



Assesing the efficiency of different prenvetion methods of pine pitch canker, and the creation of a manual with the good practices to follow in plant nurseries

Introduction

Pine pitch canker is a disease caused by the fungi *Fusarium circinatum*, which is a quarantine disease, that can lead to serious problems in the production of plants by the nurseries and a shortage in the availability of seeds. The fungi can be dispersed by wind, water and insects, however the most common way is by transporting/using seeds and plants that are infected but don't show signs and symptoms of the disease yet. This project had as its objectives the creation of standard procedures to disinfect the seeds, plant containers and the water used to irrigate. To achieve this goal various technics were tested in different pine specimens (*Pinus pinaster*, *Pinus pinea*, *Pinus radiata*, *Pinus sylvestris*), and their results were reported in a manual that summarizes the results of the different experiments and has the description of the techniques used with the most success. The success of the technique was measured by different factors, first of all was if the fungi was present after the treatment, then the germination rate, and for last, the size of the plants created. The methods that had a high success in the lab experiments were put to the test in the field, in this case the plant nurseries, to check their feasibility in the "real world".

The seeds are one of the most important ways of dispersion of the fungi inside a plant nursery, therefore the disinfection of seeds is a way to avoid and minimize the infection of plants by the disease. The treatments that will be described should be applied before the hydration of the seeds and after the treatments they are ready to be seeded. From the different approaches used the most successful ones were:

Heating water until 60°C and submerging the seeds for 15 minutes maintaining the water temperature;
Submerging the seed for 30 minutes in a solution of 20% H₂O₂ (Hydrogen peroxide);
Submerging the seeds for 5 minutes in a solution of 60% C₂H₆O (Ethanol) or 70% in the case of *P. pinea*;
Submerging the seeds for 5 minutes in a solution containing 1,9g of Captana (Captana 800 WDG) per liter of water.

From the different techniques used in the disinfection of the plant containers, hydrogen peroxide was the substance that showed the best results and didn't affect the growth of the plants. To achieve the expected result the containers should be submerged for 30 minutes in a solution of 20% H₂O₂ (Hydrogen peroxide).

To disinfect the irrigation water the treatments should be applied in the reservoir of the water that is going to be used. The most effective treatments were:

Applying 10,2 liters of Desogerme (Desogerme SP Vegetaux) per 1000 liters of water (1% solution) ;
 Applying 42 liters of Hydrocare (Intra Hydrocare) per 1000 liters of water (4% solution).

Pine bark is used a lot by plant nurseries as a soil component that gives porosity to the soil, however because it comes from a host plant it may contribute to the dispersion of the disease. Different components that can do the same function as pine bark were tested, the maximum percentage of each tested component in the soil are: 30% for Perlite (2-6mm), Polystyrene foam grains (8-12mm), ADT cork grains (1-2mm) and 15% “falca” (shredded cork from the first debark).

Lessons learned

From this project a standard procedure was created to combat the infection by *Fusarium circinatum* in plant nurseries. Various techniques were tested for the different ways of this fungi dissemination, which are, in the case of plant nurseries, by infected seed, plant containers and the water used in irrigation. The ones that were effective in the elimination of the fungi and didn't affect the germination rate or plant growth, were summarized and described in detail.

All the results of the different case studies allowed the creation of different scientific articles, in this way sharing the results with the academic and scientific community. And the creations of a manual, easily available to plant nurseries workers with the methods tested.

This manual “Technical manual for the suppliers of forestry reproduction materials - Prevention of pine pitch canker” (“Manual técnico para fornecedores de materiais florestais de reprodução - Prevenção do cancro-resinoso-do-pinheiro”) is available online and printed. It was freely distributed to forest owners associations, diverse entities related forestry and plant nurseries, which allows the information to reach its target audience.

For further information contact

info.projetos@icnf.pt

The information presented in this factsheet was developed by the FOREST4EU partner, drawing on the innovations and knowledge generated by the indicated operational group with their explicit authorization.

Further information

<https://www.inia.pt/projetos/prevcrp#:~:text=Com%20este%20projeto,%20pretende-se%20desenvolver%20estrat%C3%A9gias>



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