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Up-to-day knowledge and experience on main bark diseases of trees in Zagreb urban areas

Introduction

During the last decade examined samples from diseased trees in Zagreb urban areas and research results revealed the important role of several bark pathogenic fungi. Some of them were found as weak parasites which occur on predisposed trees, and some as causal agents of dieback. The most frequent fungi turned out to be *Sphaeropsis sapinea* and *Apiognomonia veneta*. Pine trees have been heavily attacked by *S. sapinea* and plane trees differently infected by *A. veneta* in the last ten years. The experience and up-to-day knowledge on these two fungi are presented and discussed in this paper.

Sphaeropsis sapinea (Fr.) Dyko et Sutton on *Pinus* spp.

During the last ten years significant dieback caused by *S. sapinea* have been observed in crowns of *Pinus nigra* Arnold and *P. leucodermis* Antoine. Less damage was found in *P. mugo* Turra, while on shoots of *P. sylvestris* L. the fungus caused no significant damage. Austrian pine (*P. nigra*) and Bosnian pine (*P. leucodermis*) shoots, branches and even hole trees have been heavily affected. Bosnian pine turned out to be the most susceptible to fungus attack.

The typical symptoms of fungus presence were shoots blight randomly positioned in pine crowns. From currently developed shoots the disease spread to older tissues, and the most observed symptoms were dieback of different branch parts. Very often, after some time, the hole branches were affected. Along the trunks of *P. leucodermis*, from the top of the tree and downward, the resin was significantly present. Affected trees highly suffer because of disease infection, and they have been constantly losing their value in landscape design from esthetical and social point of view.

Concerning to the biology of *S. sapinea* it is well known that some stress factors predispose pine trees to fungus attack. Different abiotic and biotic factors have been associated or found out up-to-day to cause stress and to predispose pine trees to *S. sapinea* attack (CHOU and MACKENZIE 1988, DE KAM et al. 1991, NICHOLLS and OSTRY 1990, STANOSZ et al. 2001, SWART et al. 1987). Water stress (directly or indirectly) turned out to be the most frequent and most important. In previous researches following stress factors were analysed and discussed: drought, pure site conditions, and increased SO₂ concentrations, as possible pine predisposing factors for sudden fungus outbreaks not only in urban areas but also on several localities in Croatia (DIMINIĆ 1994, 1999).

Upon our observations during last decade it turned out that Austrian pines when planted in poor soil conditions in private gardens or public places were predisposed to *S. sapinea*. But, when planted in solid site conditions and well maintained parks and tree lines the symptoms haven't been observed or they were not significant. Unfortunately this was not the case with Bosnian pines as they have been observed in good soil conditions and well maintained public areas, but with significantly developed symptoms as consequence of fungus attack.

Since 1990 drought periods have been recorded in Zagreb. The variations in precipitation level have been found out comparing the same months data from year to year, e.g. in May the precipitation was in total 26.5 mm in 1992 or 19.7 mm in 1993, and 115.5 mm in 1995 or 138.1 mm in 1999. Comparing these two pine species it could be concluded that *P. leucodermis* is more susceptible to *S. sapinea* attack than *P. nigra* if planted in the same urban site conditions. Lack of precipitation (plus site conditions) can obviously cause stress to Bosnian pines, and much earlier than to Austrian pines in the same conditions.

Control method has been tested to suppress the disease since 2001. For the purpose an experimental plot was chosen in typical green urban area. Affected Bosnian pine trees were previously pruned (the infected shoots or branches) and then sprayed by carbendazim two times in May. The first treatment was at the time when current shoots were in the beginning of development, and the second approximately three weeks later. The result of applied control hasn't been satisfactory as the symptoms are still present, although the percentage of infected shoots and branches are reduced. One of the reasons for lack of better results is that we have found along the branches of affected trees necrotic lesions in the bark, from which *S. sapinea* was isolated. The infected bark tissues obviously haven't been influenced by systemic fungicide in crown treatment.

According to aforementioned the landscape architectures are advised to avoid Bosnian pine in future landscape designs, in spite of its very nice crown shape, until some progress will be obtained in controlling the disease.

***Apiognomonina veneta* (Sacc. et Speg.) Höhn. on *Platanus hispanica* (syn. *P. xacerifolia*)**

More than ten years the plane trees in Zagreb urban areas have been continuously infected by *A. veneta*. Some years the fungus has caused a serious wilting of young shoots and leaves, and in case of the repeated heavy infections, severe damages have been observed. A few cases of trees dieback as consequence of the fungus attack were recorded. Along the diseased shoots, twigs and branches the small cankers and necrotic lesions, caused by conidial state *Discula platani* (Peck.) Sacc., can be very often found. Symptoms observed were similar to described by TELLO et al. (2000), and one of the frequent pictures seen in heavily affected plane crowns were numerous shoots with short internodes, growing in whorls along branches.

The preliminary results on health status research, carried out in May 2003, in one experimental tree line revealed 30 - 70 % shoots and twigs dieback in plane crowns. The symptoms were mainly observed in the base and in the middle part of the crowns.

Up-to-day the control measures were limited to prevention or sanitary pruning in practical use, and no fungicide applications have been done in urban areas. Leaves were collected in autumn and infected branches were pruned when possible. According to the common practice of pruning in urban areas affected planes were partially pruned in a way to maintain the esthetical shape of crown. Up-to-day this partially sanitary pruning revealed solid results, with aim to eliminate as much as possible the presence of *D. platani* in the infected bark of shoots, twigs and branches.

Conclusion

During the last ten years the significant damage to shoots and branches have been observed in some pine and plane trees in Zagreb urban areas. Analyses of samples revealed the important role of two pathogenic fungi *S. sapinea* and *A. veneta*. The health problem in this tree species is even more complex as the influence of some insects (*Rhyacionia buoliana*, *Leucaspis* spp., *Corythuca ciliata*, *Phyllonorycter platani*), and the rising impact of abiotic damaging factors, including urban environment *per se*, could cause the most weakened individuals to collapse. This was the case with some pine and plane trees in a few urban areas in Zagreb.

According to applied control methods, used to suppress these diseases, we have found that sanitary pruning in plane trees in general, from the practical point of view, can be satisfied. Concerning the control methods applied to pine trees the conclusion is unfortunately opposite. The landscape architectures are presently advised to avoid Bosnian pine in future landscape designs, until some progress will be reached in controlling the disease. Prevention of the disease occurrence should be the main target, according to obtained research results.

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