

## Rationalisation of the use of phytosanitary treatments to control *Alternaria* in apple trees using risk prediction models and crop management techniques

### Summary

Alternariosis in apple trees, caused by the fungus *Alternaria spp.*, is an emerging disease that was first reported in Girona in 2013. This disease causes leaf necrosis, which can lead to the premature defoliation of trees, but its most critical effect is its impact on the fruit, where small but highly visible necrotic lesions appear, reducing its quality and making it more difficult to market. This damage can lead to losses of between 10 and 40% of production, depending on the year and the property affected. The disease spread and affected around 20% of commercial apple farms in the province of Girona in 2017, and was particularly prevalent in the varieties in the Gala and Golden groups. However, treatments with fungicides specifically designed to control this disease have proven effective, and the figures show that the number of farms affected fell below 10% in 2018. This decline was also due to a 20 to 30% increase in the total number of treatments. This increase is significant, particularly given that these treatments are applied on a concentrated basis very near the harvest, and therefore have a direct effect on waste in the fruit. Given this situation, measures to reduce the number of treatments are required, either by optimising treatments when necessary, or by reducing the pressure of the disease by managing the inoculum.

### Objectives

The main objective of this project is to improve control of *Alternaria* by minimising the use of phytosanitary treatments. Two priority areas have been considered to that end: first, validating and assessing various risk prediction models for *Alternaria* infections in order to reduce the number of fungicide treatments by improving their positioning; and second, influencing the source of primary inoculum for *Alternaria* in order to reduce the pressure of inoculums on farms, thereby reducing the incidence of the disease.

### Description of the measures planned in the project

*Task 1. Validation of various risk prediction models for Alternaria.* This task will involve monitoring the release of *Alternaria* spores and the appearance of symptoms on several farms located in different agroclimatic areas. The data from tracking the spores and the symptoms will be correlated with the infection warnings given by the different models, in order to identify the model that most closely matches the risk prediction.

*Task 2. Evaluation of the control strategy for Alternaria based on different risk prediction models.* Two risk prediction models for *Alternaria* will be evaluated on commercial properties. In specific terms, the control strategy based on the model used will be compared with the reference strategy in the area based on the number of treatments carried out, and the incidence of infections in leaves and fruit in order to select the best treatment strategy.

*Task 3. Study of the effect of reducing the inoculum by removing leaves on spore dispersal and infections of Alternaria.* A differential strategy for the removal or treatment of fallen leaves will be applied on various farms, and this will be compared with elsewhere on the farm, based on the presence of spores and infections of *Alternaria*. Various inoculum management strategies are envisaged.

*Task 4. Implementation of the Alternaria risk prediction model in the phytosanitary alert service.* After the risk prediction model that best suits our conditions has been selected, it will be integrated into the ATLANT platform to obtain predictions in real time, and thereby provide a rapid response for the control of alternariosis, while enabling a rationalisation of applications with fungicides.

### Expected results and practical recommendations

We anticipate selecting a risk prediction model that will enable us to adjust the infection risk periods with sufficient precision to be able to target fungicide treatments and keep the disease under effective control, as well as a significant reduction in the number of treatments. We envisage a 20% reduction in the number of treatments with the support of the risk prediction model. After the model has been validated, its integration into the phytosanitary warning service means that it can be disseminated among specialists and producers, and its implementation in a short period of time will be facilitated.

By eliminating the inoculum, we anticipate that some of the proposed strategies will have a significant impact on reducing infections and complement the effectiveness of fungicide treatments. We expect a 40% reduction in the rate of incidence through removal of the leaves. At the same time, this solution should lower the inoculum level to levels low enough that carrying out specific fungicidal treatments to control *Alternaria* is unnecessary. One of the critical aspects in this strategy is that the methodology used to remove the leaves must be as compatible as possible with the machinery available to the producers, so that this measure can be implemented easily.

The combination of the two strategies will reduce the number of fungicide treatments by at least 20%, and will significantly reduce fruit waste. At the same time, the production obtained will be an innovation in the field of productivity and sustainability, will minimise the environmental impact of the production process, and foster respect for the health of producers and consumers.

### Leader of the Operational Group

ORGANISATION: GIRONA FRUITS, SCCL

CONTACT E-MAIL: gironafruits@gironafruits.com

### Coordinator of the Operational Group

ORGANISATION: IRTA

CONTACT E-MAIL: silvia.fernandez@irta.cat; jordi.cabrefiga@irta.cat

### Other members of the Operational Group (grant recipients)

ORGANISATION: GIROPOMA COSTA BRAVA, SL

CONTACT E-MAIL: giropoma@giropoma.com

ORGANISATION: FRUCTICOLA EMPORDÀ, SCCL

CONTACT E-MAIL: emporda@empordasl.com

ORGANISATION: FLORENCI BOSCH

CONTACT E-MAIL: danibosch@florencibosch.com

ORGANISATION: ADV Productors independents de Fruita Dolça de l'Empordà

CONTACT E-MAIL: advindependents@gmail.com

### Subject area(s) of application

- Agricultural production system
- Agricultural practice

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

### Geographical area(s) of application

PROVINCE(S)	REGION(S)
Initially in Girona, but as in the case of <i>Stemphylium</i> , the disease is expected to eventually spread to other fruit-producing areas.	Baix Empordà Alt Empordà Selva Gironès

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

One of the aims of the project is to pass on the results to the sector. To this end, a number of transfer seminars will be held, aimed at specialists and producers in the sector. The communication plan involves actions at various levels, including technical meetings with technical advisers, transfer seminars and participation in specialised conferences.

### Project website

--

### More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2020	Total budget: €117,180.00
Completion date (month-year):	DARP funding: €47,862.90
Current status: Underway	EU funding: €36,107.10
	Own funding: €33,210.00

## With funding from:

---

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014–2020.

*Order ARP/133/2017 of 21 June, 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 ARP/1531/2019, of 28 May, announcing the call for the grant.*



Generalitat de Catalunya  
**Departament d'Agricultura,  
Ramaderia, Pesca i Alimentació**



**Fons Europeu Agrícola  
de Desenvolupament Rural:**  
Europa inverteix en les zones rurals