Predator-prey relationships in NOcsPS winter wheat cultivation systems

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NOcsPS is an interdisciplinary research project dealing with different intensive agricultural cultivation systems without use of chemical-synthetic pesticides.

The aim of the subproject is to examine, if the avoidance of synthetic pesticides can stabilize the function of the predator-prey relationship between the predatory flies and insect pests. For this purpose, five bioindicators were considered: hoverflies (Syrphidae), robber flies (Asilidae), dance flies (Hybotidae), ladybirds (Coccinellidae) and bees (Apoidea). Particular attention is paid to predatory flies, as these are natural antagonists of plant-damaging midges and flies (e.g. wheat gall midge, stalk and leaf miner flies). The small dance flies (Hybotidae), which are only 3 mm in size, are particularly sensitive to synthetic pesticides. They can recover less quickly through immigration. Therefore, this group of flies is suitable both as a new indicator for agrobiodiversity and for mapping the effects of different cultivation systems on predator-prey relationships.

The experiment was set up as a randomized block design in 2019. It consists of five wheat variants with four repetitions each. There are three ecological variants (one etablished organic variant since 1995, two organic variants since 2019 with two different varieties of wheat). Additionally, there are two other variants: NOcsPS II (no synthetically pesticides, adapted fertilization) and the conventional wheat variant.

The entomological investigations are carried out with sweeping nets, photoelectors, yellow traps and soil activity tests. Sampling takes place from the beginning of May to the end of June. The trapped insects are determined taxonomically. In addition to comparing the arthropod biomass and insect numbers, the samples are compared with regard to the diversity (shannon index, evenness) of different taxocoenoses. A taxonomic determination of all caught insects is carried out at family, genus or species level.

After two years of trials, the effects of cultivation intensity on biodiversity parameters are still inconsistent. However, the absence of pesticides tends to have positive effects on biodiversity in general and more stable predator-prey relationships. Statistically significantly, the group of robber flies benefits from extensive, organic farming and builds up stable predator populations in wheat. Wild bees benefit from the food supply of flower-rich weeds in organic wheat and appear in higher numbers of species and individuals.

At the end of the project, the results will allow statements about the influence of wheat cultivation systems of different intensity as well as fertilization methods and sowing methods on the abundance, diversity and function of predatory flies and their prey in the wheat cultivation systems. This predator-prey relationship is an indicator of the impact on functional biodiversity in wheat farming systems.