



# Beyond chemical control of late blight:

Implementing IPM strategies with Orange oil in the SAGROPIA project.

**Eric Ferre - Global R&D Biocontrol and Adjuvants**

**Martien Melissant - Business development and Sales NL**

**EUROBLIGHT – May 2024**

Let's grow greener

# Rovensa Next at a glance.

The leading pioneer in sustainable agriculture



**+3,000**

People worldwide



**30**

R&D excellence centres and greenhouses



**+90**

Countries with sales presence



**14**

Production plants



**+80**

Partnerships with research centres & universities

agro  
tecnologia

bio

idainature

MICROQUIMICA

MIP  
AGRO

ogt

ORO AGRI

RODEL  
FLOWERS

SDP

tradecorp  
nutri-performance

# Product characteristics and mechanism of action.

## Active ingredient:

Orange oil – 60g/L (cold pressed)

## Formulation type:

Micro Emulsion (ME)

## Functions:

CONTACT Fungicide - Insecticide / Acaricide

## Non-specific MoA:

Resistance management tool

No residue definition (no MRL fixed)

Short PHI (0-3 days function of crops and countries)

**Product sold under different brands:**  
OROGANIC (NL), PREV-GOLD (FR, DE), OROCIDÉ PLUS (FR), etc.

**Potato late blight registration expected in France and Germany in 2024.**



## Fungicide

**Disrupt cell membranes** (reaction with phospholipids) of the fungi organs (spores, sporangia and mycelium) leading to **desiccation of the exposed organs.**



## Insecticide / Acaricide

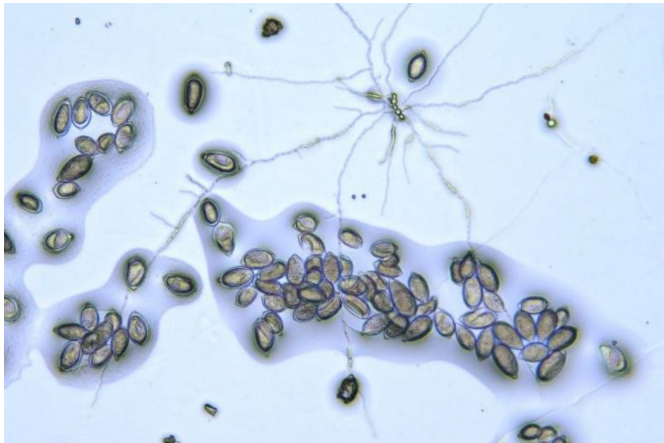
**Damage the cuticle of soft bodied insects** leading to a loss of body fluids and ultimately **death of the insect by desiccation.**

# Focus on the effect on spores.

**In-vitro evaluation Orange oil 60g/L – ME on *Phytophthora infestans* spore germination**  
Wageningen University and Research (The Netherlands, 2019).

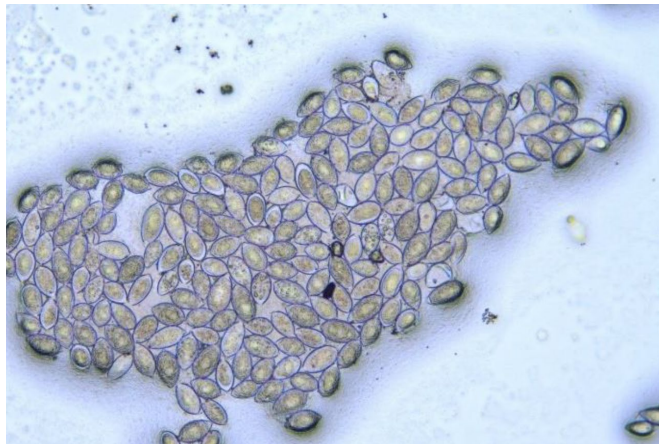
Spray application using a boom sprayer (250 L/ha) over Agar plates with *P. infestans* sporangia.

Pictures below were taken 56 hours after application.



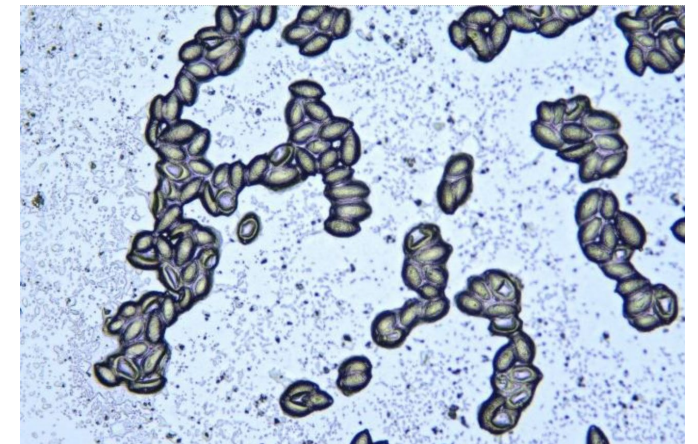
**Control**

Zoospores emission and germination visible.



**Orange oil 60g/L – ME @ 0.4%**

Absence of germination of zoosporangia and zoospores.



**Orange oil 60g/L – ME @ 0.8%**

Absence of germination of zoosporangia and zoospores.

# Optimal application timing.

## Greenhouse trial

### Comparison of pre and post inoculation application positioning

Wageningen University and Research (The Netherlands, 2017).

**Crop:** Potato (Bintje) – potted plants – **Target:** *Phytophthora infestans*

**Design:** RBC – 4 replicates

**Application water volume:** 250 L/ha

**Inoculation:** suspension of 5000 sporangia / mL sprayed over the plants (10mL/plant) followed by 7h of incubation period in high RH.

## Key findings:

- Low efficacy when applied curatively (contact product)
- Preventative positioning equivalent to INFINITO
- Optimum application window: max. 3 days before infection

| Assessment timing     |           |  | 5 days after inoculation |        |                     | 11 days after inoculation |        |                     |
|-----------------------|-----------|--|--------------------------|--------|---------------------|---------------------------|--------|---------------------|
| Treatment             | Dose rate | Application timing                               | % severity on leaves     | SNK 5% | Abbott efficacy (%) | % severity on leaves      | SNK 5% | Abbott efficacy (%) |
| Untreated check       | -         | -  | 38                       | e      | 0                   | 53                        | f      | 0                   |
| INFINITO              | 1.2 L/ha  | <b>PREVENTATIVE</b><br>3 days before inoculation | 1                        | a      | 98                  | 15                        | a      | 72                  |
| Orange oil 60g/L - ME | 0.8%      |  | 3                        | a      | 93                  | 20                        | ab     | 62                  |
| INFINITO              | 1.6 L/ha  | <b>CURATIVE</b><br>6 hours after inoculation     | 6                        | a      | 85                  | 33                        | c      | 38                  |
| Orange oil 60g/L - ME | 0.8%      |  | 21                       | bc     | 43                  | 48                        | def    | 10                  |
| INFINITO              | 1.6 L/ha  | <b>CURATIVE</b><br>24 hours after inoculation    | 6                        | a      | 85                  | 26                        | bc     | 50                  |
| Orange oil 60g/L - ME | 0.8%      |  | 29                       | cd     | 23                  | 51                        | ef     | 2                   |

INFINITO:  
Propamocarb (625 g/L) +  
Fluopicolide (62.5 g/L) - SC

# Standalone field efficacy evaluation.

## Potato late blight - Summary of 30 GEP efficacy trials (2017-2020)

Consecutive applications of standalone solutions every 5 to 10 days across the full crop cycle. Assessment timings selected function of inf. in UTC (% infected foliage area).

### Trial locations:

EPPO Maritime: 12 trials (DE, NL, UK, CZ, FR N)  
 EPPO South-East: 9 trials (HU, RO, BG)  
 EPPO North-East: 7 trials (PL)  
 EPPO Mediterranean: 2 trials (ES, IT)

**Trial design:** RCB – 4 replicates

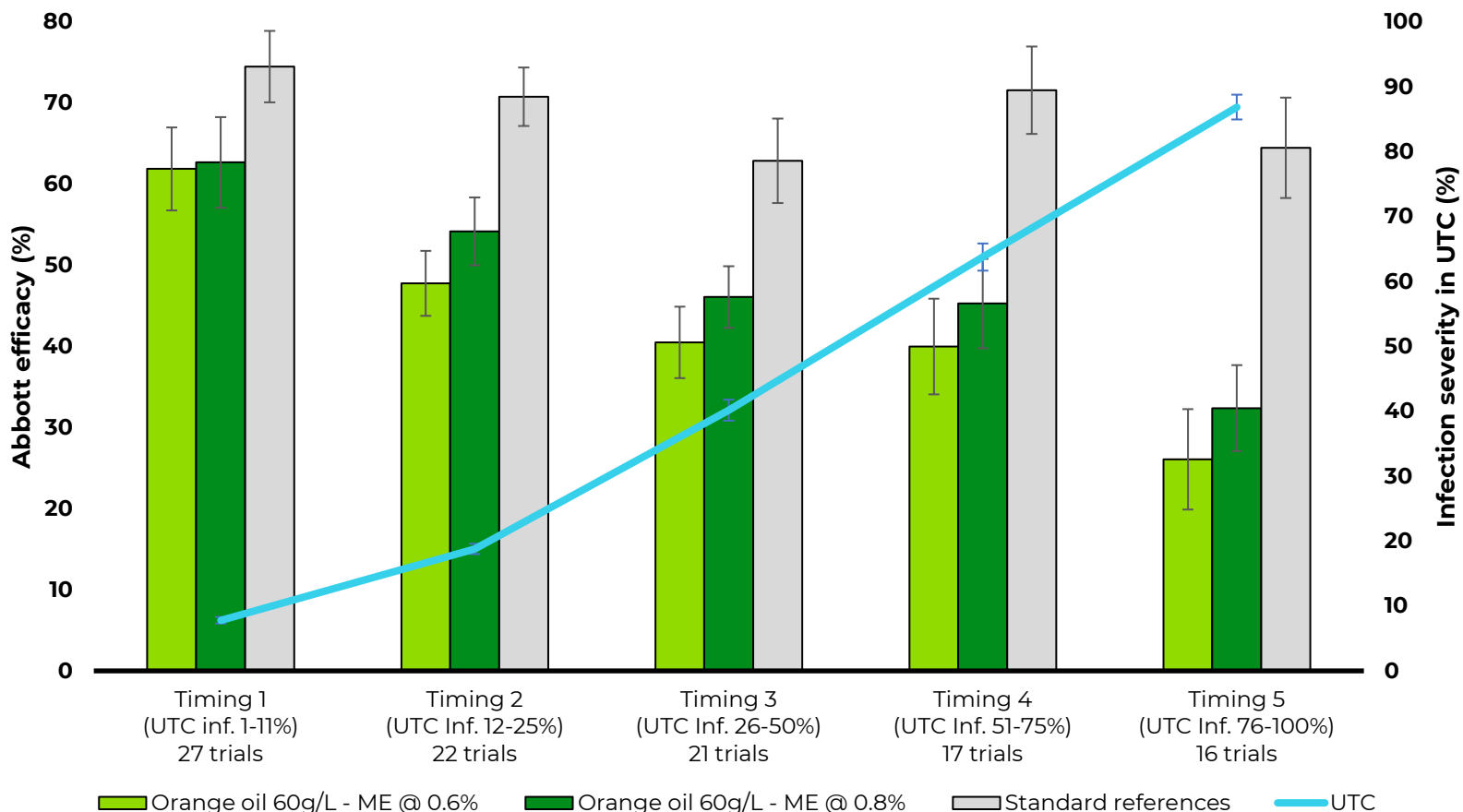
### Application water volumes:

200 – 300L/ha (21 trials)  
 >300 – 400 L/ha (6 trials)  
 >500 L/ha (3 trials)

### Standard references (applied at label rate):

- Copper compounds (9 trials)
- Chlorothalonil (3 trials)
- Cyazofamid (3 trials)
- Cymoxanil + Mancozeb + Copper (3 trials)
- Dimethomorph + Mancozeb (2 trials)
- Mancozeb (2 trials)
- Mandipropamid (2 trials)
- Metiram (2 trials)
- Conventional standard program (2 trials)
- Propamocarb + Fluopicolide (1 trial)
- Difenconazole (1 trial)

### Average efficacy function of infection severity in UTC





# Importance of building strategies.

## Orange Oil 60g/L – ME:

- ✓ **Optimum efficacy when applied preventively** (effects on spores).
- ✓ **Efficacy demonstrated in numerous field trials** (consecutive standalone applications) against potato late blight.
- ✓ **High versatility** (broad efficacy spectrum) and **compatibility** with many bio and conventional solutions (experience from other crops).
- ✓ **Resistance management** tool (non-specific MoA).

**However**, short persistence and absence of **curative effect** trigger the need of **developing strategies** (spraying sequences & tank mixtures) to reach **satisfactory and robust control**.

**Collaborative projects**, like  **Sagropia** involving various **industry and academic partners** are key to develop **sustainable and robust strategies addressing farmer's needs**.

# Sustainable agriculture through novel pesticides using an integrated approach.



## Project partners:

**SAGROPIA** focuses on **potato and sugar-beet**, intending to incorporate **13 biological and low-risk PPPs** (plant & microbial extracts and micro-organisms) into **comprehensive IPM strategies**.

### Objectives:

1. **Confirm the efficacy of SAGROPIA solutions** in replacing chemical pesticides against the target pests.
2. **Supply affordable biopesticides with known mode of action** in market-relevant amounts.
3. **Develop and validate alternative SAGROPIA IPM strategies** adapted to typical pest-disease complexes in key European regions.
4. **Test and exhibit the newly developed IPM strategies in large-scale field trials** under realistic conditions.
5. **Assess the overall sustainability** (environmental, socioeconomic) of alternative IPM strategies.



**For more information please check:**  
[www.rtds-group.com/services/sagropia/](http://www.rtds-group.com/services/sagropia/)  
<https://cordis.europa.eu/project/id/101136677>  
<https://sagropia.eu/>







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