

Control of *Monilinia* spp. and *Rhizopus* spp. in stone fruit using new strategies during the harvest

Summary

Catalonia is a leading international producer of stone fruit (*Prunus persica* (L.) Batsch), with a total output of 406,279 tonnes. Brown rot due to *Monilinia* spp. is the main disease affecting stone fruit in our area of production. *Rhizopus* spp. is another of the major pathogens that affect stone fruit, causing soft rot, and its prevalence in our area of production has increased in recent years.

Despite the incidence of stone fruit affected by soft rot, no reliable information is currently available on the effectiveness of fungicides on stone fruit to control it, and no effective products for controlling this disease are included in the design of pest control strategies and diseases in the field. The situation as regards *Monilinia* spp. is completely different, as programmes for applying synthetic fungicide products throughout the crop's entire phenological cycle in order to bring the disease under control are designed.

Fruit production is currently facing a scenario in which it must comply with the applicable legislation and meet the requirements imposed by consumers, and as such it is necessary to innovate and redesign the disease control strategies which are applied so that they do not lead to residue on the end product. This situation led to the establishment of the Operational Group, with the primary objective of controlling *Monilinia* spp. and *Rhizopus* spp., the main diseases that affect stone fruit, using strategies for control that leave no residue on the surface of the fruit when they are harvested, in order to be able to access the most demanding markets.

Objectives

The primary objective is to control post-harvest diseases of peaches and nectarines caused by *Monilinia* spp. and *Rhizopus* spp., using strategies that leave no residue when the fruit is harvested. The specific objectives are:

1. Determine which products leave no residue on the fruit.
2. Ascertain the maximum period within which synthetic chemicals can be applied in the field without any residue appearing when they are harvested.
3. Determine possible preventive and cultivation measures. Biomarkers to predict the disease's occurrence will also be ascertained.
4. Develop and validate an integrated management strategy.

Description of the measures planned in the project

- Alternative products to chemicals will be assessed, and the most effective for application in the field selected.
- Information will be collected regarding when to apply the chemicals so that they are not detected during the harvest. Further studies will be conducted if necessary.
- The presence of *Rhizopus* spp. in the field will be ascertained.
- An in vitro and in vivo study of *Rhizopus* spp. will be carried out at various temperatures.
- Cultivation and prevention practices will be defined and applied in the field.
- The periods for determining the presence of volatile compounds in inoculated fruit will be defined.
- A control strategy that leaves no residue will be defined and validated at a commercial level. This will then be drafted as a document.

Expected results and practical recommendations

The anticipated results of this project are outlined below:

- A list of effective products for the control of *Monilinia* spp. and *Rhizopus* spp. in peaches and nectarines will be produced, including their effectiveness depending on whether they are applied as curative or preventative measures.
 - The project will determine which of the products selected are effective under field conditions when applied subject to a schedule or based on the model indicating risk of infection by *Monilinia* spp. It will also ascertain whether it is necessary to apply a positioned chemical at a time when it does not lead to the presence of residue on the fruit at the time of harvest.
 - The application time in the field closest to the harvest will be determined for each of the effective chemicals for controlling *Monilinia* spp. and *Rhizopus* spp., so that no residue is detected in the fruit at the time of harvest.
 - The presence or otherwise of any *Rhizopus* spp. inoculum on stone fruit farms will be ascertained, as well as their location on the farm.
 - Further knowledge will be obtained regarding the behaviour of *Rhizopus* spp. in the various situations that arise under field conditions (different temperatures) and post-harvest conditions (different storage temperatures, different concentrations of sodium hypochlorite at different water temperatures), which will provide a focus for the preventive and cultivation practices necessary for its control.
 - Further knowledge will be obtained of the behaviour of *Rhizopus* spp. under the various conditions of temperature and relative humidity that arise in field and post-harvest, which will provide a focus for the preventive and cultivation practices necessary for its control.
 - The need and effectiveness of cultural and preventive measures actions for the control of *Rhizopus* spp. on stone fruit farms will be determined.
 - The volatile compounds characteristic of the diseases caused by *Monilinia* spp. and *Rhizopus* spp. will be ascertained and used as predictors of their onset.
 - An effective strategy for controlling *Monilinia* spp. and *Rhizopus* spp. will be designed based on strategies that do not leave a residue on the surface of the fruit when harvested, and which enable stone fruit producers to control these diseases using strategies without any residue.
- The producers and technicians of the companies in the Operational Group will have detailed and organised information on how to control *Monilinia* spp. and *Rhizopus* spp. using strategies that do not leave a residue. This integrated strategy will include all the relevant information obtained from this project and from fruit in previous studies, which will improve the control of the diseases addressed without leaving any residue on the fruit when they are harvested.

Leader of the Operational Group

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Subject area(s) of application

- Agricultural production system
- Agricultural practice
- Agricultural equipment and machinery
- Livestock farming and animal welfare
- Vegetable production and horticulture
- Landscape / Territorial management
- Pest and disease control
- Fertilisation and nutrient management
- Soil management
- Genetic resources
- Forestry
- Water management
- Climate and Climate Change
- Energy management
- Waste and by-product management
- Biodiversity and environmental management
- Food quality/processing and nutrition
- Supply chain, marketing and consumption
- Competitiveness and agricultural and forestry diversification
- General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
LLEIDA, TARRAGONA, BARCELONA	LLEIDA: EL SEGRIÀ, LA NOGUERA AND LES GARRIGUES TARRAGONA: LA RIBERA D'EBRE, EL BAIX CAMP AND EL BAIX EBRE BARCELONA: L'ALT PENEDEÈS, L'ANOIA AND EL BAIX LLOBREGAT

Dissemination of the project (publications, seminars, multimedia, etc.)

In order for the results obtained to benefit the participants and as many companies as possible, this project will include the following internal and external actions:

The internal actions will be those that will take place within the beneficiary companies of the Operational Group, and they will therefore be for the participating members of the group and will be disseminated at all levels of the company (from management to field). Meanwhile, the external actions will be open to the general public

INTERNAL ACTIONS:

Drafting of an integrated strategy for the control of *Rhizopus* spp. and *Monilinia* spp. in stone fruit that leaves no residue on the fruit. This document will be provided and explained to the technicians in the participating companies, so that they can disseminate it as widely as possible among their producers. All company staff will be given the results at various times during the execution of the project. Due to the dynamics of cultivation, part of this dissemination will have to take place after the project is completed. The aim of this

action is to make the company's staff at all levels aware of the results and the application and future benefits arising from them. Management staff, technical staff and producers will participate. The strategy designed and validated for the control of *Monilinia* spp. and *Rhizopus* spp. in stone fruit which leaves no residue on the final fruit will be explained in depth, as well as all the information created during the execution of the project.

EXTERNAL ACTIONS:

1. Dissemination of the results by participation in technical seminars for the sector.
2. Drafting of informative articles.

More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2019	Total budget: €178,557.00
Completion date (month-year):	DARP funding: €72,972.54
Current status: Underway	EU funding: €55,049.46
	Own funding: €50,535.00

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