



CIFRE PhD POSITION

PhD thesis summary

The aim of this PhD project is to identify natural plant resistance by assessing the intrinsic ability of rose varieties to resist or sustain low level of thrips infestation. The interactions between roses and thrips are poorly documented. However, some plant traits, including flower colour and morphology, plant shape, and volatile organic compounds (VOCs), are known to influence thrips attraction or repellence. Some studies have also highlighted variability in the responses of rose varieties to thrips. This PhD project therefore aims to characterise rose-thrips interactions in terms of resistance/susceptibility and repellence/attractiveness.

To achieve this objective, the PhD candidate will follow the following methodology: (i) phenotypic characterisation of a large rose collection to assess thrips attraction and repellence; (ii) investigation of the genetic bases of this interaction using a genome-wide association study (GWAS); and (iii) analysis of the floral bud volatilome and metabolome during the interaction.

Keywords: rose, thrips, plant-pest interaction, genetics, metabolomics, volatile organic compounds

CIFRE PhD project within the PARSADA programme

This PhD project will be carried out under a CIFRE agreement (Industrial Convention for Training through Research). It will be jointly supported by ASTREDHOR, the technical institute specialising in horticulture, floristry and landscaping, and the GDO team (Genetics and Diversity of Ornamental plants) within the IRHS research unit (Institute of Research in Horticulture and Seeds).

The PhD project is part of the PARSADA Trans'Thrips programme (2025-2030) and will be conducted in collaboration with ASTREDHOR Méditerranée, the GDO team of the IRHS, the BVpam unit (Plant Biotechnology Applied to Aromatic and Medicinal Plants) at the University of Saint-Étienne, the SONAS laboratory (Natural Substances and Structural Analogues) at the University of Angers, and rose breeders and growers, Meilland International and Roses and Delbard Nurseries.

Project description

The Ecophyto 2030 strategy reaffirms the objective of reducing the use of pesticides by 50%, as well as the risks associated with their use, by 2030, relative to the 2011–2013 three-year average. Many crops are currently affected by thrips, several exotic species of which have become established in protected-cropping systems, which are the most severely affected by these pests. Thrips comprise numerous genera (Mound, 2002), including several species that are pests of horticultural crops. One of the main pest species, *Frankliniella occidentalis*, is an invasive species that was first observed in the United States in the 1970s and 1980s. The expansion of international trade has facilitated its spread throughout Europe, and subsequently to Africa, Asia and Australia in the 2000s (He et al., 2020).

In certain crops, such as roses, the world's leading ornamental crop, thrips spend a substantial part of their life cycle inside unopened flower buds. This behaviour makes them inaccessible to control measures, resulting in damage that only becomes visible when the flowers open.

One potential strategy for managing this pest is to target the rose–thrips interaction. While little data exists on this interaction, flower colour and shape, plant architecture, and volatile compounds are known to act as attractive or repellent signals for thrips in plants (Cao et al., 2019; Ren et al., 2020). The aim of this PhD project is to identify sources of natural resistance. The objective is to determine the genetic and biochemical bases of rose resistance to thrips. The findings will help to identify traits and mechanisms that can be exploited in rose breeding programmes.

The PhD candidate will address the following research questions:

- What are the genetic determinants of variation in thrips resistance among rose varieties?
- How does variation in the specialised metabolite profiles of flower buds contribute to thrips resistance in roses, and what are the genetic determinants of this variation?

To address these questions, the PhD candidate will undertake the following activities:

1. phenotypic characterisation of a collection of 200 rose varieties at three sites to assess thrips attraction and repellence;
2. investigation of the genetic basis of rose resistance to thrips using a genome-wide association study (GWAS);
3. characterisation of the biochemical mechanisms underlying resistance, repellence and reduced attractiveness to thrips through the analysis of flower bud's metabolome and volatilome.

Location and working conditions

The PhD candidate will conduct most of their research in Angers with the GDO team at the IRHS unit. Frequent travel to project partners' sites will be required, particularly to ASTREDHOR Méditerranée, for phenotyping and sample collection.

Start date: 1th April 2027

Salary: €30,000 gross per year, plus benefits in accordance with the company's collective agreement.

Candidate profile

The candidate should have a strong background in plant genetics, particularly quantitative genetics, and biochemistry. Knowledge of plant-pest interactions would be advantageous. The project will involve substantial phenotyping work with the various partners. The ability to manage and analyse the different datasets (phenotypic, genotypic, metabolomic and volatilomic data) with a high degree of rigour and organisational skills will be essential.

Application procedure

Application deadline: 13 November 2026

Required documents:

- curriculum vitae (CV)
- cover letter
- two references from academic or scientific referees

Complete applications should be sent to Fabrice Foucher, PhD supervisor (fabrice.foucher@inrae.fr), and to Vanessa Soufflet-Freslon (vanessa.soufflet-freslon@institut-agro.fr) and Laurent Ronco (laurent.ronco@astredhor.fr), co-supervisors of the PhD project.

Bibliography

- Cao, Y. et al. (2019). Population development of *Frankliniella occidentalis* and *Thrips hawaiiensis* in constant and fluctuating temperatures. Journal of Applied Entomology 143, 49-57, doi:10.1111/jen.12571
- He, Z., Guo, J.-F., Reitz, S.R., Lei, Z.-R. and Wu, S.-Y. (2020). A global invasion by the thrips, *Frankliniella occidentalis*: Current virus vector status and its management. Insect Science, 27: 626-645
- Mound, L., Mound, L.A. (2002). *Thysanoptera* biodiversity in the Neotropics. Revista de biología tropical. 50. 477-84
- Ren, X. et al. (2020). Behavioral Responses of Western Flower Thrips (*Frankliniella occidentalis*) to Visual and Olfactory Cues at Short Distances. Insects 11, 177