



Landscape features can help to predict natural pest control

Natural predators of agricultural pests are influenced by the type and range of habitats within a farming landscape. A new study has developed an approach which predicts the risk of pest infestation and natural predation according to landscape features, to help land managers structure landscapes that encourage natural pest control.

There are two ways to promote natural pest control in agriculture: crop management practices at the field scale, such as increasing within-field diversity or reducing soil tillage, and landscape management measures, which include finding the best way to set up crop and semi-natural habitats next to each other.

Although there is growing evidence that the landscape can influence pest species' population dynamics and their interacting food webs (trophic interactions), there is a lack of practical guidelines to help landscape planners determine the best way of designing land use in order to reduce pest numbers.

To help meet this challenge, the study measured and compared the accuracy of individual landscape indicators to predict pest infestations and successful biological pest control in oilseed rape fields located in northwestern France. Landscape indicators, such as neighbouring woodland or grassland, can be used to try and predict which fields are likely to be at risk of pest infestation or the fields in which natural pest control will be more successful.

Oilseed rape is prone to infestation of the pollen beetle, *Meligethes aeneus* F., resulting in the large use of insecticides across Europe. However, the beetle's population is also controlled naturally by a range of parasitoids, which lay eggs in its larvae, thereby killing it. In the study, fields were divided into groups depending on whether they exceeded a certain level of infestation or parasitism. The researchers then tested the ability of each landscape indicator to identify which fields would be likely to have more beetles, and which would have more parasitoids.

Digital images of land use around the fields were produced and the proportion of different landscape indicators was calculated: woodland, grassland, semi-natural habitats, the area of oilseed rape and the area of oilseed rape from the previous year with reduced soil tillage.

The proportion of woodland and the proportion of semi-natural habitats in the landscape were good indicators of pest infestations, particular at larger spatial scales. For parasitism rates, the proportion of woodland, the proportion of semi-natural habitats and the proportion of the previous year's oilseed rape fields having reduced soil tillage were good indicators. Proportion of grassland and area of oilseed rape in a landscape appeared to be poor markers of pest infestation and natural control; combining various landscape indicators did not generally improve prediction accuracy.

The approach developed in this study could help landscape planners and policy makers to predict landscapes running the risk of pest infestation or unsuccessful biological control. Different scenarios of land use can be modelled using the digital maps created to optimise landscape configuration for natural pest control. The use of landscape indicators can also highlight the potential existence of areas pests use to avoid their parasitoids, so called 'spatial refuges', which could be a target for habitat and landscape management.

Source: Rusch, A. Valantin-Morison, M., Roger-Estrade, J., Sarthou, J.P (2012) Using landscape indicators to predict high pest infestations and successful natural pest control at the regional scale. *Landscape and Urban Planning*. 105: 62-73.

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