

Re-bugging the system: Promoting Adoption of Alternative Pest Management Strategies in Field Crop Systems

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Project Objectives

Concern over health and environmental side effects of chemical pesticides has created demand for alternative pest control technologies. This concern has been highlighted recently in the Royal Commission on Environmental Pollution report. However, crop protection still largely relies on pesticide inputs. This is particularly so in arable field crops where, in spite of some potentially useful existing biocontrol technologies, there has been little movement away from pesticides. Potential reasons for lack of adoption of biocontrol (or other technologies) may simply be poor efficacy of the technologies or might be a result of market failure at the farm or other levels in the supply chain. Another RELU 'Food Chains' project, lead by Wyn Grant, will consider the possibility of regulatory or political failure in respect of a similar technology. This project will investigate both the efficacy and the adoption decision issues using two technologies, 1) habitat manipulations to encourage predators and parasitoids and 2) semiochemical odours to manipulate predator distribution, as case study vehicles. The aim is to develop an improved research and development framework, with appropriate policy recommendations, for implementing alternative pest control technologies so to break pesticide dependency.

Economics & Social Science

Work concentrating on the investigation of the decisions made by horticultural producers to adopt Integrated Pest Management (IPM) strategies, and biocontrol technologies in particular. Unstructured interviews with commercial growers, each lasting between 2 to 5 hours, were used to elicit their reasons to first consider investigating alternatives to pesticide use, subsequently to trial and adopt the techniques and to investigate how and on what grounds growers evaluate their relative success. At this stage it would seem that:

- contract specification,
- pesticide de-listing and resistance

are important motivating forces although other issues, including

- environmental damage,
- worker health and
- economic cost savings

may be important drivers. This on going work will help the design of a wider field crop farmer survey. Within this survey we anticipate to illicit responses to characterise a mix of both economic and sociological decision models in order to widen the impact of this work. This effort will guide future scientific effort and will characterise potential early adopters of these technologies.

Semiochemical Push-Pull

Rothamsted Research group have been working on the efficacy of using the semiochemical cis-Jasmone to activate the natural defence systems in wheat plants. This compound not only makes plants less suitable for pests but it also makes them more attractive to enemies of the pests. In laboratory experiments, on both cis-jasmone treated and untreated wheat plants, the performance of foraging aphid enemy parasitoids were evaluated:

- The generalist parasitoids spent significantly longer on cis-jasmone treated wheat plants but specialist parasitoid showed no significant change in behaviour.

Manipulation of generalist parasitoids by cis-jasmone treatment of wheat has potential value in conservation biological control programmes.

The generalist parasitoids are more likely to occur in field margins than specialist parasitoids and so cis-jasmone treatment might work well in combination with beetle-banks or other habitat manipulations.

Habitat Manipulation & Biocontrol

Ecology: Experimental

The main focus of this work will be to discover the potential synergistic and antagonistic effects of diversity and abundance of mixed species predator groups on the ability to maintain pest population below economic thresholds.

The IC Ecology group have also developed a Predator Diversity-Ecosystem Function working group to draw together researchers (currently from the UK and US) with an interest in natural enemy diversity and pest control functioning. The aim of this group is to share knowledge and approaches from different experimental systems and through this build linkages and future collaborations regarding predator diversity and its theoretical and applied consequences.

Ecology: Field Trails

Game Conservancy Trust group charged with conducting field-scale experiments on pest control function for the first year of this project were to:

- Develop and test experiments to measure the level of cereal aphid predation provided by ground dispersing and flying aphid natural enemies.
- Consider the impact of floral field margin composition on predator diversity and cereal aphid control.
- Develop and test a technique to monitor the movement of flying natural enemies.