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Metabolomics Approach to Study the Environmental Impact and Residues of Biocontrol Products (BP)

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INTRODUCTION

PALVIP

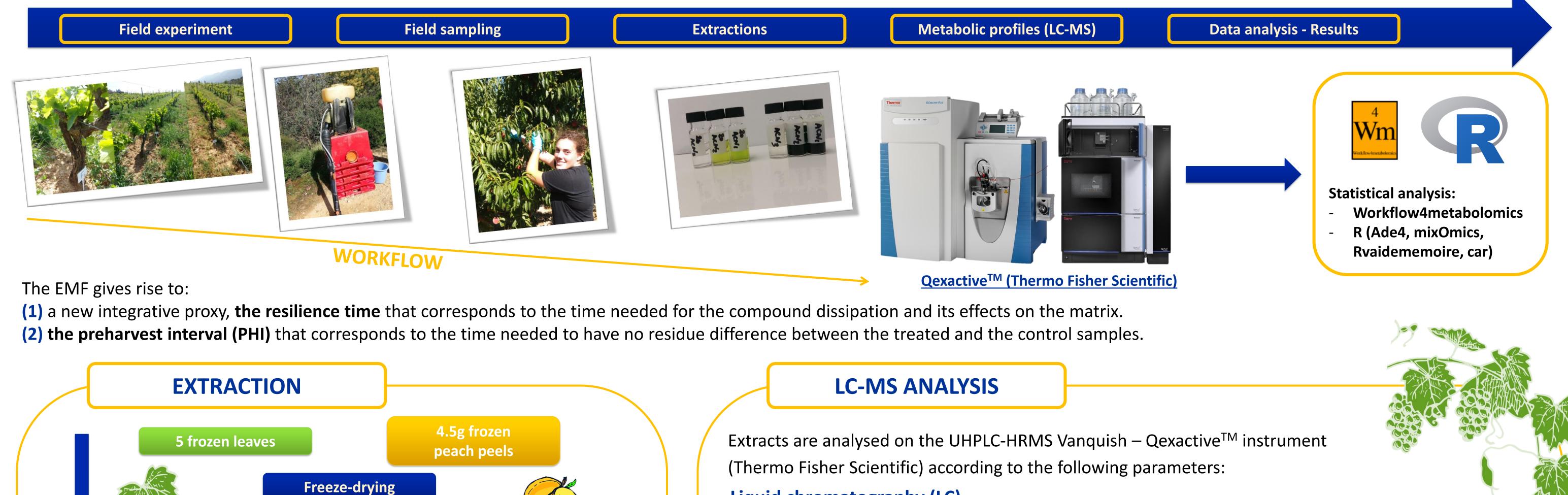
Biopesticides or Biocontrol Products (BP) represents an interesting alternative to conventional pesticides. However, there is a need of technical efficacy studies and ecotoxicological profile references. The PALVIP project (local Mediterranean crops' alternative protection) aims to fill that gap while evaluating new BP developed by small local businesses partners. To reach that goal, the BP selected in the project are studied according to their efficacy through field experimentations, their effect on plants and their environmental impact.

In a first stage the CRIOBE / University of Perpignan Via Domitia will contribute to the part of the project regarding the evaluation of BPs' environmental impact. To date, the half-life, t_{1/2}, was often used to study the fate of pesticides in environmental matrices. However, this value doesn't give any information regarding the formation of by-products and the effect on biodiversity. Consequently,

an innovative approach based on metabolomics (LC-MS), the Environmental Metabolic Footprinting (EMF), was recently developed in the lab.

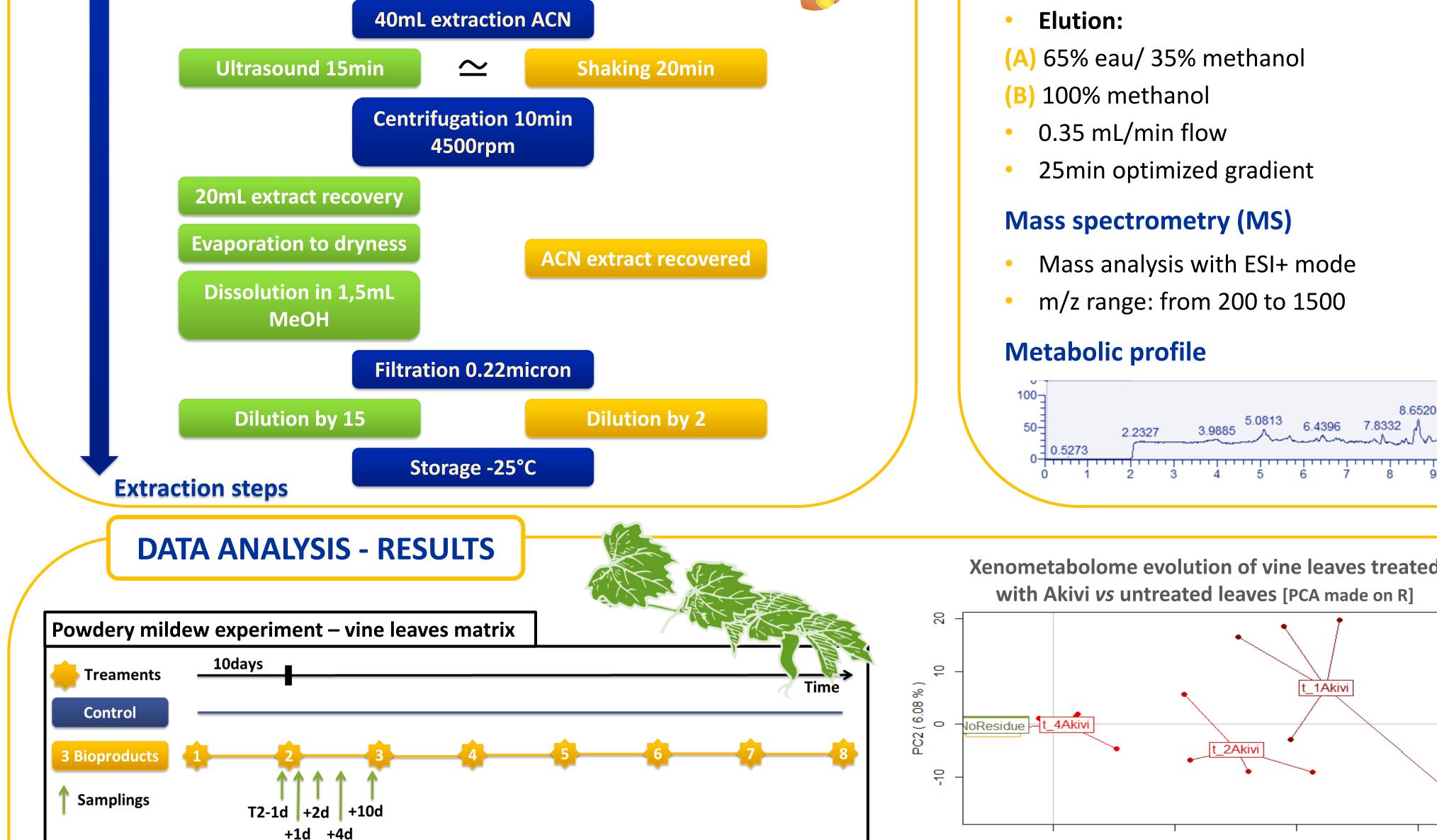
ENVIRONMENTAL METABOLIC FOOTPRINTING (EMF)

Grinding



Liquid chromatography (LC)

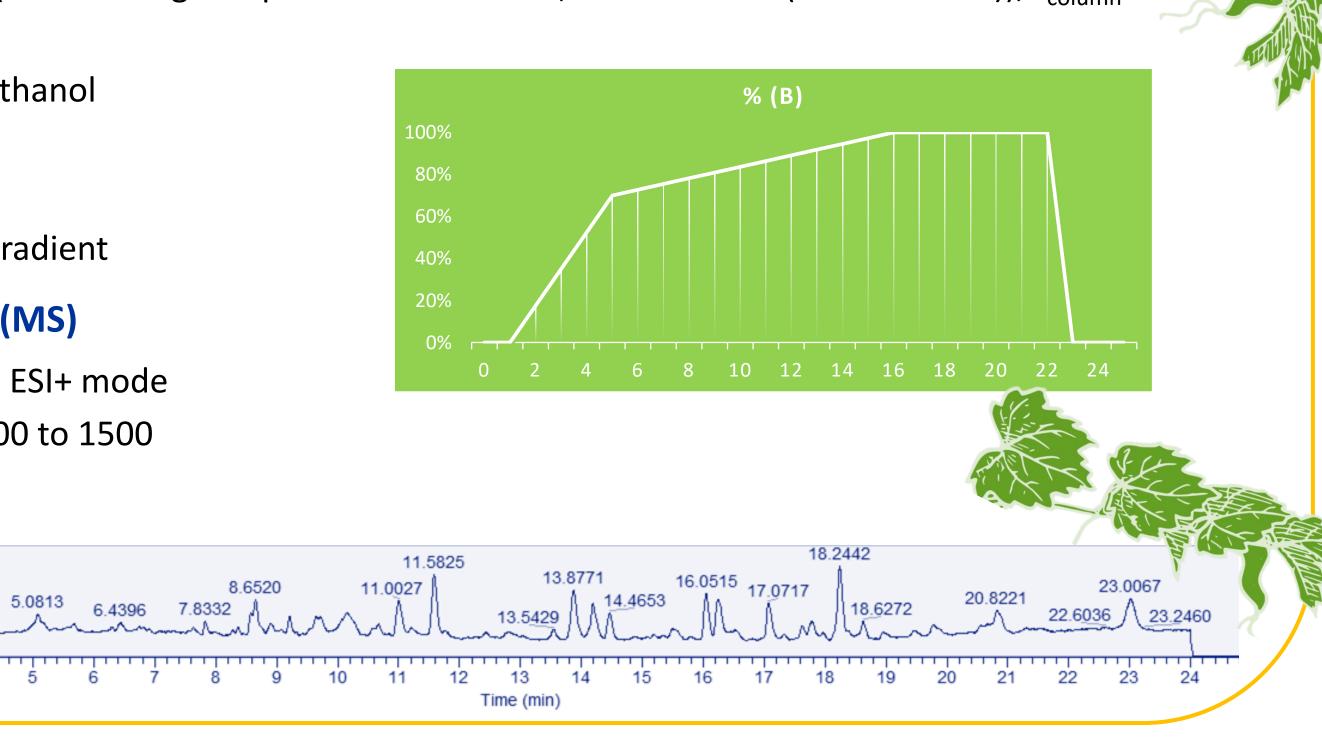
Polar C18 column (Luna[®] Omega 1.6μm Polar C18 100 Å, 100 ×2.1 mm (Phenomenex)), t_{column} = 30°C



T4t0 T4t1

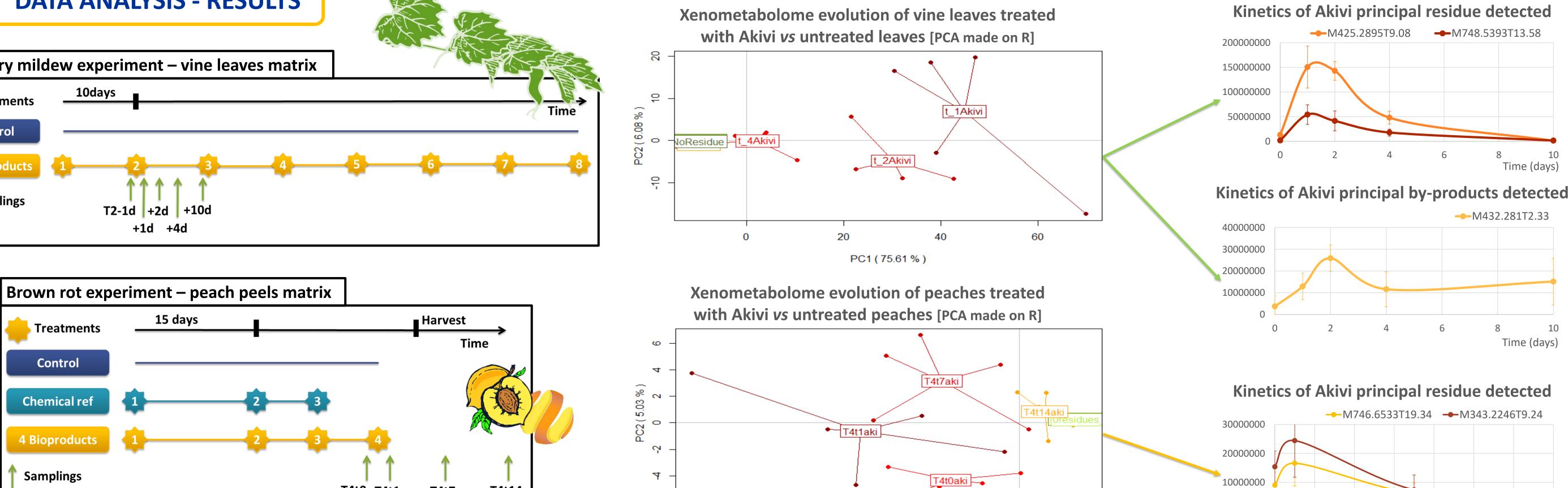
T4t7

T4t14



12

Time (days)



-20

-10

PC1 (80.13%)

CONCLUSION

Control

Samplings

The degradation of Akivi – a fungicide BP – was monitored on vine leaves and on peach peels. The extraction steps were optimised and the extracts were analysed using a UHPLC-HRMS instrument. For now, only the xenometabolome was studied and the preliminary results showed a degradation kinetics for the 2 matrices studied. We still are able to detect xenometabolites into the last time point samples for the 2 kinetics: 10 days for the leave matrix and 14 days for the peach matrix. The effect on the leaves and peaches metabolites (endometabolome) is currently analysed. The same study will be performed for the 2019 field experiment (the project lasts 3 years (from 01/2018 to 12/2020) and sampling are done each year). Also, other matrices will be studied in the project: grape treated against grey mould and soil treated against weed development.

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