The Contemporary Situation of Dothistroma Needle Blight Outbreak in the Czech Republic

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Abstract – Dothistroma needle blight *Mycosphaerella pini* E. Rostrup resp. its anamorphic stage *Dothistroma septospora* (Dorog.) Morelet was for the first time noted in the region of the Czech Republic in a consignment of imported plants of Austrian pine *Pinus nigra* Arnold in 1999. In 2000, it was also found on *Pinus nigra* in an open planting in a plantation of Christmas trees near the village of Jedovnice by Brno in the South Moravia. In the Czech Republic, Dothistroma needle blight was identified on 19 species of pines and 5 species of spruces. The critical period for infection is in the Czech Republic from the second half of May until the end of June, when the new shoots and needles develop. The incubation period lasts about 2–4 months depending on climatic conditions. The first symptoms on the needles infected in the current year appear in August being clearly expressed from September to November. In the CR, Dothistroma needle blight spread probably with infected planting stock obtained from import at the end of the 80s and at the beginning of the 90s.

Dothistroma needle blight / *Mycosphaerella pini* / *Dothistroma septospora* / host spectrum / diseases of Pines

Kivonat – A dothisztrómás tűhullás kitörésének jelenlegi helyzete a Cseh Köztársaságban. A dothisztrómás tűhullást, a *Mycosphaerella pini* E. Rostrup anamorf stádiumát 1999-ben jegyeztük először a Cseh Köztáraság területén import feketefenyő (*Pinus nigra* Arnold) növényeken. 2000-ben egy *Pinus nigra* karácsonyfa telepen is megtaláltuk Jedovnice falu közelében, Brno mellett. A Cseh Köztársaságban a dothisztrómás tűhullást 19 *Pinus* és 5 *Picea* fajon azonosítottuk. A fertőzés kritikus időszaka május második felétől június végéig tart, ami egybeesik a hajtás- és tűnövekedés időszakával. Az inkubációs idő hossza, az időjárási körülmények függvényében, 2-4 hónap. A folyó év során fertőzött tűkön az első tünetek augusztusban jelentkeznek, szeptember- novemberre teljesen kialakulnak. A Cseh Köztársaságban a betegség valószínűleg importból származó, fertőzött szaporítóanyaggal terjedt el a 80-as évek végén és a 90-es évek elején.

Dothisztrómás tűhullás / *Mycosphaerella pini* / *Dothistroma septospora* / gazdanövénykör / *Pinus*-ok betegségei

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1 INTRODUCTION

The Dothistroma needle blight caused by *Mycosphaerella pini* E. Rostrup was described from Europe, more exactly from Russia, as *Cytosporina septospora* Dorog in 1911 (DOROGUINE 1911). SACCARDO (1920) described the Dothistroma needle blight fungus found on *P. ponderosa* in Idaho as *Actinothyrium marginatum* Sacc. *Cytosporina septosporum* was later transferred to the genus *Septoriella* Oudem. as *S. septosporum* (Dorog.) Sacc. (TROTTER 1931). Later, this anamorphic stage was described as *Dothistroma pini* Hulbary (HULBARY 1941). The connection between the American and European pathogen was given when GREMMEN (1968) and MORELET (1968) realized that the fungus described in Europe as *C. septosporum* was the same as *D. pini* causing Dothistroma needle blight in the United States. MORELET (1968) found that it referred to the same fungus and created a new combination *Dothistroma septospora* (Dorog.) Morelet. Both names are commonly used. Some papers note differences between these two anamorphs. Eg. Barnes et. al (2004) find on the bases of phylogenetic studies, that *D. septospora* and *D. pini*, make up two distinct phylogenetic lineages. *Dothistroma septosporum* has a worldwide distribution and it is the causal agent of the disease that has severely damaged plantations of *P. radiata*, grown as an exotic in the Southern Hemisphere. In contrast, *D. pini* is a serious pathogen of pines that currently appears to be restricted in distribution to the North Central United States. The species found in the Czech Republic is classified as *Dothistroma septospora.*

A sexual stage was first described as *Scirrhia pini* Funk and Parker but subsequently it was included in the genus *Mycosphaerella* as *Mycosphaerella pini* E. Rostrup apud Munk. BARR (1996) reclassified the teleomorph based on the study of diversity of the genus *Mycosphaerella* to a new genus *Eruptio* as a species *Eruptio pini* (Rostr. apud Munk) M. E. Barr. Subsequent phyllogenetic analyses have proved that classifying into the genus *Mycosphaerella* is much suitable (GOODWIN et al. 2001). The anamorphic stage was divided to three varieties on the basis of differences in the length of conidia. THYR and SHAW (1964) distinguished within *D. pini* Hulbary a variety *pini* (syn. *D. septospora* var. *septospora*) with the length of conidia 15.4 – 28.0 (mean 22.4) μm and *D. pini* Hulbary var. *linearis* (syn. *D. pini* var. *lineare*) with the length of conidia 23.0 – 42.0 (31,9) μm. IVORY (1967) distinguished another variety *D. pini* Hulbary var. *keniensis* (syn. *D. septospora* var. *keniense*) with mean lengths of conidia 13.0 – 47.5 (28.9) μm. EVANS (1984) reasons that *D. pini* comes from mixt forests of Central America and occurs on isolated mountain "islands" at altitudes over 1500 m.

As compared with the anamorphic stage, the teleomorphic stage *Mycosphaerella pini* (syn. *Scirrhia pini*) occurs rather exceptionally. In the majority of countries with the occurrence of an anamorphic stage of *Dothistroma pini* or *D. septospora* a teleomorph was not found at all. A perfect stage is mentioned from Canada, parts of the USA, Germany, Yugoslavia, Poland and Portugal (BRADSHAW 2004). The perfect stage of *M. pini* is related to *D. pini* var. *linearis*. In *D. pini* var. *pini* and *D. pini* var. *keniensis*, a perfect stage has not been described (IVORY 1967).

Virtually, about 80 host species of Dothistroma needle blight are mentioned from all continents (Bednarova et al. 2006). Particularly various species of pine are hosts of the needle blight. Dothistroma needle blight is also mentioned from *Picea abies* (L.) Karst. (LANG 1987), *P. omorika* (Pančić) Purkyně (KARADŽIĆ 1994), *P. pungens* Engelm. (JANKOVSKÝ, BEDNÁŘOVÁ, PALOVČÍKOVÁ 2004), *P. sitchensis* (Bong.) Carr. (GADGIL 1984), *P. schrenkiana* Fisch. & C. A. Mey (Bednářová 2006), *Pseudotsuga menziesii* (Mirb.) Franco (DUBIN and WALPER 1967), *Larix decidua* Mill. (BASSETT 1969) etc.

The aim of paper is evaluate situation about distribution of Dothistroma needle blight in the Czech republic, epidemic situation, ecology, pathology and its host spectrum.

2 MATERIAL AND METHOD

Within monitoring carried out in 2000 - 2007, pine needle samples were examined taken mainly in the region of southern and central Moravia, Silesia and eastern and central Bohemia, individually also from other regions of the CR. Samples were taken with symptoms of damage to the assimilatory apparatus of pines from more than 60 localities.

The presence of the pathogen was always investigated according to characteristic symptoms such as red bands, dying tips of needles or the occurrence of subepidermal sporocarps, acervuli. A precise identification was proved on the basis of microscopic analyses of conidia. Records of the study are deposited in the herbarium of the Department of Forest Protection, Faculty of Forestry and Wood Technology, Mendel University of Agriculture and Forestry Brno (BRNL)

3 RESULTS AND DISCUSSION

Dothistroma needle blight caused by *Mycosphaerella pini* (or its anamorph *Dothistroma pini*) was firstly recorded in the Czech Republic on an imported *Pinus nigra* in 1999. In 2000, it was found in the open planting. Its occurrence was noticed in more than 50 localities in the region of Moravia and Silesia and eastern Bohemia (JANKOVSKÝ, BEDNÁŘOVÁ, PALOVČÍKOVÁ 2004). At present, it is a serious problem particularly in Christmas tree plantations as well as in forest nurseries.

3.1 Host spectrum in the Czech Republic

In the Czech republic, Dothistroma needle blight was identified on 19 species of pine: *Pinus aristata* Engelm., *Pinus banksiana* Lamb., *Pinus cembra* L. var. *sibirica* (Du Tour) G. Don, *Pinus contorta* Douglas ex Loudon, *Pinus heldreichii* H. Christ, *Pinus heldreichii* H. Christ var. *leucodermis* (Antoine) Markgraf ex Fitschen, syn. *Pinus leucodermis* Ant., *Pinus jeffreyi* Grev. et Balf, *Pinus mugo* Turra, *Pinus nigra* Arnold, *Pinus ponderosa* Douglas ex Lawson, *Pinus pungens* Lambert, *Pinus rigida* Miller, *Pinus rotundata* Link = *Pinus mugo* nothosubsp. *rotundata* (Link) Janchen & Neumayer, *Pinus strobus* L. var. *chiapensis* Martinez, *Pinus sylvestris* L., *Pinus tabuliformis* Hort. ex Carrière, *Pinus taeda* L., *Pinus thunbergii* Parlatore, syn. *Pinus thunbergiana* Franco, *Pinus wallichiana* A. B. Jackson. *Pinus nigra* Arnold and *Pinus mugo* Turra are the most frequent hosts. As for species of other genera *Picea pungens* Engelm., *Picea asperata* Masters, *Picea omorika* (Pančić) Purkyně and *Picea abies* L. Karst. also were noted as hosts. *Picea schrenkiana* Fisch. & C. A. Mey as a very sensible host of Dothistroma needle blight is also a certain rarity. Unusual new hosts are mostly from arboretums or ornamental plantings (Bednářová et al 2003).

3.2 Biology of D. septosporum in the Czech Republic

The open acervuli of *D. septosporum* were noticed in the majority of localities in the CR already from mid-March in the year 2002. In some localities, the formation of conidia was noticed from the end of April. The critical period for infection is in the Czech Republic from the second half of May until the end of June (beginning of July). The incubation period lasts about 2–4 months depending on climatic conditions.

The first symptoms on the needles infected in the current year appear in August in the form of unspecific yellow spots on needles. Finally, the needles get dry from tips and dead tissues are at first of straw-brown color. In the course of September, at first dark brown and later narrow black strips are formed on dead parts of needles. In this stage, fruit bodies are

formed on needles in which conidia of *Asteromella* synanamorph are produced. On their place, acervuli are formed from October and characteristic red strips are created. In acervuli, *Asteromella* spermogonia can be formed at first together with conidia of the stage of *Dothistroma*. In this period, intensive development of infection occurs. During a week, a progress of damage to pines was noticed in localities under study. Infection demonstrations are particularly evident in early spring.

Under strong infection pressure, needles die already during the year of infection, namely rather early, from August till September. In the same year, acervuli can be formed even with accompanying symptoms as the occurrence of red strips. Heavily infected trees are weakened to such an extent that sufficiently large new current year shoots are not often formed. If the shoots grow they are shortened and stunted ("lion tails") and during the next year, they die under the infection pressure.

Ascospores of *Mycosphaerella pini* were noticed only once on fallen needles of *Pinus mugo* from the Říkovice locality, Eastern Bohemia in October 2001.

Results obtained correspond to observations of PETERSON (1967). Virtually the same results are given by KARADZIĆ (1989) from the region of Serbia. He mentioned that conidia of *Mycosphaerella pini* were in Serbia dispersed from the beginning of April until the end of October, and ascospores from the second half of June until the end of September.

In Germany, conidia of *M. pini* were detected between March and November being particularly abundant from April to June (LANG, KARADZIĆ 1987).

4 CONCLUSIONS

Dothistroma needle blight caused by *Mycosphaerella pini* resp. mostly by its anamorphic stage *Dothistroma septospora* is one of the most important harmful organisms making problems in decorative nursery practice and forestry. In the Czech Republic, the spectrum of hosts includes 19 species of pines and 5 species of spruce. It is not possible to exclude that the disease is neglected in the region of the CR already for several decades. Only inclusion into quarantine organisms brought about an interest in the pathogen. Roughly at the same time as in the Czech Republic, the disease was also noticed in neighboring countries. The spread of Dothistroma needle blight can be considered (in addition to trade with planting stock) to be the result of favorable climatic conditions when natural geographic and climatic barriers preventing the spread of the disease towards north were removed.

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