

Development of an essential oil-based new tool for pest-management in orchards : research methodology

Introduction

The rosy apple aphid (*Disaphys plantaginea*) and the pear psylla (*Cacopsylla pyri*) are responsible for large yield decreases in both apple and pear orchards through sap sucking and disease spreading. To manage them, farmers use a range of phytosanitary products, that are sometimes very damaging to the environment/health. TREE INJECTION aims to propose an alternative technique based on an essential oil formulation that will be injected directly in the tree vascular system. Essential oils are natural insecticides developed by some plants through evolution, by injecting them directly in the tree, we hope to increase their persistence and avoid negative impact in the environment.

The first objective is to select the essential oil (or the blend) presenting the strongest insecticidal and/or harmful properties (antifeedant, repellent, oviposition deterrent) by rearing insects on artificial diets.

Secondly, the possible phytotoxicity of these essential oils on trees will then be evaluated along with their translocation and impact within the plant. This will be monitored by designing a Gas-chromatography-mass spectrum method to detect essential oil components within different organs of the tree (leaves, fruits) as well as phloem and xylem saps.

Thirdly, the impact of formulation techniques such as micro-emulsion or other encapsulation techniques on the biodisponibility and persistence will be under investigation. Finally, the efficiency of these treatments will be evaluated under laboratory and field conditions.

Objectives

Cacopsylla pyri



Pyrus communis



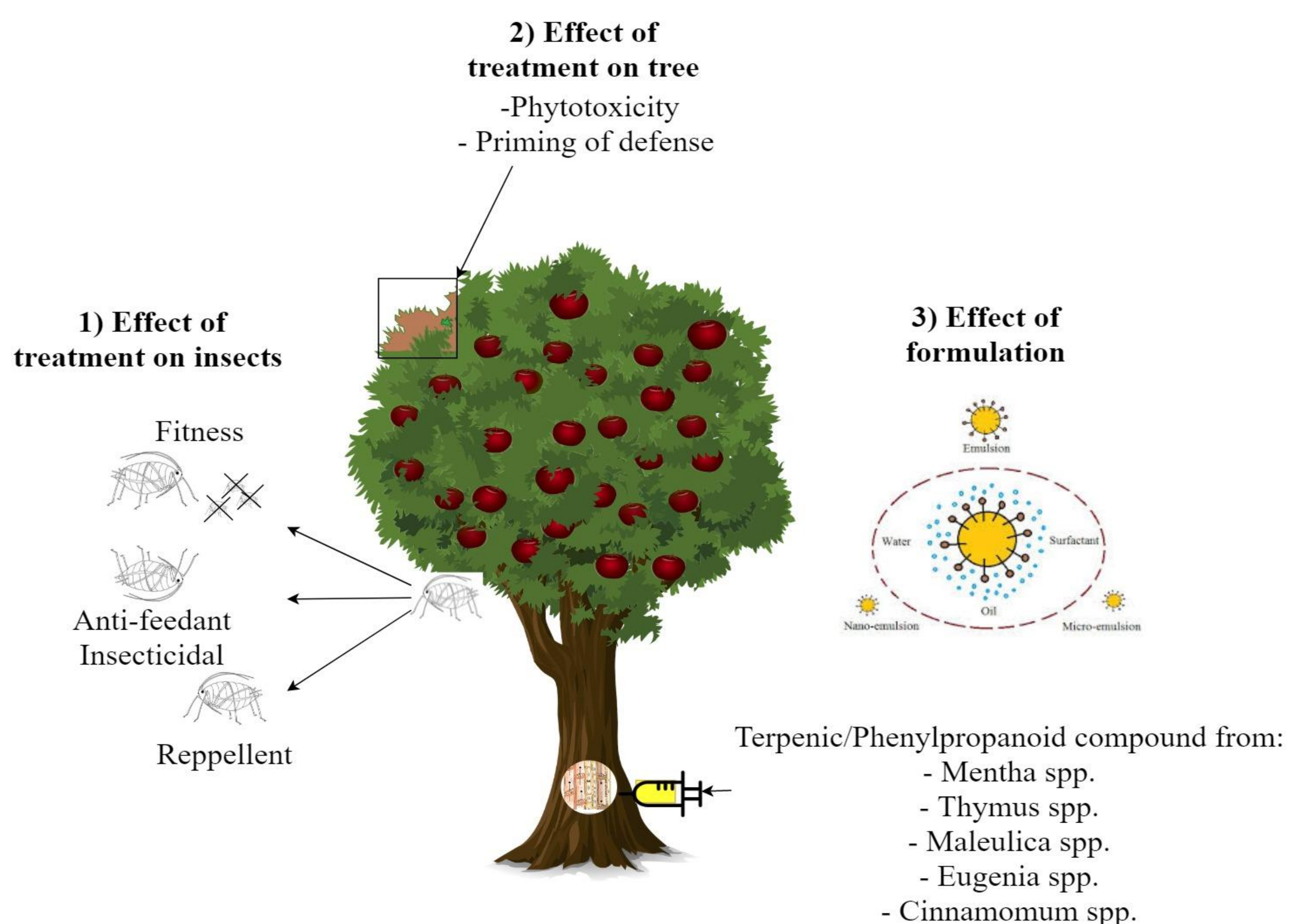
Dysaphis plantaginea



Malus domestica



Extended infestations causing heavy economical losses (Albert,2017)(Civolani ,2012)



Materials and methods

1) Insecticidal properties

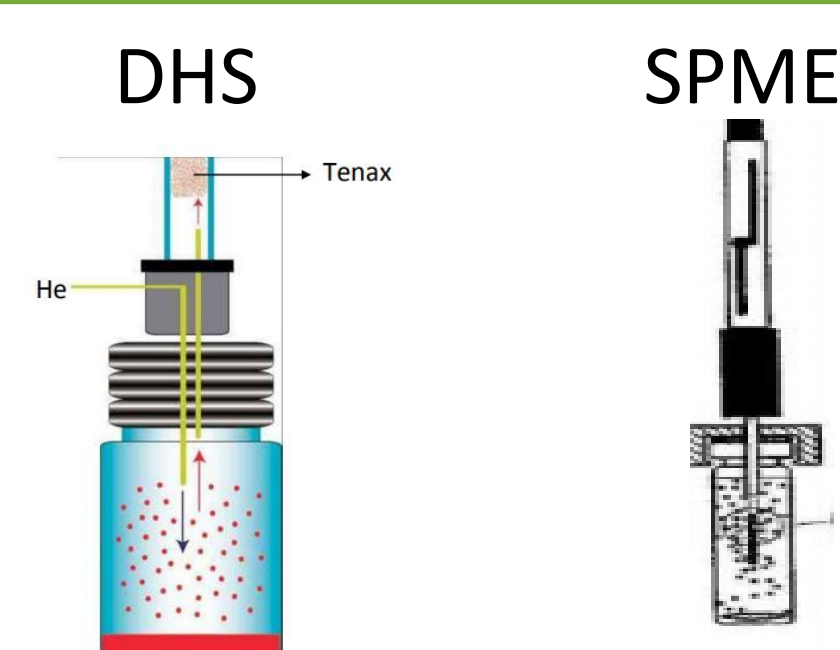
Artificial media (nutritive solution/essential oil/surfactant)
Survival rate/comportemental studies



2) Volatiles organic compounds (VOC) in

Leaf } Solid phase micro-extraction (SPME)
Fruit } Dynamic headspace (DHS)

Sieve: Full evaporation dynamic headspace (FEDHS)



parameters to consider:
incubation time/temperature
Sorbent type

3) Phytotoxicity

Chlorophyll fluorescence
High resolution scan of foliar surface/Growth monitoring
Electrolytic leakage



Conclusion

The project presented here aims to take advantage of the very large body of evidence available in the literature on the insecticidal properties of essential oils to develop an application in fruit arboriculture

Literature

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Civolani, S. (2012). The Past and Present of Pear Protection Against the Pear Psylla, *Cacopsylla pyri* L. In *Insecticides - Pest Engineering*.

For further informations

Please contact Pierre-Yves.Werrie@uliege.be

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