

Assessment of the effect of mycorrhizae on *Gemmamyces piceae* infection



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Summary

- Gemmamyces piceae* (Borthw.) Casagr. is a significant invasive fungal pathogen of several species of the genus *Picea*²
- Mycorrhizal fungi improve plant growth, health and resistance to pests and diseases^[1]
- Non-infested trees have a higher percentage of active mycorrhizal (AM) tips than infested trees (Wilcoxon test, $\alpha = 0.05$, $p = 0.0455$)

Introduction

- Gemmamyces piceae* (Borthw.) Casagr is a significant pathogen of coniferous trees belonging to the *Ascomycota*^[2]
- The outbreak of the disease was first recorded in the Czech Republic in 2009 at *Picea pungens* in the Ore Mountains. Since 2014, it has started to spread significantly to another species of spruce - *Picea abies*^[2]
- This pathogen attacks the buds and causes characteristic and practically unmistakable symptoms (buds swell and continue to spiral and are covered with black basal stroma of the fungus from summer)^[2]



Symptoms of disease caused by *Gemmamyces piceae*

- Mycorrhizae has a positive effect on the ecosystem and health of trees^[1]
- Trees with well-developed mycorrhizae show a better ability to adapt to adverse environmental conditions than trees with less developed mycorrhizae^{[3][4]}
- Plants living in mycorrhizae are characterized by increased and better resistance to low temperatures, drought, pH changes and toxins and attack by pathogens^{[3][4]}

Methodology

- In the autumn of 2020, 49 soil probes were taken from 6 forest stands from FA Litvínov (LČR, s.p.) in the Ore Mountains (CZ)
- Soil probes were collected from 24 infested and 25 non-infested *P. abies* individuals
- Infestation of *P. abies* was assessed based on the degree of defoliation and the incidence of disease symptoms



Detail of soil probe^[4]



Forest Authorities Litvínov in Ore Mountains

- Mycorrhizal conditions were evaluated on roots up to 1 mm in diameter with a basic length of 5 cm
- Active and nonactive mycorrhizal (AM and NM) tips were sorted and counted under a binocular magnifier (Olympus SZ61)

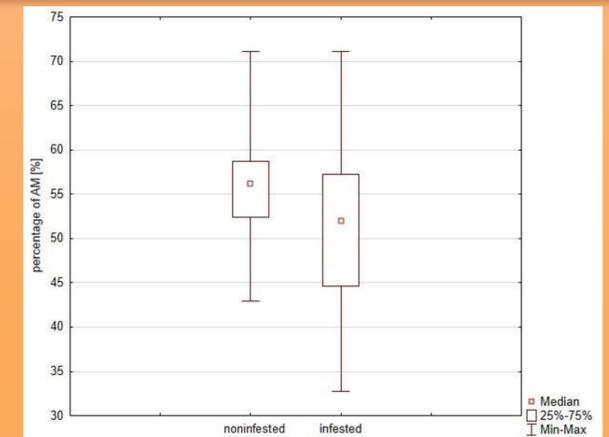


Individual root segments (up to 1 mm in diameter) from the soil probe

- According to the character of the hyphal mantle, Hartig's network and hyphae, morphotypes of AM tips were recognized, which will be analyzed by PCR - RFLP and fungi involved in mycorrhizae will be determined (during the year 2021).

Results

- The average value of the percentage of AM was 53.6 % and NM 46.4 %
- The average total density of mycorrhizal tips was 2.9, of which the density of AM was 1.6 and NM 1.4
- There was statistically significant difference between the percentage of AM in non-infested and infested trees (Wilcoxon test, $\alpha = 0.05$, $p = 0.0455$)



- 5 different morphotypes of active mycorrhizal tips were determined (total 154 from all samples)
- The most common were morphotype a (bulbous, thick shape and khaki green color) and morphotype b (significantly lighter yellow) tip and the rest brown)



Morphotype a



Morphotype b

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