M2 student internship in 2021

Impact of landscape structure and weather conditions on pests in vineyards and apple orchards


Background:

The management of pest populations in vineyards and apple orchards is currently highly dependent on phytosanitary products. The environmental factors that determine the levels of pest infestations in crops and the use of plant protection products are still not well known. Landscape structure, both in terms of composition and configuration, can have a large impact on the population dynamics of pests and their natural enemies. For example, the proportion of host crops in the landscape may favour the development of pests by providing them with abundant amounts of resources. Conversely, maintaining semi-natural habitats in the landscape around crops can lead to an increase in the abundance and diversity of the pest natural enemies and thus a better regulation of pests.

However, results about the impact of landscape scale semi-natural elements on pests and biological control are equivocal. One of the reasons for this variability is that the temporal dynamics of the landscape can influence biological control but is only rarely studied. Pests will also be impacted differently by weather conditions according to their ecological traits. Further, climatic factors may have an impact on the phenology of pests, but also on the plants affecting pests. In addition, climatic factors would also have an impact on natural enemies and thus on the regulation of pests. Some studies have shown the importance of taking into account the joint effects of landscape and weather on pests. However, these combined effects have been little studied on apple trees and vines.

Objective:

The aim of this M2 internship is to analyse the impact of the variation of meteorological factors and landscape structure on the infestation levels of the main pests of apple orchards and vineyards. Initially, a literature review on the effect of meteorological factors on pests, of the landscape on pests and their combined effect will be necessary to select variables of interest. Following this, data processing and analysis will be carried out. Multi-annual national databases on climate, landscape and major pests of these crops are available for this purpose. Possible statistical analyses are of multivariate type (PCA, AFC) to account for correlation among the meteorological variables and/or based on linear models (glmm) to explain the pest abundances. They will be carried out both on each pest independently and on the pest assemblage.

This internship will contribute to analyse the effects of the climatic variables of interest on the abundance of pests and to understand to what extent they are good predictors of this abundance. This study is part of Lucas Etienne's PhD project: "Analysis of the impact of the landscape structure on pests and the use of pesticides in apple orchards and vineyards".

Necessary skills: knowledge of the R statistical software and taste for data processing and statistical analysis. Knowledge of QGIS would be a plus. Autonomy, organization, communication and good knowledge of the English language (reading and synthesis).

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