



## Good practices for the management of pests 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.

Three major pests were identified: Western conifer seed bug (*Leptoglossus occidentalis* H.); Pine cone moth (*Dioryctria mendacella* S.); Pine cone weevil (*Pissodes validirostris* S.).

Three minor pests were identified: Pine processionary (*Thaumetopoea pityocampa* D. & S.); Common pine shoot beetle (*Tomicus piniperda* L.); Pine shoot beetle (*Tomicus destruens* W.).

The *L. occidentalis* can feed on pine nuts, at every stage of the cone development but it a preference for pine cones in the third year of development. It may dry the cones that have 1 or 2 years, however in cones that have 3 years the damage can only be visible in the pine nuts, since no hole or other sign of their attack can be visible from the outside of the pine cone. Their life cycle is the following: adults feed and lay eggs in April/May, in June/July a new generation is created by laying eggs again, if the climate conditions are favourable a third generation may be created in October/November, the adults from the last generation will gather in big groups and hibernate during the colder months. This life cycle leads to small population numbers in the beginning of the cycle reaching a maximum in July/August. It was observed that the adults most of the times will stay feeding in the same branch or tree but are capable to fly more than 15 km per day if searching for new resources. The population numbers are very different each year for the same place, no explanation was found for this behaviour. This population dynamic leads to very different production damage each year.

As a rule for damage assessment if the insect is detected in one third of the tree in the stand a 25% loss of pine nuts per pine cone can be expected, if they are detected in one fifth of the tree the expected loss is 15%.

The specie *D. mendacella* is affecting the most the pine nut production at a national level, since it's the most numerous pest in our country. The larvae feeds inside the pine cones, mostly in cones with 2 or 3 years, but can also affect cones in their first year. The adult lays a single egg in a pine cone, that hatch between 7 to 10 days. This specie larvae can be identified by their brown body with legs. When leaving the pine cone the hole has an irregular shape, and resin, excrement, silk and sawdust can be seen in the

misshaped pine cone. This specie life cycle was not yet fully understood. It is suspected that it has 2 overlapping generations per year, since the insect can be seen in different life stages simultaneously year-round. The maximum population size is reached in June/July, and it stays the winter hibernating.

The specie *P. validirostris* in their adult stage feed on the pine shoots creating small superficial wounds that do not affect the development of the tree. However, when in their larvae stage they feed in the inside of the pine cone. This specie larvae can be differentiated from the larvae of *D. mendacella* by their white compact body without legs, and can usually be seen more than one larvae inside the pine cone. The hole left in the pine cone is round and usually resin, sawdust and silk is not detected. This specie life cycle has only 1 generation each year, and the adults can live up to 2 year. In April/May the adult lays some eggs in each pine cone, reaching the adult stage in the beginning of the fall, during the winter the adults hibernate in the tree bark.

One management practice that helps in the prevention of pests and reducing their impact is the plantation of mixed forest instead of monocultures. Its is not yet quantified its effect, however it helps by reducing the food source availability and creating more habitats for potentials predators."

## Lessons learned

Two pest control methods are suggested for the *L. occidentalis*. In extreme cases of production loss, pesticides with 50% concentration of Flonicamid, can be used to a maximum of 20gr/hl. However, it should be taken in mind that each country has different regulations related to insecticides, in the case of this study (Portugal), only the brand Tepeki is allowed to be used. This brand only kills the nymph stages, after 24 hours, and was proven to not leave residual traces in the pine nut. Another method is installing traps with aggregation or sexual pheromones. This technic has less environmental impact since it targets only the pest and no other living beings.

In the case of *P. validirostris* and *D. mendacella* the most efficient control method is detecting and collecting the pine cones that have been attacked before the larvae reach the adult stage, and destroying the affected material with the use of fire. For the specie *D. mendacella* the use of pheromones together with traps in the last years had a huge development. The use of the female sexual pheromone had demonstrated a high success in the capturing of the specie males while they are flying in their reproduction period.

| Level of impact each biotic agent as in the different stages of the <u>pine cone</u> development |       |        |       |        |        |
|--|-------|--------|-------|--------|--------|
| Year   | Month | Insect |       |        |        |
|  |       | lepto  |       | dio    | piss   |
|  |       | adult  | nymph | larvae | larvae |
| 0  | 1     |        |       |        |        |
|  | 2     |        |       |        |        |
|  | 3     |        |       |        |        |
|  | 4     |        |       |        |        |
|  | 5     |        |       |        |        |
|  | 6     |        |       |        |        |
|  | 7     |        |       |        |        |
|  | 8     |        |       |        |        |
|  | 9     |        |       |        |        |
|  | 10    |        |       |        |        |
|  | 11    |        |       |        |        |
|  | 12    |        |       |        |        |
| 1  | 1     |        |       |        |        |
|  | 2     |        |       |        |        |
|  | 3     |        |       |        |        |
|  | 4     |        |       |        |        |
|  | 5     |        |       |        |        |
|  | 6     |        |       |        |        |
|  | 7     |        |       |        |        |
|  | 8     |        |       |        |        |
|  | 9     |        |       |        |        |
|  | 10    |        |       |        |        |
|  | 11    |        |       |        |        |
|  | 12    |        |       |        |        |
| 2  | 1     |        |       |        |        |
|  | 2     |        |       |        |        |
|  | 3     |        |       |        |        |
|  | 4     |        |       |        |        |
|  | 5     |        |       |        |        |
|  | 6     |        |       |        |        |
|  | 7     |        |       |        |        |
|  | 8     |        |       |        |        |
|  | 9     |        |       |        |        |
|  | 10    |        |       |        |        |
|  | 11    |        |       |        |        |
|  | 12    |        |       |        |        |
| 3  | 1     |        |       |        |        |
|  | 2     |        |       |        |        |
|  | 3     |        |       |        |        |
|  | 4     |        |       |        |        |
|  | 5     |        |       |        |        |
|  | 6     |        |       |        |        |
|  | 7     |        |       |        |        |
|  | 8     |        |       |        |        |
|  | 9     |        |       |        |        |
|  | 10    |        |       |        |        |

Figure 1. The level of impact each biotic agent has in the different stages of the pine cone development.

## For further information contact








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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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