

TREE-INJECTION: Injection of essential oils as bio pesticides in fruit arboriculture



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Introduction

The rosy apple aphid (*Disaphys plantaginea*) cause large yield decreases in apple orchards through sap sucking and disease spreading. TREE INJECTION aims to propose a bio pesticide alternative technique based on an essential oil (EO) injection in tree vascular system

Biological Model

Dysaphis plantaginea *Malus domestica*



Objectives

- Formulate a biocompatible essential oil emulsion
- Evaluate phytotoxicity on trees
- Design a GC-MS method to detect EO components in leaves, fruits and saps

Materials and methods

1) Experimental design

Passive injection system for 2 years tree with essential oil nano-emulsion



Clip cage for insects colony monitoring

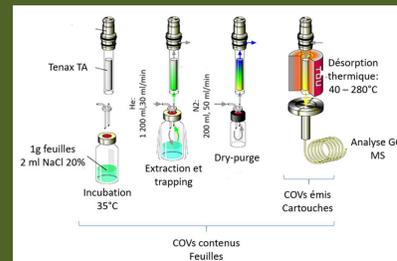


2) Headspace sampling

Volatile Emitted
Thermodesorption tube (TDU-GC-MS)



Volatile Contained
dynamic headspace sampling (DHS-GC-MS)



3) Phytotoxicity

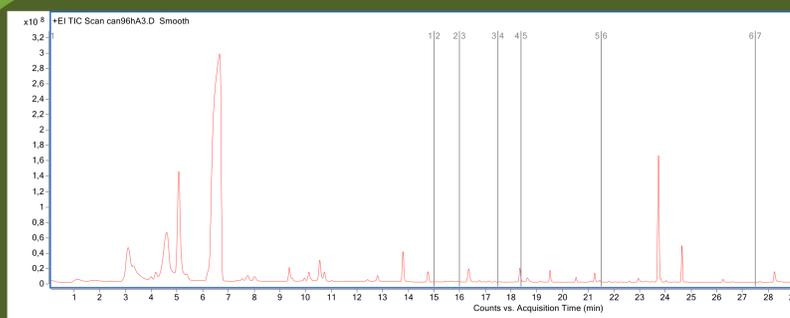
Fluorimeter
quantum efficiency of photosystem II (Fv/Fm)



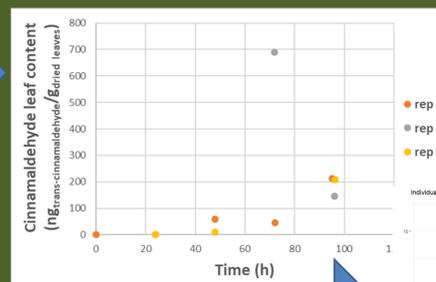
Infra-red gas analyser
photosynthetic rate (A)



Results

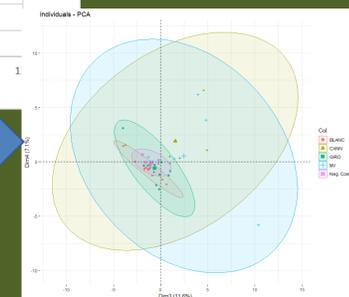


EO Quantification



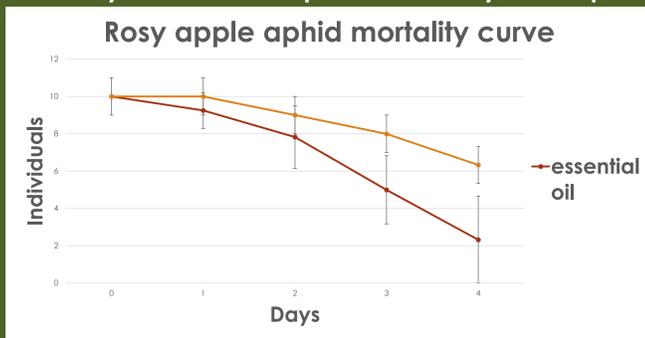
Kinetics of EO in apple leave through time
-> up to 0,2µg/g of trans-cinnamaldehydes

Untargetted Profiles analysis (PCA)



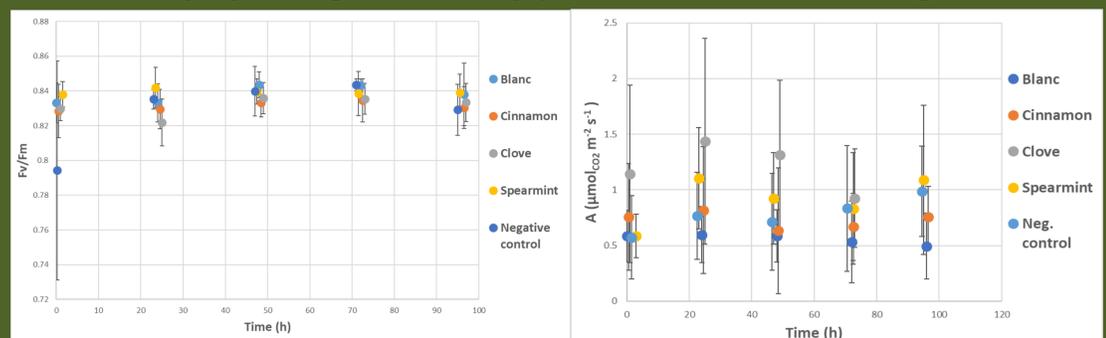
Major contributor
-> VOC affected by treatments
-> Terpenic/stress released VOC
-> indirect impact

Mortality curve of aphid colony in clip cage



-> 80% of mortality after 4 days of treatments

Eco-physiological vitality parameters monitoring



-> No impact on plant photosynthesis apparatus

Conclusion

Stable bio-compatible nano-emulsion
EO diffusion kinetics with DHS-GC-MS
Effects on VOC profiles and physiology

Perspectives

Biological test (insect/orchards)
Impact on plant physiology (ROS production,...)

For further informations

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Acknowledgments

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