FOREST4EU

ITHub 2 - Forest Adaptation to climate change

FOREST4EU partner: ANSUB
OG: GO +PINHÃO
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Type of Innovation: Technological innovation

Good practices for the management of diseases in Stone Pine (*Pinus pinea* L.)

Introduction

The objective of this project was to identify the biotic entities (pest and diseases) that affect the development of the plants and the pine nut production, describing the ways to detect them, and which management practices could be applied for their control.

For a long time the only significant disease found in the stone pine was from a fungi named *Diplodia sapinea*. However in the last years diseases related to the dieback of the tree shoots are becoming more common.

The main fungi associated to the dry of the apical branches are: Diplodia tip blight (*Diplodia sapinea*); Pestalotiopsis dieback (*Pestalotiopsis pini*); Dieback of pine (*Sydowia polyspora*).

Other fungi were identified as minor diseases since the tree normally restore their prior vigour and the fruit production is not affected. They are: Lophodermium Needle Cast of Pine (*Lophodermium seditiosum*); Blight of Allepo pine (*Thyriopsis halepensis*); Red band needle blight (*Dothistroma septosporum*); Black spot needle blight (*Heterotruncatella* sp.).

The fungi *D. sapinea* normally only affect the tree branches causing them to dry. It can also affect directly the pine cone, misshaping it, reducing its size and the quality of the pine nuts produced. The main visual signs of this fungi presence is the drying of the apical shoots, the leaves get a brownish/greyish colour, the leaves dry from their base, cancers are developed in branches, resin is expel in branches and pine cones are misshaped. The fungi P. pini mainly affects the apical tree branches, causing them to dry and die, it also dries the leaves and creates black spots in them, which are the fungi reproductive structure. The *S. polyspora* only visible sing is the drying of the apical branches.

The minor diseases signs and symptoms are described for each fungi as: in *L. seditiosum* the tree shoots grow slower, the branches dry from the base to the top, the leaves from the second year turn brownish or even die and black oval dots can be seen in the dry leaves; in *T. halepensis* the leaves turn brown/yellow, creating a uniform yellowing of the crown, it affects particularly the older leaves; trees affected by *D. septosporum* have apical branches with a "wisp" like formation where a lot of leaves grow from, in initial phases the leaves get a yellow then brown colour, leaving the base of the leaf still green, yellow/brown rings around the leaves are usual; the fungi from *Heterotruncatella* genus has a signs the yellowing of the branches and the leaves dry from top to bottom.

The trees are more susceptible to the different diseases when they are younger or when they are old and there is a deficit of nutrients or water. This means that plant nurseries and young plantations are the ones more affected by diseases than the trees already established in the forest. However severe attacks in adult trees can also lead to their death.

Lessons learned

The control methods to fight the major diseases are the following: Good management practices that keep the vigour of the plants are the best way to prevent infections; Sanitary pruning is the method most used since no homologated fungicides exists in the country (Portugal) for the diseases. The pruning should be applied in the dry season, so the spores are not dispersed, and the removed branches should be burn; in the case of *S. polyspora* there are some reports with good results of forest owners using calcium chloride when the trees are starting to grow the shoots of the year.

It is also known that insects are a vector, contribution for the dissemination of the diseases. Most of the times the diseases described are not powerful enough to kill the trees, however the mixture of the effects of both the disease and other pest are what leads to the dead of adult trees.

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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.unac.pt/index.php/id-i/grupos-operacionais-accao-1-1-pdr2020/pinhao

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