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Disease incidence of shot-hole disease of plum in two training systems

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SUMMARY

Of the foliar diseases of European plum, Wilsonomyces carpopilus is the most commonly occurring fungal pathogen. The aim of this two-year study was to investigate the susceptibility of 'Čačanska lepotica' plum variety to shot-hole disease (Wilsonomyces carpophilus) in two different training system with 4 x 1.5 m and 6 x 3 m tree spacings. The obtained results showed that the cultivar is susceptible to this disease and by the end of the vegetational period disease incident was above 50% in both years in both tree spacings. In 2018 disease incidence was higher in both spacing than in 2019, reaching almost 90% at the 4 x 1.5 m tree spacing plot. There were few significant differences between high and low density tree spacings. The results highlighted the importance of inoculum accumulation late in the season.

Keywords: *plum; Wilsonomyces carpophilus; training system; cultiva*

INTRODUCTION

European plum (*Prunus domestica*) production has a long history, and it is still one of the most important stone fruits produced in Hungary. It's popularity is due to the perfect soil climatic conditions for plum production in the Carpathian Basin. Although yield it is the second highest amongst stone fruits after sour cherry, the production fell back in the past years comparing to the previous decades. The potential of plum market is very high because it is not very likely to have alternating yield, the amount of fruits year to year is more balanced (Nyéki, 2012). Regarding intensification of training system in the past decades, plum orchards haven't gone through the same innovation as apple orchards did and they are still under extensive production (Szabó, 2004). The need for smaller spacings and better sunlight penetration has grown, because plum is the most sensitive to shade conditions, although European Plum is often harvested with machine. Unfavorable pruning conditions also affect light penetration negatively (Gonda-Balmer, 2012).

Plant protection practice of European plum is not necessarily precise because growers sell their fruit to the industrial sector, therefore they cannot afford the high costs of intensive plant protection. Expectation of fruit quality are low according to its industrial use. Until it is not causing economic losses fruit growers do not give much attention to high fruit quality, pesticide applications are only carried out against key pests that directly endangering fruit quantity and quality. (Holb, 2008). Foliar diseases aren't in the center of attention when it comes to plant protection of stone fruits, therefore these diseases can multiply fast in some orchards. Foliar diseases - and the damage they cause - have a huge impact on the condition of the trees, because in some severe cases the trees could be defoliated prematurely (Teviotdale et al., 1997). Premature leaf loss can reduce frost resistance of the trees therefore the orchard can take serious winter damage (Surányi, 2006). As flower buds and twigs cannot mature sufficiently due to the photosynthetic area loss, these diseases are affecting fruit quantity indirectly (Holb, 2005).

Amongst the foliar diseases of European plum, *Wilsonomyces carpopilus* is the most commonly occurring fungal pathogen – belonging to *Ascomycota* – affecting foliage. Although other pathogens have similar symptoms, *W. carpophilus* is responsible for most of cases (Adaskaveg et al., 1990; Bubici et al., 2010; Yousefi-Shahri, 2014). *W. carpophilus* is widespread on Earth, present on almost all continents. The damage caused by this pathogen can make a huge economical impact as well (Ogawa and English, 1991). *W.carpophilus* has numerous host species in the group of stone fruit trees. It's occurring on *Prunus* species, affecting apricot (*Prunus armeniaca*), peach (*Prunus persica*), sweet and sour cherry (*Prunus avium* and *Prunus cerasus*), European Plum (*Prunus domestica*), and other ornamental *Prunus* species as well (Ivanová, 2012; Ahmadpour, 2012; Wilson, 1953). The disease appears on leaves, twigs, flowers and fruit also but some symptoms are not present on some host species (Glits, 2000; Ivanová 2012). On European plum leaf symptoms are more common (Glits, 2000), but it is affecting fruits and twigs as well (Ahmadpour et al., 2009). *W. carpophilus* is early present and is infecting plants already when it has optimal life conditions in springtime (Evans et al., 2008). As it is mainly spreading by rainwater, rainy periods and places where they use irrigation against frost damage means more damage by the disease (Grove, 2002). Fungicide treatment and other non-chemical methods together can be effective against the disease (Glits, 2000).

The aim of this two-year study was to investigate the susceptibility of 'Čačanska lepotica' plum variety to shot-hole disease (caused by *Wilsonomyces carpophilus*) in two different training system with 4 x 1.5 m and 6 x 3 m tree spacings.

MATERIALS AND METHODS

An experimental plum orchard site was provided to us, to conduct this 2-year study, in 2018 and 2019. The experimental site is located in Eastern Hungary, about

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7 km away from Debrecen in the north direction. Plum trees were planted in 1997 on Myrobalan 'C 359' rootstock. Soil type is sandy loam according to the characteristics of surrounding areas. There are 4 varieties planted in the experimental site, under this study we examined 'Čačanska lepotica''s sensitivity to *W. carpophilus* disease. Total area of the orchard is 1 ha in which all varieties occupy 0.25 ha each. There are four different spacings, from which we examined the one with the highest density with 4 x 1.5 m spacing and 1667 tree per hectare, and the other with the lowest density with 6 x 3 m and 556 trees per hectare.

Fungidice treatments were conducted in both years, with a total of 7 applications in 2018 and 2019 as well. Treatments started on April 15th and finished on September 23rd in 2018. In 2019 the first fungicide application was in April 16th and the last happened on sept 26th

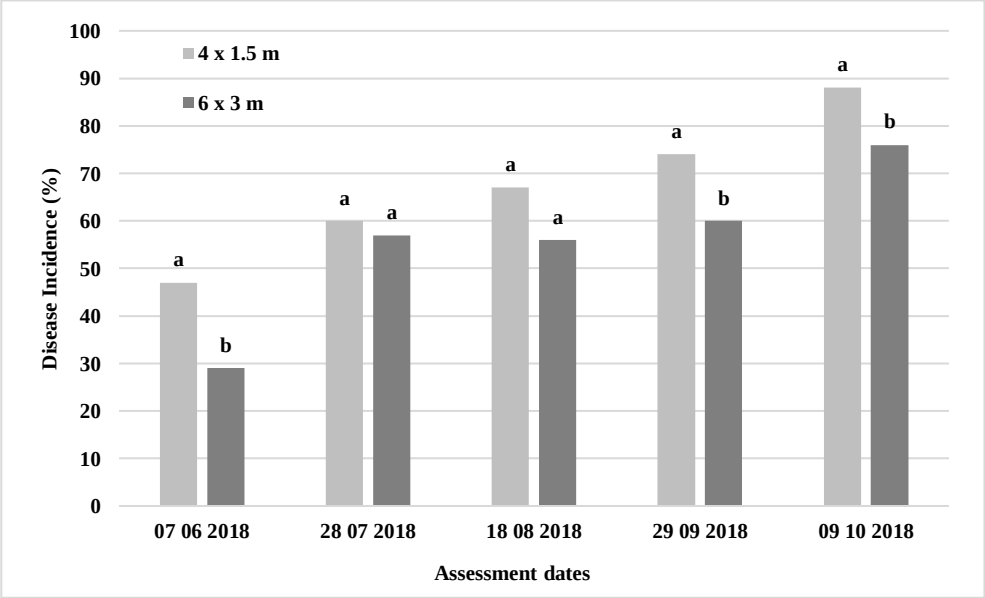
In each cultivar-training system plot, 4 trees were chosen for assessment. On each tree 25 leaves were examined for shot-hole symptoms, which means a 100 leaves per plot. The leaf was considered infected if at least a spot was detectable on leaf surface. We examined how the disease is progressing, which means there were five assessment dates during the vegetational period.

Significant differences between the two training systems were analyzed by ANOVA at P = 0.05 probability level.

RESULTS AND DISCUSSION

Shot-hole symptoms were detected in the beginning of June in 2018 (*Figure 1*). Comparing the two spacings, there were almost 20% difference in disease incidence between the 4 x 1.5 m and the 6 x 3 m spacings. Highest incidence was detected in the highest density in the middle of summer. Later on, the differences between the two training system eased, but the highest density still showed more diseased leaves. In the beginning of October disease incidence reached almost 90% in case of the 4 x 1.5 m spacing. The 6 x 3 m plot was also above 70% regarding incidence.

Figure 1. **Disease incidence of *Wilsonomyces carpophilus* on 'Čačanska lepotica' variety in 2018**



Disease incidence of 'Čačanska lepotica' in 2019 is shown on *Figure 2*. On the first assessment incidence was almost the same (around 45%) in both spacings. In August, between the two spacings, about 10% of difference was detected regarding disease incidence. Highest density with 4 x 1.5 m meant higher disease incidence as well. In the end of September there were 18% difference in disease incidence between the two plots. For the last assessment, the 4 x 1.5 m density plot had higher disease incidence with 14%. Disease incidence in October was 71% and 57% in 4x 1.5 and 6 x 3 m spacing respectively.

The collected data shows that a susceptible variety like 'Čačanska lepotica' can have high disease incidences on it's foliage, accumulating in autumn as expected. Disease incidence is affected by annual weather conditions, when it is favorable for the pathogen we can expect a higher damage of photosynthetic area. Other studies showed similar data regarding weather condition's importance (Bubici et al., 2010). In practice if we are cultivating a susceptible variety we should pay more attention under favorable weather conditions and also at the end of the season for preventing accumulation of inoculum source which leads to infection next year.

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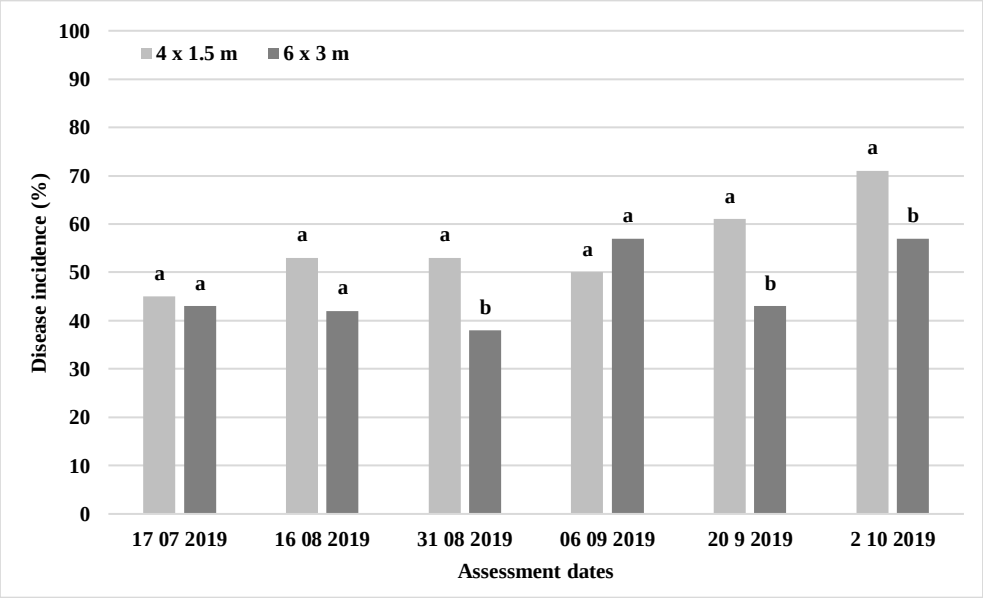
Figure 2. **Disease incidence of *Wilsonomyces carpophilus* on 'Čačanska lepotica' variety in 2019**



CONCLUSIONS

In this study we examined *W. carpophilus* disease incidence in different spacing systems from July till October in 2018 and 2019. We also determined 'Čačanska lepotica' is susceptible to this disease with disease incidence up to 88% around the end of vegetation period in autumn. There were few significant differences between high and low density tree spacings. This highlights the importance of inoculum accumulation late in the season.

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