

PROJECT I.D.
1.1. Acronym: FORCONTROL AGL 2005-017-11
1.2. Project title: Sustainable management of conifer boring scolytidae
1.3. Financial backers: Spanish Ministry of Education and Science and the Basque Government Department of Agriculture, Fisheries and Food.
1.4. Participating bodies:
NEIKER DETAILS
1.5. Lead researcher: Arturo Goldarazena Lafuente (agoldarazena@neiker.net)
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1.6. Start date: October 2005
1.7. End date: October 2007

Summary:

Conifer scolytidae are among the most destructive insects as regards the forest masses of the planet. However, our knowledge of them in Spain consists of hardly more than faunistic studies. This project studies the dynamics of the populations of the species most important for conifers (*Ips sexdentatus*, *Tomicus piniperda* and *Tomicus destruens*). We aim to define the role of their natural enemies, associated fungi and the resistance of the host plant in controlling the populations of these species. We will use this information to evaluate possible environmentally friendly control strategies: semi-chemical (aggregation pheromones, anti-aggregation and volatile compounds of non-host angiosperms) and biological control agents (two predators: *Thanasimus formicarius* and *Temnochila caerulea* and an entomopathogenic fungus: *Beauveria bassiana*).

Overall Aims: To develop integrated strategies to control *Pinus radiata* wood boring beetles in the Basque Country. To acquire an understanding of the fungal diseases they transmit and fine-tune sustainable methods for controlling them.

Specific Aims:

1. – To identify the phoretic organisms: association of Ophiostomatoides fungi with different species of scolytidae.
2. – To develop a strategy for the sustainable protection of forest masses by using natural compounds to inhibit primary attraction (verbenones and limonenes).
3. – To evaluate certain entomopathogenic fungi (*Beauveria bassiana*) as potential controllers of *Ips sexdentatus*.
4. – To draw up good forestry management standards to avoid or reduce the damage caused by the attacks of these species.
3. – To study the ecology of colonisations by scolytidae (Coleoptera: Scolytidae) and associated ophiostomatoid fungi (Plectomycetes: Microascales) in *Pinus radiata* plantations in Northern Spain.
4. – To study the molecular phylogeny and taxonomic characterisation of ophiostomatoid fungi (Plectomycetes: Microascales) causing blueing of *Pinus radiata* in Northern Spain.

Participants in the Sub-Project: Neiker (Agricultural Innovation Unit) and the University of the Basque Country (Dept. of Zoology).

Participants in the Project: Neiker, the University of Santiago (Maria J. Lombardero) and the University of Palencia (Juan Pajares).

Results:

The aims of the project have been reached, with the publication of the results in several scientific journals and general publications. In particular, with regard to the aims mentioned, the following results have been obtained:

- Ecology of crossing and unidirectional deviation of the type of crossing for mycangial and hyperphoretic ophiostomata fungi. Results: The isolation and identification stages of hyperphoretic fungi on tarsonemid mites have been carried out. We have also isolated certain mycangial fungi of *Ips sexdentatus*, although we have not yet been able to identify all the species.
- Prospection of Entomophthorales and Hyphomycetales entomopathogenic fungi and evaluation of isolated examples of *Beauveria bassiana* as potential agents for controlling *Ips sexdentatus*. Results: We have isolated the entomopathogenic fungi and identified them using morphological and molecular techniques. We have carried out laboratory experiments to evaluate the pathogenicity of the same as regards scolytidae. In order to evaluate the pathogenicity of *Beauveria bassiana*, we used the *Hylurgops palliatus* species, as it was simpler to capture a high number of individuals.

The most significant results are:

1. – Determination of the insect-pathogenic fungus relationship of the main species of scolytidae associated with *Pinus radiata* (blueing fungi, pitch canker fungi)
2. – Study of the chemical ecology of the scolytidae species associated with Monterey Pine. Determination of the role of verbenone as a repellent in the field.
3. – Study of the entomopathogenic fungi associated with wood boring scolytidae of conifers. Isolation of strains of *Beauveria bassiana* as potential agents for the biocontrol of scolytidae.

Impact

The results of the project allow us to approach the control of these insects and their fungi in a comprehensive fashion. The Spanish Forest Science Society is transmitting the know-how acquired during the project, the role played by scolytidae as vectors of fungal diseases of pines and strategies for their sustainable control to the forestry sector. Particularly interesting is the development and transfer of the technology concerning the use of semiochemicals in the field for the integrated control of these plagues to public administrations.

The entomological material gathered during the project has been used to compile a book-guide on scolytidae affecting conifers in the Basque Country for the forestry sector:

Scolytidae and conifers in the Basque Country. A practical guide for their identification and control. López S, Iturrondobeitia JC, Romón P & Arturo Goldarazena. Publisher: Basque Government Publications Service. Department of Agriculture and Fisheries. 280 pp.

Publications

- Romón P, Zhou X.D., Iturrondobeitia JC. & Goldarazena A. Ophiostomatoïd fungi (Ascomycetes: Ophiostomatales) associated with bark beetles (Coleoptera: Scolytidae) colonizing *Pinus radiata* in northern Spain, 2007. *Canadian Journal of Microbiology* 53: 756-767.
- Pedro Romón, Juan Carlos Iturrondobeitia, Ken Gibson, Staffan Lindgren & Arturo Goldarazena, 2007. Quantitative Association of Bark Beetles with Pitch Canker Fungus and Effects of Verbenone on their Semiochemical Communication in Monterey Pine Forests in Northern Spain. *Environmental Entomology* 36(4): 743-750
- Romón P, Troya M, Fernández de Gamarra ME., Eguzkiza A, Iturrondobeitia JC. & Goldarazena A, 2008. Fungal community associated with pitch canker disease of Monterey pine caused by *Fusarium circinatum* in Northern Spain : association with insects and pathogen-saprophytes antagonistic interactions. *Canadian Journal of Plant Pathology* 30, 241-253.
- Ionso-Zarazaga M.A., & Goldarazena A, 2005. Presencia en el País Vasco de *Rhyephenes humeralis* (Coleoptera, Curculionidae), plaga de *Pinus radiata* procedente de Chile. *Boletín de la Sociedad Entomológica Aragonesa*. 36: 143-146.
- Sergio López, Iturrondobeitia JC & Goldarazena A, 2007. Primera cita en la Península Ibérica de *Gnathotrichus materiarius* (Fitch, 1858) y *Xylosandrus germanus* (Blandford, 1894) (Coleoptera: Scolytinae). *Boletín de la Asociación de Entomología Aragonesa*.