Control of sour rot in stone fruit in the context of sustainability:

SOUR ROT IN PEACHES

Summary

Sour rot is an emerging disease affecting stone fruit. In recent years, its incidence has increased, and on occasion the losses can be similar to those caused by *Monilinia* spp, the main pathogen affecting stone fruit. Commercially available synthetic chemicals currently applied in the field and/or post-harvest are not effective in controlling it. Furthermore, it is already known that this disease is not only caused by *Geotrichum* spp. but is also caused by a consortium of micro-organisms including yeasts of the genus *Pichia* spp. This fact further complicates their control, as the epidemiology and the effectiveness of the products must be studied in parallel for both types of micro-organisms. This project will look deeper into the epidemiology of the disease, both in the field and during post-harvest, and will focus on control strategies both in the field and during post-harvest, including alternative products and systems. In addition, cultural practices to be applied in the field will be studied to determine their effectiveness for controlling sour rot. Finally, all the knowledge generated and control tools that end up being effective will be integrated into a single control strategy that will be validated at the commercial level.

Objectives

The overall objective is to control in a sustainable way the sour rot affecting stone fruit caused by *Geotrichum spp.* and yeasts of the genus *Pichia*. The following secondary objectives are established to achieve this overall objective:

1. Determine the epidemiological factors affecting the incidence and severity of stone fruit disease caused by the microorganisms that induce sour rot (*G. candidum and Pichia* spp.)
2. Study the consortium of micro-organisms causing sour rot.
3. Assess the risk of infection of healthy fruit arriving at the fruit and vegetable processing plant due to the presence of inoculum on the packing lines.
4. Evaluate the effectiveness of new products on a commercial scale or reported as effective in the latest literature, in in vivo laboratory studies.
5. Study the scale-up in the field of the potentially most effective products for controlling sour rot.
6. Determine the effectiveness and feasibility of cultural practices applied in the field to control sour rot.
7. Study the most effective technology for the application of potentially effective products for controlling sour rot in stone fruit post-harvest.
8. Study the option of heat treatments – hot water baths – to control sour rot in stone fruit.
9. Design and study the effectiveness of a control strategy in accordance with all the knowledge generated, integrating the most effective field and post-harvest actions to control sour rot.

Description of the actions planned in the project

The work plan that will be followed for the implementation of this project is described below:

1. Research related to the epidemiology of the disease to determine the presence and infectivity of the organisms causing sour rot, depending on the phenological stage and agro-climatic factors.
   - 1.1 Determine the epidemiological factors affecting the incidence and severity of stone fruit disease caused by the microorganisms that induce sour rot (*G. candidum and Pichia* spp.)
   - 1.2 Study the consortium of micro-organisms causing sour rot.
   - 1.3 Assess the risk of infection of healthy fruit arriving at the fruit and vegetable processing plant due to contamination by inoculum on the packing lines.

2. Research related to the effectiveness of different strategies of interest for field or post-harvest application to control the disease in a sustainable way.

2.1 Evaluate the effectiveness of new products on a commercial scale or reported as effective in the latest literature, in in vivo laboratory studies.
2.2 Study the scale-up in the field of the potentially most effective products for controlling sour rot.
2.3 Determine the effectiveness and feasibility of cultural practices applied in the field to control sour rot.
2.4 Study the most effective technology for the application of potentially effective products for controlling sour rot in stone fruit post-harvest.
2.5 Study the option of heat treatments based on hot water baths, to control sour rot in stone fruit.

3. Commercial validation:
3.1. Design and study the effectiveness of a control strategy based on all the knowledge generated during the lines of research 1 and 2, integrating the most effective field and post-harvest actions to control sour rot.

Expected results and practical recommendations

1. The research will reveal the extent of the presence of primary inoculum and the dynamics of secondary inoculum, both of which cause sour rot in stone fruit farms. Therefore, its presence throughout the phenological cycle of the crop will be determined, including during harvesting, as well as its distribution in the field. Finally, its correlation with agro-climatic factors will be determined, which will provide information on the climatic factors that are most conducive to the development of the disease. All these results will be the basis for developing an epidemiological model to indicate the risk of disease.
2. The interactions between these micro-organisms and whether one of them facilitates the initiation or development of infection will be revealed. These results are of critical importance to understand how the disease can initiate in the field and develop during post-harvest.
3. Based on previous studies, it is known that one of the important sources of inoculum in fruit and vegetable processing plants are the belts of the sorting lines. Meeting the objective of the study will help reveal the risk for healthy fruit of contamination when passing along these belts, in all the cases that may arise with commercial fruit, direct sale with shelf life or waiting time in the dispatch chamber. Depending on the risk of infection of healthy fruit and subsequent development of the disease, the level of stringency at which prophylaxis measures should be applied in the plant will be noted.
4. Given the response obtained in terms of the low effectiveness of the different products evaluated in in vivo and in vitro conditions so far, with the fulfilment of this objective all the products on the market that are potentially applicable in stone fruit, either in the field or in post-harvest, will have been evaluated. Therefore, the susceptibility of sour rot causing strains (fungi and yeasts) to the full range of synthetic chemical fungicides and/or alternative products that could be applied for their control under commercial conditions will be known. These results will help design strategies for evaluation and implementation in the field.
5. The research will reveal which control strategies applied in the field are effective for controlling sour rot.
6. The need, effectiveness and economic viability of cultural and preventive measures actions for controlling sour rot on stone fruit farms will be determined. In addition, the effectiveness of low-toxicity products to reduce soil inoculum without affecting the soil microbiota will be studied on an experimental scale.
7. The study will determine the most effective methodology for the application of post-harvest treatments on stone fruit, draining, bathing or online spraying, for controlling sour rot, with the products that are currently available on a commercial scale and whose efficacy will have been previously demonstrated.
8. The effectiveness of the alternative strategy to chemical or low toxicity products based on the treatment of stone fruit with hot water for controlling sour rot will be determined.
9. An effective strategy for controlling sour rot, under the principle of sustainability, will be designed and will therefore integrate all available and effective tools to control sour rot in stone fruit, with special emphasis on the use of cultural practices and, whenever their effectiveness allows it, the use of low-toxicity products.
10. Producers and technicians of the companies in the Operational Group will have detailed and organised information on how to control sour rot. 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 sour rot.

Leader of the Operational Group

ORGANISATION: AGROPECUARIA DE SOSES, SCCL

Coordinator of the Operational Group

ORGANISATION: IRTA - Institute of Agrifood Research and Technology

Other members of the Operational Group (grant recipients)

ORGANISATION: GRUP COOPERATIU FRUITS DE PONENT, SCCL

ORGANISATION: AGRICOLA ESPAX, SL

ORGANISATION: BARO E HIJOS SL

ORGANISATION: PRODUCCIONS AGRARIES DE CAMP, PAC SAT 1375 CAT

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)
Catalonia	

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

In response to an important sectoral opportunity, the sector in general and in particular the different actors in the value chain should be made aware that work is under way to implement this project. For this reason, the dissemination of the project will be promoted through the activities of the OG companies themselves.

- An informative note on the results of the project will be sent to specific technical publications in the target sectors.
- The results will be disseminated OG members using their dissemination networks such as newsletters, workshops, websites and social media. At least three social media communications are planned (one communication per year). The content of these will be reviewed by content dissemination experts to reach the maximum number of people.

- Dissemination of results at sectoral events will be carried out in person. IRTA Postharvest Conference and IRTA Fruit Growing Conference

All informative notes will be available in three different languages (Catalan, Spanish, English), depending on the target audience.

Project website

More information on the project

PROJECT DATES	TOTAL BUDGET
Starting date: July 2021	**Total budget:** €246,450.00
	DACC funding: €113,971.50
Current status: Under way	**EU funding:** €85,978.50
	Own funding: €46,500.00

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Order ARP/113/2021 of 20 May, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ACC/1660/2021, of 27 May, announcing the call for the grant.

Generalitat de Catalunya
Departament d'Acció Climàtica, Alimentació i Agenda Rural

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