

International master's program in agriculture science: IMPLANTEUS

<https://implanteus.univ-avignon.fr/en/>

4 months between late February and early July 2024

TITLE:

State of the art on the specificity of psyllid vectors-phytoplasma-plants interactions: from text to field.

SUBJECT

Phytoplasmas (wall-less bacteria) are the cause of three diseases endemic in Europe on fruit trees of the Rosaceae family: European stone fruit yellows (ESFY); Apple Proliferation (AP); and Pear Decline (PD). These diseases are induced respectively by '*Candidatus Phytoplasma prunorum*' (CaPprunorum), '*Candidatus Phytoplasma mali*' (CaPmali), and '*Candidatus Phytoplasma pyri*' (CaPpyri). These three pathogens can be transmitted to plants by grafting or by insect vectors, mainly psyllids of the genus *Cacopsylla*.

At first glance, the interactions between the three partners, insects, pathogens, and plants, appear to be highly specific. For example, each host plant group (*Prunus*, apple, pear) is associated with a bacterial species (e.g. *Prunus* => CaPprunorum) vectored by a particular group of psyllids (e.g. only psyllid species native to pear seem capable of transmitting CaPpyri). However, data reported in the literature sometimes contradicts this idea (e.g. authors claim that a leafhopper [\neq psyllid] would be a CaPmali vector), or at the very least, studies show that closely related psyllid species (e.g. species on pear) are not all phytoplasma vectors.

This information raises questions on the dissemination specificity, such as (i) whether the conclusions of certain past studies are erroneous, e.g. in view of the techniques available today, but have not been called into question; (ii) whether the published information currently available is incomplete; etc.

The aim of the internship will be to answer these questions by means of a three-stage approach:

- (i) as comprehensive a review as possible of the literature on insects described as vectors (or potential vectors) of fruit tree phytoplasmas (including as sources, textual data extracted from various databases: Web of Science, Google Scholar, EPPO, CABI, Psyllidlist, etc.);
- (ii) detailed analysis of the results and conclusions of each source to study how knowledge has been built up (e.g. factual and substantiated results *versus* highly speculative conclusion) and then propagated (e.g. restatement of the facts in a neutral manner *versus* (re)interpretation of the facts/conclusion of a study);
- (iii) comparison of knowledge acquired from texts with his own expertise acquired through field observations (i.e. psyllid sampling followed by morphological identification in the laboratory).

The intern will be supervised by an entomologist specializing in plant-insect interactions, who has been working on psyllids for over 20 years. The internship will complement an M2 internship aimed at analyzing the biodiversity of psyllid vectors of phytoplasmas in France. To this end, field surveys are planned for spring 2024, in which the M1 trainee will be able to take part in order to familiarize himself with this group of insects and better understand the challenges facing the Fruit Sector associated with this vector transmission problem. This M1 internship also complements work done in the BEYOND project¹ with a team specialized in Text Mining approaches², to automatically extract and structure textual information on insect-borne disease transmission.

¹ <https://beyond.paca.hub.inrae.fr/>

² <https://maiage.inrae.fr/en/bibliome>

PEDAGOGICAL RESOURCES:

Access to various databases and work in collaboration with a M2 student specialized in ecology. Internship in a research unit with more than 30 students (M1, M2, PhD).

LOCATION

PHIM (Plant Health Institute of Montpellier): <https://umr-phim.cirad.fr/en>

TEAM FORISK: <https://umr-phim.cirad.fr/en/recherche/comprendre-les-epidemies-dans-les-champs-prism/equipe-forisk>

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