Essential oils against *Phytophthora infestans*: Experimental methodology towards the prevention of potato late blight disease

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20µL of cold spore

suspension at 5*104

sporocysts/mL

UMRt BioEcoAgro 1158 - Gembloux Agro-Bio Tech, ULiège, Belgium - JUNIA, Lille & UPJV, Amiens, France : "Specialized metabolites of plant origin" team

of 3 different varieties

in soil at 20°C under

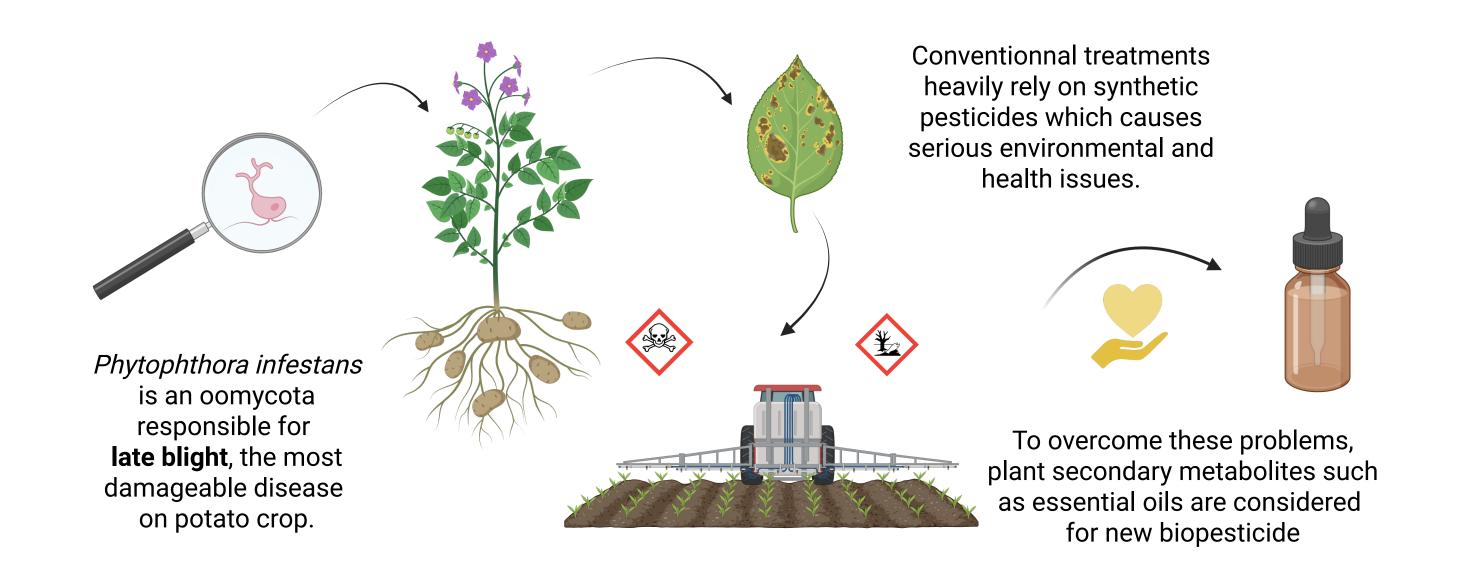
natural sunlight

leaves from

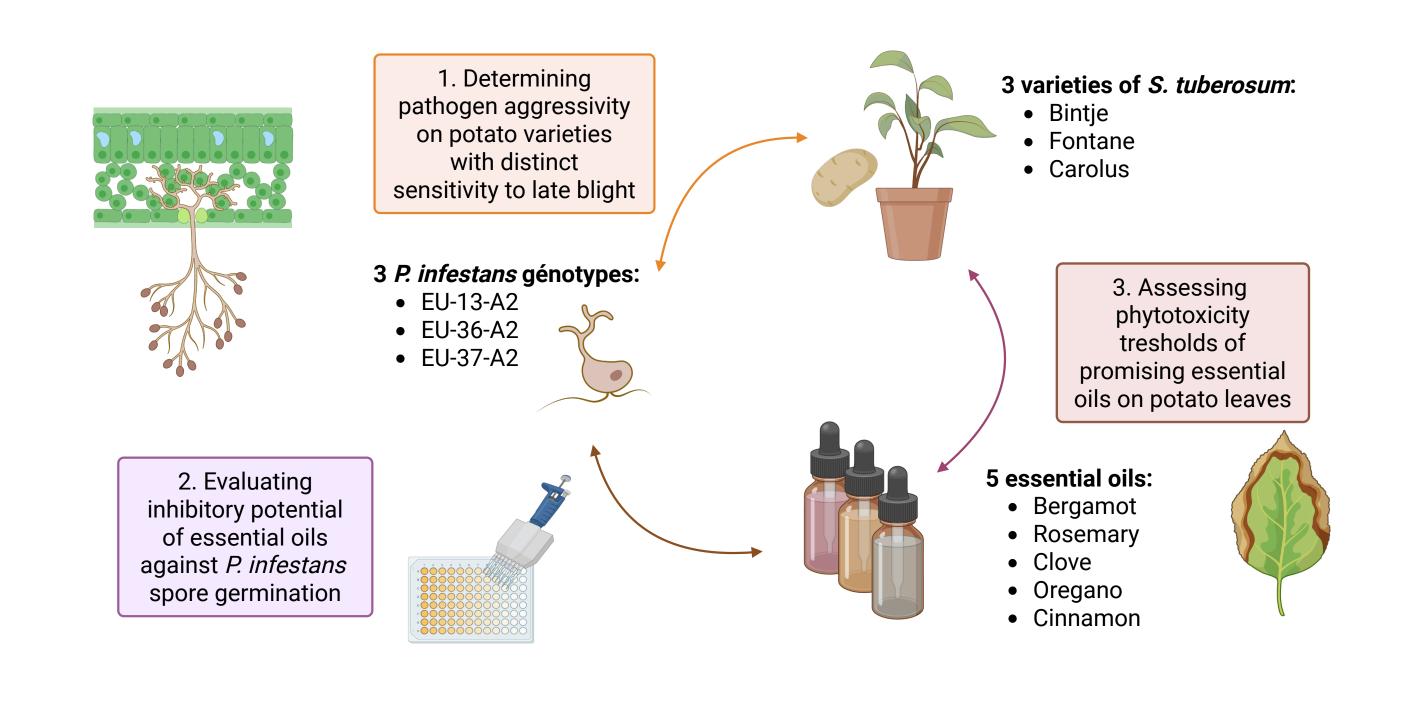
intermediate

foliage stages

INTRODUCTION



EXPERIMENTAL CONTEXT



METHODOLOGY

Determination of *P. infestans* genotypes aggressivity on three potato varieties of different sensitivities to late blight

Potato tubers cultivation

Sampling entire

Successive rinsing in

Incubation in Petri dishes

Inoculation with

filled with agar followed by

quantitative evaluation of late

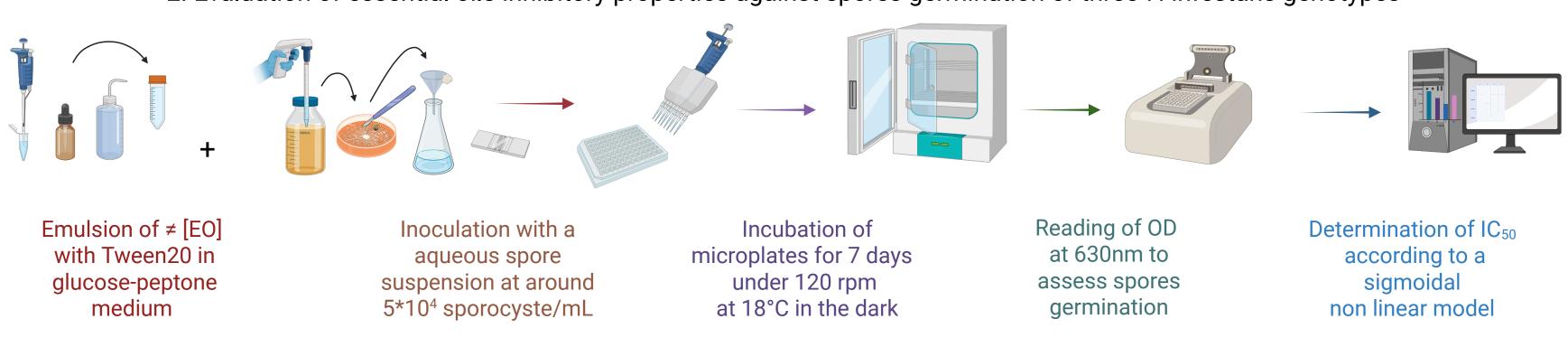
blight symptoms after 7 days

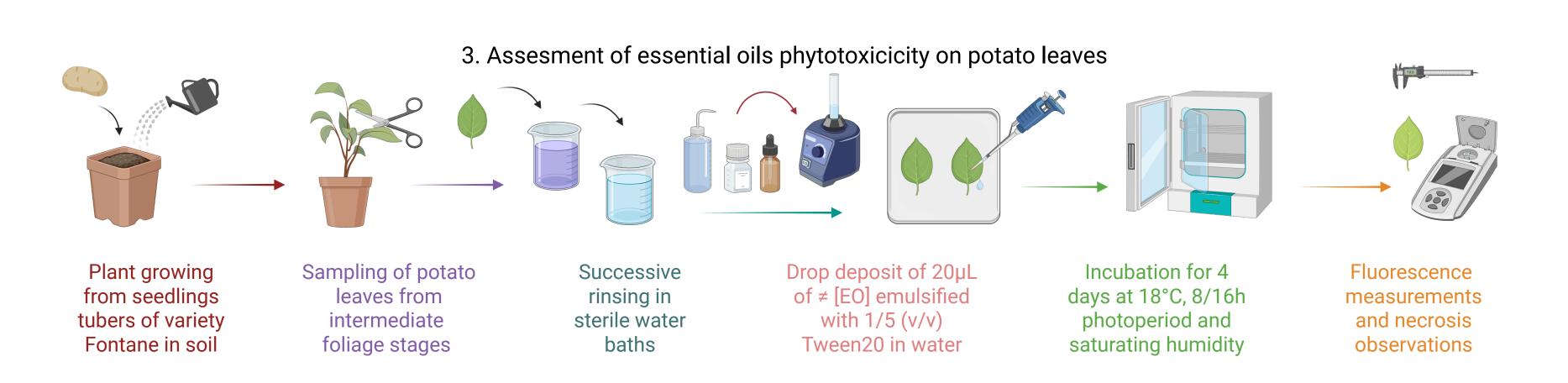
2. Evaluation of essential oils inhibitory properties against spores germination of three *P. infestans* genotypes

0,5% sodium

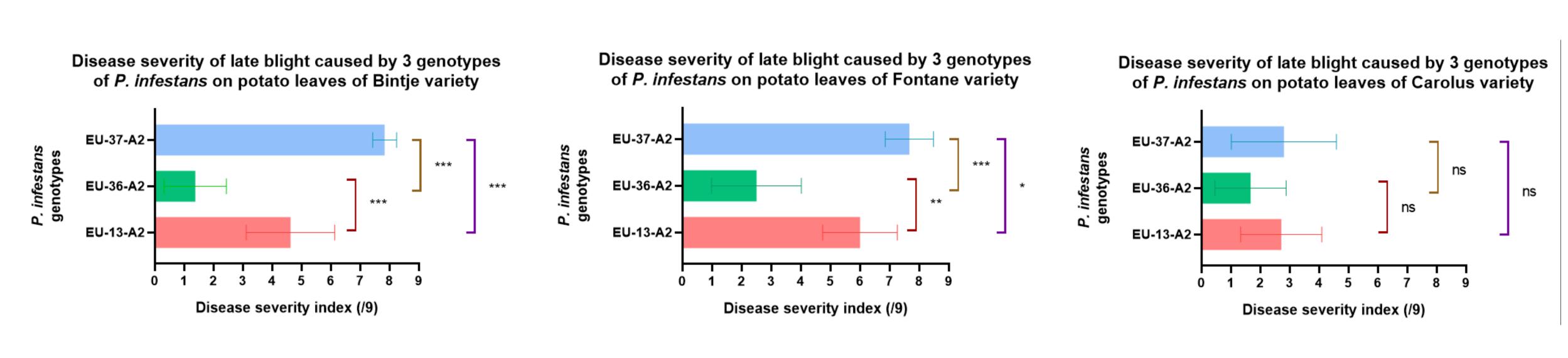
hypochlorite solution

and sterile water





RESULTS



1. Bintje and Fontane are two sensitive varieties while Carolus clearly shows some tolerance to late blight. Genotype EU-37 seems the most aggressive.

Bergamot

9100

9900

4400

IC50

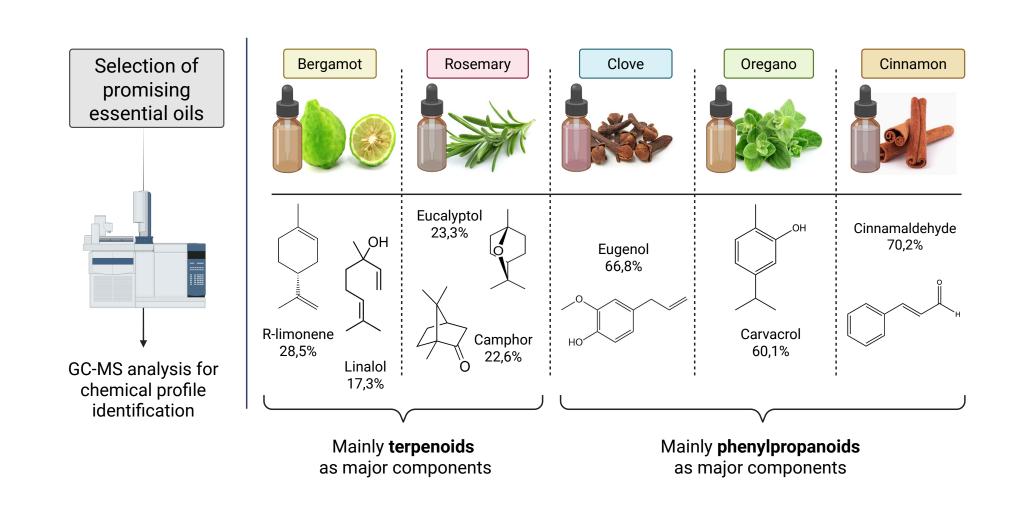
(mg/L) [confidence

range]

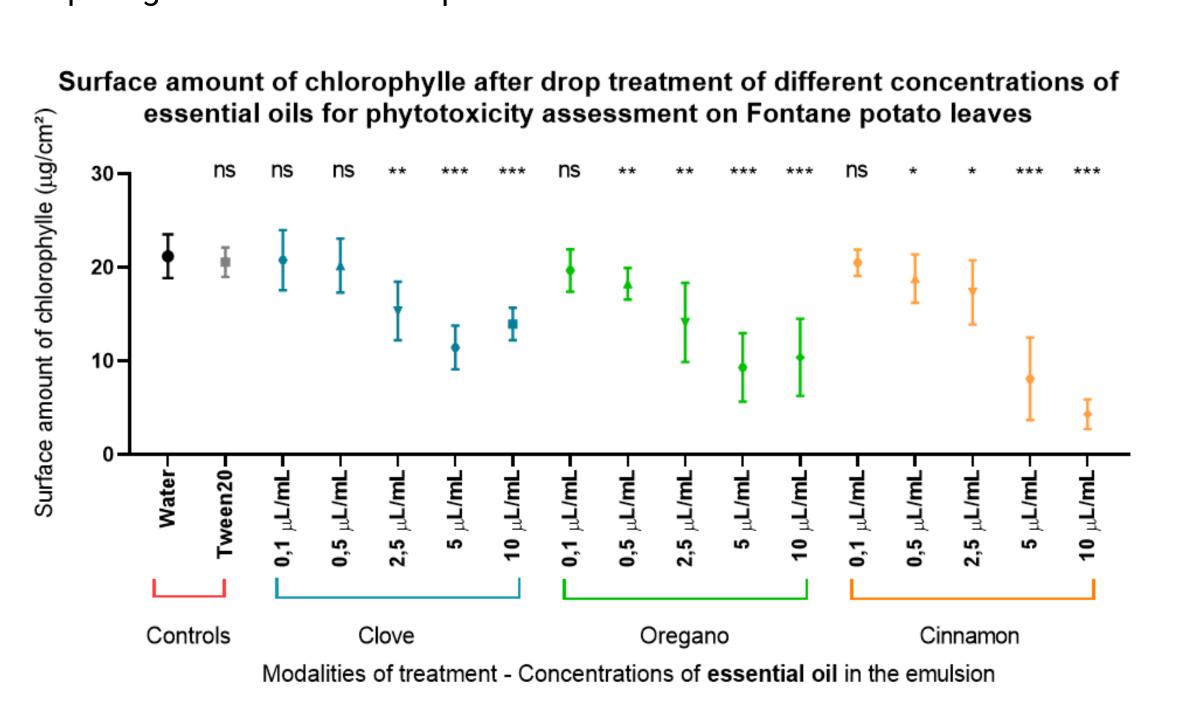
EU-13

EU-36

EU-37



2. All three essential oils with phenylpropanoids as major compounds allowed a much higher inhibitory potential against spore germination than terpenoids-rich essential oils.



3. Phytotoxicity tresholds were assesed only for the three most promising essential oils against *P. infestans* namely clove, oregano and cinnamon, mainly composed of phenylpropanoids. It seems that non-visible signs of phytotoxicicity

appeared on leaves for

all three oils between

0,5 and 2,5 μ L/mL.

Rosemary

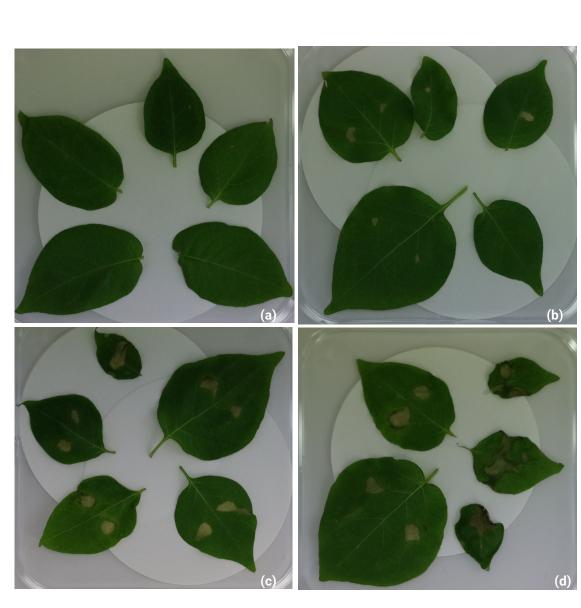
9810

2160

5940

[7500; 13000] [7920; 12060]

[6300; 15300] [1080; 3330]



Oregano

620

[390;870]

270

[180; 360]

360

[180; 540]

Cinnamon

130

[90; 200]

120

[50; 280]

80

[50;130]

Essential oils median inhibitory concentrations on 3 P. infestans genotypes

Clove

500

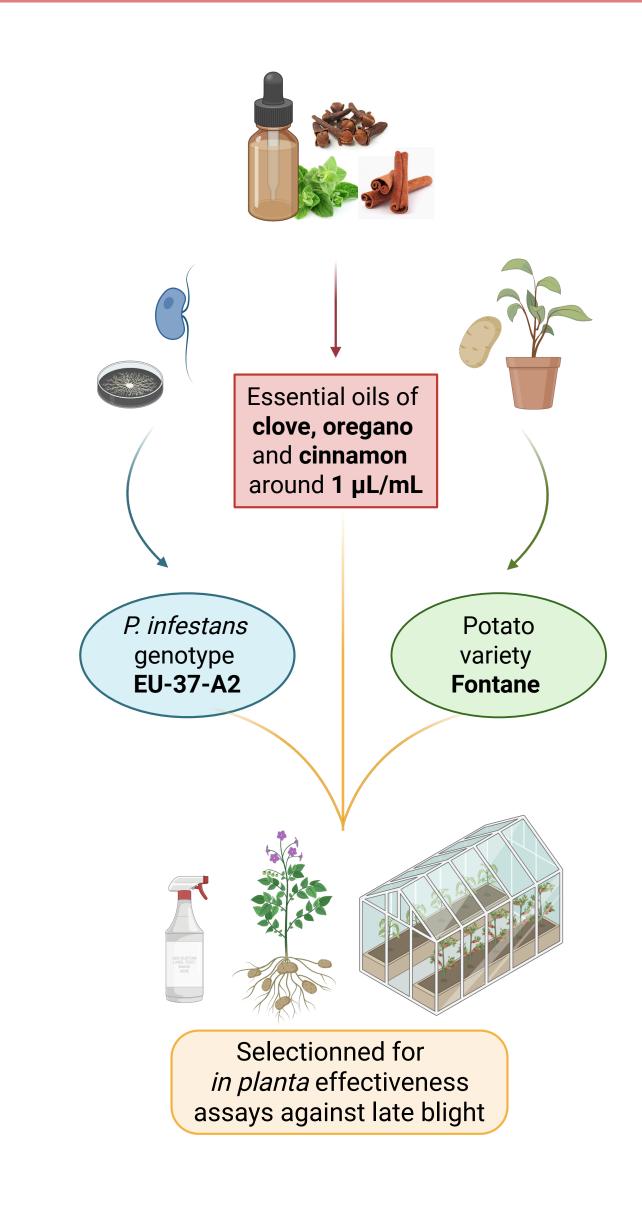
[400;600]

[60; 140]

400

Potato leaves after 4 days with drop treatments of oregano essential oils emulsions at (a) control; (b) 2,5 µL/mL; (c) 5 µL/mL and (d) 10 µL/mL

CONCLUSION



REFERENCES

Deweer, C.; Sahmer, K.; Muchembled, J. Anti-Oomycete Activities from Essential Oils and Their Major Compounds on Phytophthora Infestans. *Environmental Science and Pollution Research*, **2023**.

Martini, F.; Jijakli, M. H.; Gontier, E.; Muchembled, J.; Fauconnier, M.-L. Harnessing Plant's Arsenal: Essential Oils as Promising Tools for Sustainable Management of Potato Late Blight Disease Caused by Phytophthora Infestans—A Comprehensive Review. *Molecules*, **2023**.

Werrie, P.-Y.; Durenne, B.; Delaplace, P.; Fauconnier, M.-L. Phytotoxicity of Essential Oils: Opportunities and Constraints for the Development of Biopesticides. A Review. *Foods,* **2020**,