How do local factors and landscape affect insect-pollination efficiency in oilseed rape?

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Abstract

More than 70% of the crops depend on insect pollination and the world's area of these crops is increasing while the pollination service is endangered. Pollination service depends on the community of pollinators which is influenced by local (ecological niche) and landscape factors (dispersal) through the support of floral resources (organic farming, oilseed rape, semi-natural habitats), the provision of nesting sites (semi-natural habitats) or the connectivity (length of the boundaries between the habitats).
The aim of this study was to understand how local and landscape factors interact to influence the efficiency of insect pollination in the oilseed rape (*Brassica napus*). Oilseed rape plants used as phytometers (832 since 2014) were placed in the LTSER "Zone Atelier Plaine & Val de Sèvre" in three crop types (oilseed rape, grassland, cereal) which differ in their local floral diversity. Fields were located in landscapes varying in their densities of organic farming (e.g. from 0 to 89% in a radius of 500m), oilseed rape (0-63%), semi-natural habitats (0-40%) and the length of the boundaries (7-30 kms). Landscape variables were quantified in buffers of radius ranging from 500m to 2000m.

We showed that local and landscape factors at a small spatial scale (500m) influence grain production. While grain production is more important in oilseed rape fields, it's negatively influenced by the percentage of oilseed rape in the three crop types and positively affected by organic farming in cereal fields. We further explored how local and landscape factors affect the influence of the pollination processes (entomogamy, autogamy, anemogamy) on grain production using an experimental approach. The flowering stems of the phytometers were subjected to different treatments excluding either wind- and insect-pollination, only insect-pollination, or pollination by the largest insects. Our analysis showed that local and landscape factors influence grain production independently of the pollination process.

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