations, plant protection was performed according to the integrated fruit production guidelines and small untreated plots were set up for each cultivar in both years. In 2003, when weather conditions were dry and hot, brown rot incidence was low (less than 10%) on both blossoms and fruits. *Monilinia laxa* did not cause significantly different blossom blight and fruit rot at the hilly (Gönc) area compared to the flatland, not even in untreated plots. However, in 2004, when spring and summer weather conditions were wet and cold, incidence reached 95% for blossom blight and 33% for fruit rot in the untreated plots. Blossom blight incidence was 1.5–2 times higher in the flatland area compared to the hilly growing area. During the blooming period of apricot, two (at flower bud stage and at full bloom) and three (at flower bud stage, at full bloom and at petal fall) fungicide applications were necessary for the successful control at Gönc and Cegléd, respectively. The difference between the two orchards was due to the fact that blooming started one week later in the hilly region (at Gönc) than in the flatland region (at Cegléd), therefore, the critical weather period coincided with blooming in the orchard in the hilly region only partially. Fruit rot incidence was similar in both regions as the amount and distribution of rainfall were similar during the fruit ripening period.

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

Introduction

Brown rot, caused by *Monilinia laxa* (Aderhold & Ruhland) is a devastating disease of apricot (*Prunus armeniaca* Mill.). The disease is endemic in Europe and causes epidemics in most stone fruit orchards (*Wormald*, 1954, *Byrde & Willets*, 1977; *Batra*, 1991, *Holb*, 2004a). Brown rot has been resulting in blossom blight in rainy springs and in fruit rot in rainy summers in Hungarian apricot orchards. Depending on weather conditions, blossom blight can be controlled with one to three applications of protectant or/and systemic fungicides during the bloom period in conventionally grown stone fruit orchards (*Ogawa* et al., 1985; *Holb*, 2004b). Fruit rot can be successfully decreased with insect control and repeated applications of systemic fungicides during the second half of fruit development.

Hungarian studies showed that hilly growing regions of apricot differ in some characteristics from flatland growing regions. Hungarian studies showed that apricot blooming started 5-12 days later and avoided rainy periods more often in hilly regions compared to flatland regions (*Soltész*, 1997; *Kozma* et al., 2003). This might result in differences in blossom blight epidemics and control.

The aim of our two-year study was to assess incidence of brown rot blossom blight and fruit rot caused by *Monilinia laxa* in two different geographical regions in Hungary.

Materials and methods

The study was conducted in two different geographical regions in Hungary: one was in a flatland and the other in a hilly growing area (at Cegléd and Gönc, respectively). The experimental orchards at Cegléd and Gönc were planted in 1985 and 1999 with a distance of 7×4 m and 5×2 m, respectively. Both orchards were planted with several apricot cultivars. To achieve our aim one brown rot susceptible cultivar (cv. Bergeron) were used during two consecutive years from 2003 to 2004. Trees have been grown according to the IPM guidelines.

Three fungicide treatments were set up in both years and locations on cv. Bergeron. 10 trees (replicated 4 times) were treated as follows: i) unsprayed control, ii) two sprays during bloom (closed and fully open blossom stages) and one spray during the second half of fruit development, before harvest, iii) three sprays during bloom (closed and fully open blossom and petal fall stages) and two sprays during the second half of

fruit development, before harvest. Topaz 100 EC (100 g/l penconazole, 0.5 l/ha), Mirage 45 EC (450 g/l prochloraz, 0.4 l/ha), and Sumilex 50 WP (50% procimidon, 1.3 kg/ha) fungicides were applied during closed blossom, full bloom, and petal fall stages, respectively. Topaz 100 EC (100 g/l penconazole, 0.5 l/ha) was applied during the second half of fruit development.

For each treatment and year, disease assessment was based on the percentage of blighted twigs (including flowers) two weeks after the petal fall application. Fruit rot was also assessed on each cultivar and year based on the percentage of rotted fruit at harvest. For both evaluations, all trees in the treatments were assessed and 20 randomly selected twigs and 50 fruits of each tree were examined for disease symptoms. Values were averaged to obtain the percentage of diseased twigs or fruits per tree. 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 2003, when weather conditions were dry and hot, brown rot incidence was low (less than 10%) on both blossoms and fruits. *Monilinia laxa* did not cause significantly different blossom blight and fruit rot at the hilly (Gönc) area compared to the flatland, not even in the untreated plots (*Tables 1* and *2*).

Table 1. Incidence of brown rot blossom blight and fruit rot caused by *Monilinia laxa* on apricot cv. Bergeron in an integrated apricot orchard in a hilly region (Gönc, Hungary, 2003 and 2004).

	Blossom blight (%)		Fruit rot (%)	
Treatments[a]	2003	2004	2003	2004
Unsprayed	4.2 a[b]	46.5 a	3.1 a	20.2 a
Treatment 1	0.0 b	11.5 b	0 a	10.6 b
Treatment 2	0.0 b	5.1 b	0 a	4.7 b
$LSD_{0.05}$	3.8	15.7	3.3	8.7

[a]Unsprayed = unsprayed control, Treatment 1 = two sprays during bloom (closed and fully open blossom stages) and one spray during the second half of fruit development, before harvest, Treatment 2 = three sprays during bloom (closed and fully open blossom and petal fall stages) and two sprays during the second half of fruit development, before harvest.

[d]Values within column followed by different letters are significantly different.

However, in 2004, when spring and summer weather conditions were wet and cold, incidence reached 95% for blossom blight and 33% for fruit rot in the untreated plots (*Tables 1* and *2*). Blossom blight incidence was 1.5-2 times higher in the flatland area compared to the hilly growing area. During the blooming period of apricot, the two (at closed blossom and full bloom stages) applications of fungicide treatments were less effective compared to the three (at closed blossom, full bloom and petal fall stages)

Table 2. Incidence of brown rot blossom blight and fruit rot caused by *Monilinia laxa* on apricot cv. Bergeron in an integrated apricot orchard in a flatland region (Cegléd, Hungary, 2003 and 2004).

	Blossom blight (%)		Fruit rot (%)	
Treatments[a]	2003	2004	2003	2004
Unsprayed	7.4 a[b]	89.9 a	4.9 a	21.3 a
Treatment 1	0 b	32.5 b	0 a	7.9 b
Treatment 2	0 b	12.8 c	0 a	4.3 b
$LSD_{0.05}$	3.9	19.2	5.0	10.2

[a] Unsprayed = unsprayed control, Treatment 1 = two sprays during bloom (closed and fully open blossom stages) and one spray during the second half of fruit development, before harvest, Treatment 2 = three sprays during bloom (closed and fully open blossom and petal fall stages) and two sprays during the second half of fruit development, before harvest.

[d] Values within column followed by different letters are significantly different.

fungicide applications in the flatland region. However, both fungicide treatments showed similar effectiveness in the hilly region (*Tables 1* and *2*). The results showed that two fungicide applications during the bloom period are efficient enough for control of brown rot blossom blight; however, three applications are needed in the flatland region in wet years. In 2004, fruit rot incidence was similar in both regions (*Tables 1* and *2*).

This study demonstrated that incidence of brown rot blossom blight and fruit rot is dependent on weather conditions and geographical regions during the blossom period and the second half of the fruit development.

Earlier results demonstrated that rain is necessary for infection of apricot flowers when the mean temperature is between 5 and 15 °C (*Wormald*, 1954, *Holb*, 2003). In 2003, although temperature was high enough, a dry period occurred during the blossom period, therefore, monilia infection was low in both regions. In 2004, weather conditions were favorable for the flatland region during the blossom period which resulted in severe blossom blight in the untreated plots (*Table 2*). However, infection was significantly less in the hilly region during the blossom period. The difference between the two orchards in 2004 was due to the fact that blooming started one week later in the hilly region (at Gönc) than in the flatland region (at Cegléd). The delay in the start of bloom was in agreement with earlier studies made on floral biology of apricot (*Soltész*, 1997; *Kozma* et al., 2003). As a result of this, the hilly region avoided the critical rainy period which coincided with blooming in the flatland, therefore, the infections by *M. laxa* and subsequent blossom blight were only partial. Fruit rot incidence was similar in both regions and year as the amount and distribution of rainfall were similar during the fruit ripening period.

An earlier Hungarian study suggested three applications of fungicide spray during the blossom period for successive control of brown rot blossom blight in stone fruit orchards (*Glits*, 2000). Our study demonstrated that two fungicide

applications during the bloom period are efficient enough for control of brown rot blossom blight; however, three applications are needed in the flatland region in wet years (*Tables 1* and *2*). In addition, *Wick* (1981) noted that prevention of severe infection by *Monilinia laxa* can be reached by an additional fungicide spray in dormant bud stage in order to decrease the overwintering inoculum sources on the tree.

In sum, brown rot damage on apricot is dependent on weather conditions and the time of blooming periods differing in the different geographical regions. Therefore, timing of fungicide sprays has to based on temperature, rainfall and phenological stage measurements.

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