
Landscape heterogeneity related to organic and conventional farming systems: effects on natural enemies of crop pests and pest predation levels

Stéphanie Aviron^{*†1}, Alexandre Monteiro¹, Jacques Baudry¹, El Aziz Djoudi^{2,3}, Julien Pétillon³, Manuel Plantegenest², Sylvain Poggi², and Camille Puech^{1,2}

¹SAD-Paysage – Institut national de la recherche agronomique (INRA) : UR980 – 65 rue de Saint Brieuc, 35042 Rennes Cedex, France

²Institut de Génétique, Environnement et Protection des Plantes (IGEPP) – Institut national de la recherche agronomique (INRA) : UMR1349, Agrocampus Ouest : UMR1349 – AGROCAMPUS OUEST, UMR1349 IGEPP, F-35042 Rennes, France, France

³EA7316 Biodiversité et Gestion des Territoires – Université de Rennes 1 – 263 Avenue du Général Leclerc CS 74205, Campus de Beaulieu, 35042 Rennes Cedex, France

Abstract

Organic farming is considered a promising type of production to enhance biological control of pests by their natural enemies, and therefore, to reduce pesticide use in modern agricultural systems. The effects of organic farming on natural enemies have been largely studied at the field scale, but the role of landscape heterogeneity related to the amount and spatial configuration of organic farming remains little explored. Moreover, little is known about local and landscape effects of farming systems on pest predation by natural enemies. The aim of our study was to investigate the effects of farming systems (organic vs. conventional) at the field and landscape scales, on the diversity of natural enemies and on prey predation levels in cereal crops. Natural enemies (predatory carabid beetles and ladybirds) and predation levels of sentinel preys (aphids and weeds) were sampled in 20 pairs of organic-conventional cereal crops located in 20 landscapes with varying percent cover of organic farming, in western France. Our results show that the diversity of natural enemies and pest predation levels were mainly affected by the type of farming system at the field scale, and were overall higher in organic crops. They were not influenced by the amount and spatial configuration of farming systems at the landscape scale, but were influenced by the amount of woody habitats (hedgerows). Our findings suggest that the promotion of biological control in hedgerow network landscapes mainly relies on the adoption of organic practices and, to a lesser extent, on the conservation of hedgerows.

Keywords: Organic farming, landscape context, carabid beetles, ladybirds, aphid and weed predation, hedgerows.

*Speaker

†Corresponding author: stephanie.aviron@rennes.inra.fr