

How do spatio-temporal heterogeneity of agricultural landscapes and the structure of trophic networks interact to determine the efficiency of biological control?

Several policies encourage the protection of existing hedgerows or the planting of new hedgerows for the conservation of biodiversity in agricultural landscapes. In particular, hedgerows and other semi-natural elements in agricultural landscapes provide less perturbed habitats for arthropod species, some of which include predators of crop pests. Hence, complex agricultural landscapes, such as those with a high proportion of semi-natural habitats, are generally associated with a lower intensity of pests. However, an increased complexity of spatial heterogeneity in agricultural landscapes can also modify interactions in trophic networks potentially leading to a reduction of regulating services. In this PhD project, we intend to jointly analyse through modelling approaches the effects of the trophic network structure, of the spatial organisation of semi-natural habitats and of cultivated areas on the efficiency of biological control of pests by natural enemies. This project aims at the development of a stochastic generator of virtual landscapes to go beyond the study of a single observed landscape, allowing us to account for landscape variability. We will pay particular attention to linear structures (hedgerows, ditches, roads...). Indeed, such structures can be crucial in determining population spread (dispersal barrier, corridors...) but are currently complicated to consider due to their small proportion of area.

Skills Ecology with a strong interest in theoretical approaches.

Contact The PhD will take place at INRA Avignon in the Biostatistics and Spatial Processes laboratory (BioSP) and will be supervised by Julien Papaix (julien.papaix@inra.fr), Thomas Opitz (thomas.opitz@inra.fr) and Edith Gabriel (edith.gabriel@univ-avignon.fr). The PhD will start by October 2018.