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Effect of local landscape heterogeneity on crop colonization by natural predators of pests in protected horticultural cropping systems

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Abstract

Conservation biological control of crop pests is considered a promising strategy in protected horticultural cropping systems. In Mediterranean regions, crop colonization by native predatory mirid bugs (Heteroptera, Miridae) is frequent but highly heterogeneous among crop production sites. The goal of our study was to assess whether the variability in crop colonization levels by mirids (*Macrolophus* spp. and *Dicyphus* spp.) is related to local landscape heterogeneity (land-cover diversity, percent cover, and spatial configuration), and whether these effects are significantly greater or lower than those of crop management practices. We investigated relationships between mirid abundances in protected tomato crops, farming practices, and landscape metrics (calculated within 300 m buffers) in southern France (Roussillon) in 2010 and 2011. Our results show that tomato crops were colonized the most by *Macrolophus* mirids in landscapes with fallow, suggesting that these semi-natural habitats contribute to mirid movements between protected crops and the surrounding landscape. In contrast, crop colonization by mirids was reduced by nearby orchard, which reflected either sink or dilution effects. Landscape composition and spatial configuration had similar effect on mirid populations. Effects of landscape heterogeneity on mirids were however lower than those of crop management practices. Our findings suggest that maintaining large areas of semi-natural habitats (fallow) is important to ensure colonization of protected crops by natural enemies of pests. Converting farms from conventional to organic production systems and adopting integrated plant management practices remain the most promising strategies to enhance populations of mirids in protected horticultural crops in Mediterranean regions.

Keywords: conservation biological control, tomato colonization, landscape context, Miridae, *Macrolophus* spp., *Dicyphus* spp.