Effects of nectar supply of flowering plants on hoverfly and parasitoid communities and pest regulation in apple orchards

Context

Hoverflies and parasitoid wasps are two key groups of natural enemies in apple orchards. Their larvae develop on several pests, such as the rosy apple aphid (*Cydia pomonella*) and the codling moth (*Dysaphis plantaginea*). Thus, they are efficient contributors to the biological control service (Albert et al., 2015; Maalouly et al., 2016)

In contrast, adults consume floral resources. Nectar consumption positively impacts their longevity and fecundity (Araj et al., 2006; He et al., 2021; Pinheiro et al., 2013). Flowers are therefore essential to maintain hoverflies and parasitoids in orchards and to improve pest regulation.

Nevertheless, the role of flowering plants in enhancing biological control is still difficult to demonstrate. Several elements, such as flowering period, morphology, or flower color can explain plants attractiveness for beneficial insects (Wäckers & van Rijn, 2012). Another trait, more rarely considered, is the amount of nectar provided by the flowers. Both quantity and quality of nectar - but also pollen - varies among plant species, which could condition the abundance of flower insect visitors (Fowler et al., 2016; Vattala et al., 2006). However, the importance of this trait in the selection process of flowers visited by hoverflies and parasitoids is still poorly understood.

In this study, we hypothesize that plants offering accessible and abundant nectar are more attractive for hoverflies and parasitoids, which improves pest regulation.

Goal & missions

The internship's objective is to evaluate the quantity of nectar provided by several flowering plants, their attractiveness to hoverflies and parasitoids, and their impact on biological control.
The intern will contribute to field surveys (nectar sampling, natural enemies and pest monitoring) and laboratory analyses (sugar measurements, sorting of collected samples). The intern will be in charge of data entry and will ensure their quality. Finally, the intern will participate in data processing to relate the amount of nectar offered, the abundance and diversity of beneficial insects, and the density of pests.

Skills required

- Training in agronomy or ecology;
- Interest in fieldwork and attention to detail;
- Ability to apply a protocol rigorously;
- Knowledge in entomology and statistical analysis would be a plus.

Practical information

Dates: March to August 2022
Laboratory: UR 115 - Plantes et Systèmes de culture Horticoles (PSH), INRAE, Avignon
Internship allowance: about 570€/month
Contact: Pierre Franck (pierre.franck@inrae.fr) and Ludivine Laffon (ludivine.laffon@inrae.fr)
To apply, please send a CV and a cover letter.

References

Albert, L., Franck, P., Gilles, Y., & Plantegenest, M. (2017). Impact of Agroecological Infrastructures on the Dynamics of Dysaphis plantaginea (Hemiptera: Aphididae) and Its Natural Enemies in Apple Orchards in Northwestern France. *Environmental Entomology*, *46*(3), 528-537. https://doi.org/10.1093/ee/nvx054

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