DEVELOPMENT OF A BIOPESTICIDE BASED ON ESSENTIAL OILS BY TREE-INJECTION APPLICATION IN FRUIT ORCHARDS

Pierre-Yves Werrie[1], Clément Burgeon[1], Guillaume Jean Le Goff[2], Thierry Hance[2] ,Marie-Laure Fauconnier[1],

[1]*Gembloux Agro-Bio Tech, Laboratory of chemistry of natural molecules (Ulg)*

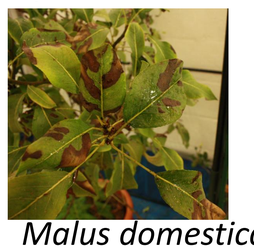
[2]Université catholique de Louvain, Earth and life institute, biodiversity research centre

Introduction

The rosy apple aphid (*Disaphys plantaginea*) and the pear psylla (*Cacopsylla pyri*) are responsible for large yield decreases in both apple and pear orchads through sap sucking and desease spreading. TREE INJECTION aims to propose an alternative technique based on an essential oil formulation that will be injected directly in the tree vascular system.

Cacopsylla pyri

Pyrus communis



Dysaphis plantaginea

Malus domestica

Extended infestations causing heavy economical losses

Objectives :

Select the essential oil with the strongest insecticidal and/or harmful properties (antifeedant, repellent,…)

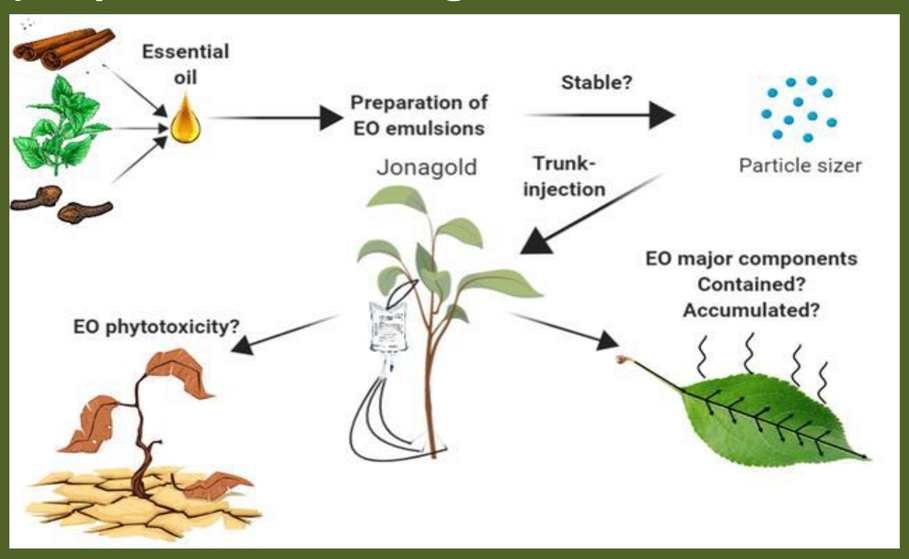
Evaluate the possible phytotoxicity of these essential oils on trees

Designing a GC-MS method to detect EO components within different organs of the tree (leaves, fruits, saps)

Design a cheep and reusable injection system

Materials and methods

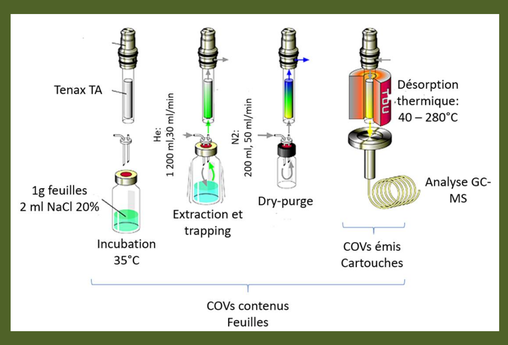
1) Experimental design



2) Headspace sampling

Emissions -> Nalophan bag + TENAX TA -> TDU-GC-MS

Contained -> dynamic headspace sampling -> DHS-GC-MS

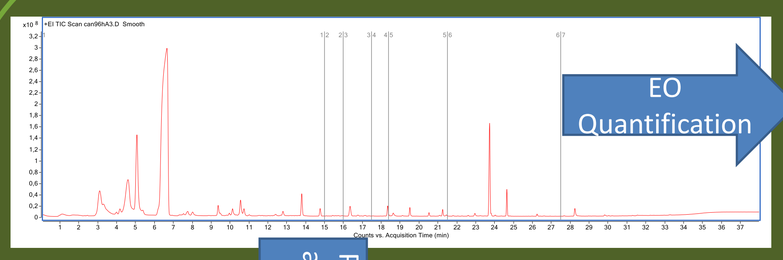


3) Phytotoxicity

Fluorimeter -> maximum quantum efficiency of photosystem II (Fv/Fm)

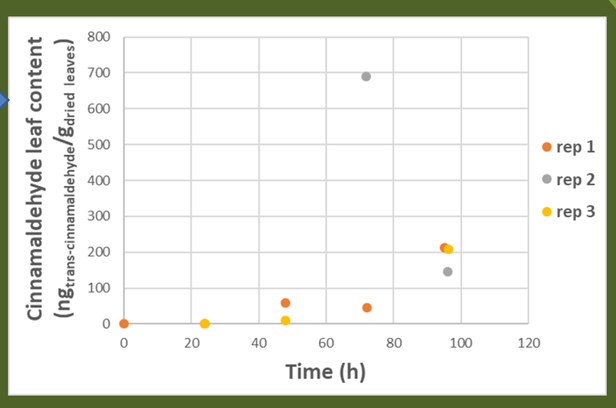
Infra-red gas analyser ->net photosynthetic rate (A)

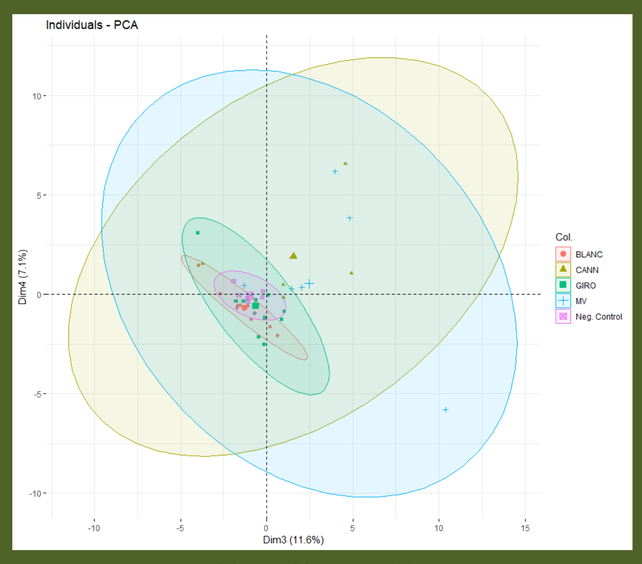
Results



EO Quantification

Profiles analysis (PCA)





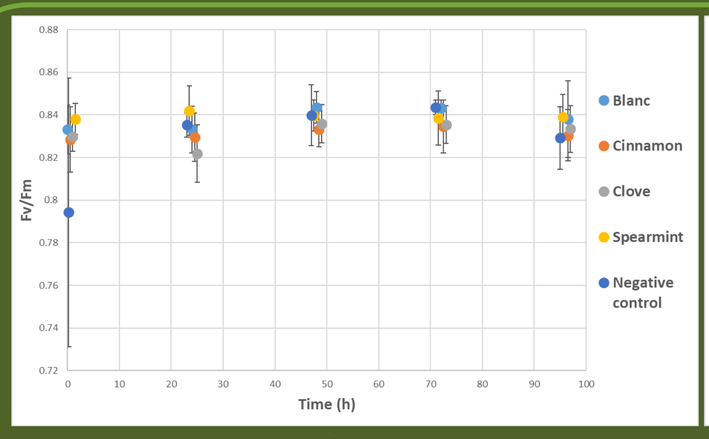
Anova to extract significant component

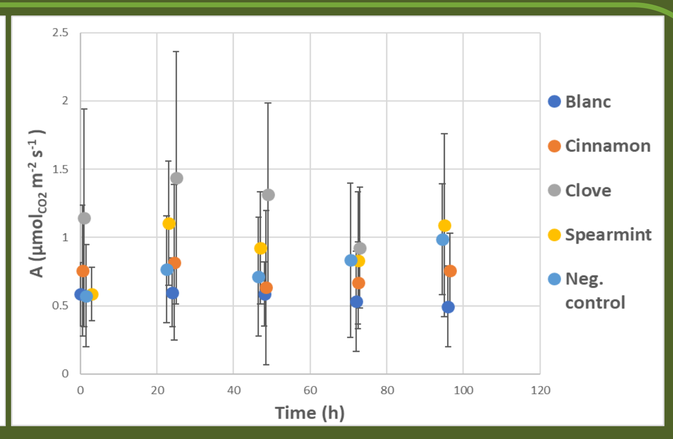
time	componant	P-Value	Cinnamon	Clove	Spearmint	TEMOIN	BLANC
24h	3	0,685	-0,395	-0,656	6,129	1,410	0,000
	4	0,566	0,787	2,319	-2,847	-0,085	0,000
48h	3	0,02862*	1,550	0,307	4,961	-0,550	0,000
	4	0,007344**	0,938	0,556	6,109	0,936	0,000
72h	3	0,03149*	3,994	1,211		0,058	0,000
	4	0,004862**	1,676	-0,493		0,723	0,000
96h	3	0,01819*	5,450	0,167	1,725	0,475	0,000
	4	0,0005894**	7,496	-0,132	1,121	0,748	0,000

Major contributor to component

CP 3	CP 4
Caryophyllene	γ-Muurolene
(3E,7E)-4,8,12-Trimethyltrideca-1,3,7,11-tetraene	δ-Cadinene
Germacrene D	α-muurrolene
Methyl salicylate	Non identif 12
β-Ocimene	Methyl salicylate

VOC profile affected by traitments -> Terpenic and stress released molecules





-> no impact on vitality

Conclusion

Stable and bio-compatible emulsion
kinetics of major EOs constituants (contained and emitted) with GC-MS
Effects on global VOC profiles (priming of defense)

Perspectives

Biological test with insects in control environment
Wider range of essential oils and concentrations
Test in orchards

For further informations

Please contact Pierre-Yves.Werrie@uliege.be

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