DROPSA: Strategies to develop innovative and practical approaches to protect major European fruit crops from pests and pathogens

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Introduction

DROPSA is a 4-year project involving 26 partners from Europe, Asia, New Zealand and North America. It will focus on new and emerging threats due to *Drosophila suzukii*, and the bacterial pathogens:

- *Pseudomonas syringae* pv. *actinidiae* (Psa)
- *Xanthomonas fragariae* (Xf)
- *X*. *arboricola* pv. *pruni* (Xap)

These pathogens and *Drosophila suzukii* are a major concern and challenge to the fruit industry because their eradication or containment is not possible. Hence the development of targeted integrated pest management (IPM) is vital to maximize the economic impact on fruit production in the EU region.

Objectives

In DROPSA special emphasize is given on the biology and epidemiology of Xap, in order to:

- identify the principle elements in the life cycle and epidemiology of Xap in stone fruit crops,
- determine mechanisms involved with pathogen virulence and fitness,
- determine host defense responses.

The project will also focus on Xap disease control, i.e.:

- to develop effective and innovative solutions for control of Xap based on biological and epidemiology data,
- to transfer of best practices and adaptation of innovative technologies.

Component objectives are:

- to provide effective control utilizing existing compounds,
- to develop novel antimicrobial compounds,
- to identify novel biological control agents.

Developing innovative formulations

- Innovative formulations, physiological improvement of biocontrol strains and compatibility between lead strains of biocontrol agents and novel compounds to develop bio-compatible mixed formulations, and delivery systems.
- Osmoadaptation and nutritional enhancement methods have been set-up for two *L. plantarum* and one *Bacillus* strain by UdG.

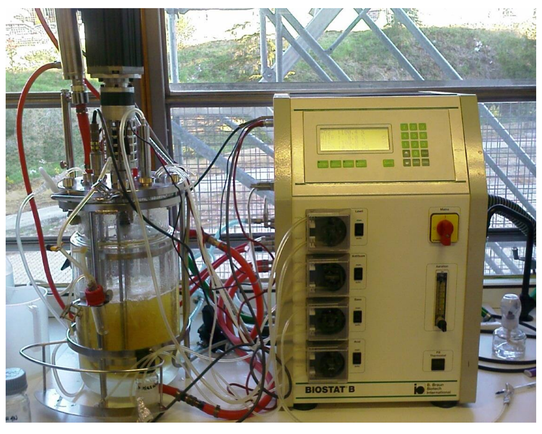

Figure. Production of *Lactobacillus plantarum* TC92 an efficient antagonist of the three plant pathogenic bacteria in the bioreactor for the improvement of formulations at the University of Girona.

Control of bacterial diseases

Screening existing compounds on pathogens

- Antibacterials and resistance inducers have been tested in kiwiplants infected with Psa strawberry plants infected with Xf , and in peach plants infected with Xap. Representative collections of Psa, Xf, and Xap strains were used as targets to verify in vitro the activity of antibacterial, biological and other compounds that are used in plant tests that are under progress. The plant-pathogen platform has been set-up for the assays of Xap and Xf in the quarantine greenhouse.

Novel antimicrobial compounds

- Synthetic antimicrobial peptides have been selected from existing peptide libraries.
- A set of 45 compounds from the libraries of linear, cyclic, cyclic lipopeptides, peptidotriazoles, fengicyn and iturin derivatives have been tested in vitro against two representative strains of the three pathogens Psa, Xap and Xf.
- Several of these products showed promising activity and are strongly active against the three pathogens.

Isolation, identification and testing of novel biological control agents

- The microbiota present in the phyllosphere of host plants has been isolated and screened for inhibition of Psa, Xap and Xf.
- A set of 29 strains of *Bacillus subtilis* and *B. amyloliquefaciens* and of 45 strains of *Lactobacillus plantarum* have been screened for in vitro antagonism against Psa, Xap and Xf.
- Seven strains of *Bacillus amyloliquefaciens* and seven strains of *L. plantarum* showed strong inhibitory activity against representative strains of the three pathogens.
- Interestingly, the two strains TC92 and PM411 of *L. plantarum* that are the object of a patent filed by UdG for fireblight control are active against Psa, Xap and Xf.

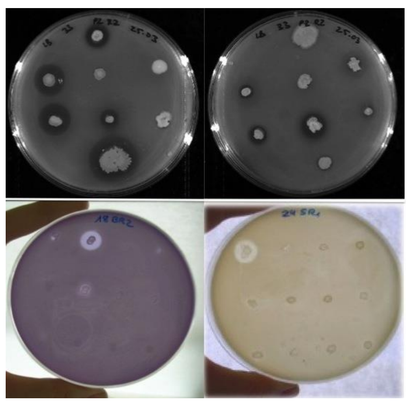

Figure. Inhibition of growth of the plant pathogenic bacteria by a set of strains of *B. amyloliquefaciens* (upper panel) and *L. plantarum* (lower panel).

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