

Science for Environment Policy

New insight into the complexities of natural pest control

Controlling pests using their natural enemies can be an environmentally sound alternative to pesticides. However, the complex interactions between different pest control species and the landscape itself can affect the efficiency of such biological pest control, research suggests.

Globally, it is estimated that pests destroy about 10% of agricultural crops before they are harvested. The use of pesticides, which has increased in recent years, can cause unwanted environmental and health effects. The EU, through the recent Plant Protection Product Regulation (PPPR)¹ and the Sustainable Use Directive (SUD)², is seeking to reduce the overall impact of pesticides on health and the environment and their actual usage. Member States are currently implementing the SUD via National Action Plans with a view to reducing pesticide inputs. One promising approach, as contained in the SUD, is to use naturally occurring enemies as pest control, as this offers an alternative, more environmentally-friendly solution.

This study investigated the effect of 'landscape complexity' on the interactions of natural enemies of pests. Landscape complexity broadly refers to the diversity of different land uses and can be measured in several ways. In this study it was represented by the percentage of semi-natural habitat around each plot.

The research studied the efficiency of insect pest control of three types of natural enemies both separately and combined. These included flying insects and birds, as well as ground-dwelling insects and spiders. The study sites, in South Korea, consisted of 18 plots of 20 m² in a 55 km² region consisting of agricultural land and semi-natural habitats. Within the plots, planted areas (ca. 1 m² each) were cordoned off using materials, such as chicken wire, mesh or plastic sheeting, to restrict access to either one of the natural enemies or combinations.

On average, those areas that were accessible to all natural enemies had 43% less insect pest larvae, 54% less damage to leaves and 57% more crop biomass than those areas where there were no natural enemies. For most cases, both the number of pest larvae and leaf damage increased with the complexity of the landscape. The exception to this was when flying insects were the only form of pest control. In this case, they reduced pests by about 11 larvae per 1 m² area in complex landscapes, but by only one larva per 1 m² area in simple landscapes.

However, the ability of flying insects to control pests in complex landscapes was modified by the presence of another natural enemy: birds. When birds were also present alongside flying insects, leaf damage and pest density were greater. This effect appeared to be specific to complex landscapes because in simple landscapes the presence of both enemies reduced leaf damage and pest density.

In this study, flying insects appeared to provide the best pest control service but, contrary to expectations, landscape complexity did not always enhance this effect. If other enemies are present, the ability of flying insects to control pests appeared to diminish. The reasons for this are not clear and further research is needed to fully explain the system. However, this study does show that management schemes using natural pest control should consider landscape complexity to mitigate any negative interactions between the different pest control species.



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1. See: http://ec.europa.eu/food/plant/pesticides/index_en.htm

2. See: http://ec.europa.eu/food/plant/pesticides/index_en.htm