Beneficial insects in furrowed field margins

Summary of a project by visiting student Benjamin Lepers, AgroParisTech France, Summer 2015

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In summer 2015, the Hutton hosted a visit by undergraduate student Benjamin Lepers from AgroParisTech. He was here to learn about vegetation and insect life in farmland. His first task was to complete a survey of plant species in different types of vegetation on the Mylnefield Farm, including land under cereal crops, grassy field margins, furrowed margins, taller mixed vegetation and hedges. The furrowed margins supported the largest number of plant species: 35-40 could be found in a brief survey. The furrowed margins – an idea developed on this farm – are called 'Magic Margins' and recently won awards for conservation and biodiversity (see *News* on the Hutton/LEAF web site).

Sampling vegetation and insects on the furrowed margins

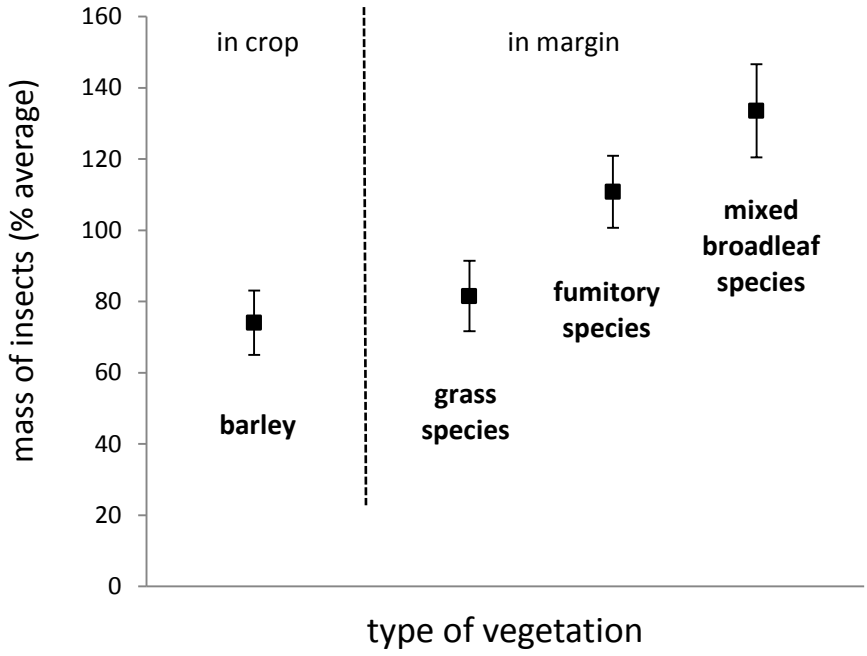
The next aim was to examine recently formed furrowed margins to see how the vegetation varied on a small scale (e.g. over a few metres) and whether the proportions of plant species influenced the insects that live there. The margins supported different patches of vegetation, from 0.5 x 0.5 m up to 2 x 2 m, that arose naturally from the soil seedbank after furrowing. Three types were chosen for study: patches consisting of only grass species, those consisting of only fumitory species, mostly *Fumaria officinalis* and *Fumaria muralis*, and those of mixed broadleaf or dicotyledonous species which included *Viola arvensis*, *Myosotis arvensis* and *Lamium amplexicaule*. (The fumitories were the most common plant in these margins and tended to form dense clumps that excluded other broadleaf species).

The types, number and mass of insects within these different patches in the furrowed margins and adjacent barley crop were sampled by vortis suction, an instrument like a large vacuum cleaner. Insects collected were separated into broad groups, including herbivores, detritivores and natural enemies.

The results – did insects vary with patch type?

The graph below summarises the mass of insects sampled from the four types of vegetation. The vertical axis shows the difference as a percentage. The 100% mark is the average of all values across the four types of vegetation, each of which was sampled at five locations. Insects on barley and grass are less than 100% while those on the fumitory and broadleaf groups are more than 100%.

The mass of the insects, and also the numbers of individuals (not shown), which are indicators of their contribution to the food web, were therefore smallest in the barley, no larger in the grass patches, much larger in the fumitory and statistically twice as large in the mixed broadleaf patches.



The findings as a whole demonstrate the value of diversity in vegetation both across the farm and at much smaller scales. Plant diversity encouraged plant and insect groups to coexist in close proximity. Notably, the mixed broadleaf patches had by far the highest density of natural enemies (especially parasitic wasps) that feed on herbivore pests on the adjacent crop.

Benjamin's supervisor, Geoff Squire, writes: "This was a highly successful, short-term, undergraduate project. The student learned about biodiversity, food webs, field sampling and analysis while the Hutton gained some early pointers to the value of Magic Margins for food web biodiversity. The project was a fine example of the opportunities that arise when research, teaching and farming work together across the Institute".

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The Mylnefield Farm is part of the LEAF Innovation Centre at the James Hutton Institute