Influence of landscape heterogeneity and agricultural practices on biological control of pests: Detailed literature review from 1993 to 2017.

Nirina Ratsimba*[†1], Aude Vialatte[2], and Olivier Thérond[3]

[1]Dynamiques et Ecologie des Paysages Agriforestiers (DYNAFOR) – Institut National Polytechnique [Toulouse], Institut National de la Recherche Agronomique : UMR1201, Ecole Nationale Supérieure Agronomique de Toulouse – 24 Chemin de Borde-Rouge – Auzeville CS 52627 31326 Castanet Tolosan Cedex – France, France
[2]Dynamiques et Ecologie des Paysages Agriforestiers (DYNAFOR) – Institut National Polytechnique [Toulouse], Institut National de la Recherche Agronomique : UMR1201, Ecole Nationale Supérieure Agronomique de Toulouse – 24 Chemin de Borde-Rouge – Auzeville CS 52627 31326 Castanet Tolosan Cedex – France, France
[3]Laboratoire Agronomie et Environnement (LAE) – Institut National de la Recherche Agronomique : UMR1121, Université de Lorraine – 28 Rue de Herrlisheim, 68000 Colmar, France

Abstract

The effect of landscape heterogeneity on pest and natural enemy communities and the resulting service of biological regulation have been investigated in several meta-analysis and reviews.

However, those analysis have been conducted on studies taking place in very variable contexts (tropical and temperate climate, cereals and orchards), and using a wide variety of indicators to describe local and landscape-scale factors, and pests and natural enemies communities' status. While those reviews were able to demonstrate general tendencies of the effect of landscape simplification on natural enemies and pest communities, they are not sufficient to provide reliable predictions of the level of biocontrol in a given field, based on its landscape. They also tended, for statistical reasons, to aggregate a lot of indicators into more general proxies, preventing the provision of specific recommendations for landscape management.

Here, we propose a detailed review of the influence of landscape heterogeneity on the biological control of pest. The results obtained in 36 articles, published from 1993 to 2017, were analyzed, and gathered in a database. We recorded information on crops, pest and natural enemy species studied, scales, and indicators. We use this information to propose a detailed view on the effect of specific landscape features (composition and configuration aspects) and agricultural practices on pest and natural enemy communities' status and the level of biocontrol. An exhaustive and non-ambiguous ontology of the indicators used to describe the landscape and the communities' responses was also built. The goal of this work is to provide sufficient information for the conception of a simulation module of biological control intended to be implemented in the MAELIA platform (http://maelia-platform.inra.fr/).

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*Speaker
†Corresponding author: nirina.ratsimba@inra.fr