The relative contribution of cropping systems and flower strips for generalist invertebrate predator communities in a biodiversity-based agroecological farm

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Résumé

Agricultural landscapes are made up of a mosaic of semi-natural habitats and of cultivated areas under various farming management. The characteristics of such mosaics impact plant and animal population dynamics, shape communities and therefore affects the provision of key agroecosystem services, such as the control of crop pests by their natural enemies. The impact of contrasted cropping systems or of the presence of semi-natural habitats on the activity of natural enemies has been well documented. Much less is known on the relative contribution of these different habitats to the life cycle of natural enemies, and notably their role as overwintering habitats. Moreover, the communities of generalist predators are frequently analysed as a homogeneous group, which precludes capturing the taxonomic and functional diversity of these organisms, which display distinct ecological requirements and pest control potential.

In this study we examined the role of sown flower strips and two cropping systems - minimum and shallow soil tillage (SD) *vs.* frequent tillage including inversion tillage (TS) - on two groups of natural enemies: ground-dwelling spiders and carabid beetles. We conducted this assessment in agroecological systems currently implemented on the Inrae CA-SYS platform, a 125 ha experimental farm near Dijon implementing innovative pesticide-free biodiversity-based cropping systems. Ground-dwelling spiders and carabids were sampled with pitfall traps and emergence tents from March to July 2023 in seventeen flower strips and adjacent fields (seven fields in SD system and ten fields in TS system).

We found that flower strips sheltered similar abundance of overwintering spiders than the two adjacent cropping systems. Abundance of circulating spiders in the flower strips was comparable with the SD system, but lower than in the TS system. Nevertheless, the circulating spider assemblages in flower strips were distinct compared to the fields, and exhibited a more even representation of the different hunting strategies. Concerning carabids, we observed a higher in-field abundance of overwintering and circulating individuals compared to flower strips. The dominant predator species circulating in the fields were mainly agrobionts, spending their entire life cycle in the fields, with an overwintering preference for the shallow-tillage system for carabids and an equal preference between the two cropping systems for

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spiders. The contribution of flower strips was less than expected but this could be explained by the particular context of the CA-SYS platform, i.e. pesticide-free with many fields under very low frequency and depth of tillage operations.

Mots-Clés: agroecology, pest control, overwintering, carabid beetles, ground dwelling spiders, soil tillage