Grower Summary

CP 061

Cross crop benefits: Developing crop combinations to promote conservation biological pest control

Final 2013

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Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Project Leader:	Dr Andrew Wilby
Contractor:	Lancaster University
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Headline

Marketable flowering species are utilised by biological control agents, increasing their abundance and persistence in the field and may support biological control of pests when grown in combination with Brassicas.

Background and expected deliverables

The horticultural industry faces a range of issues linked to crop protection. These include a reduction in the available products approved for use; problems with resistance in the target organisms; increasing pressures from consumers and retailers for residue-free produce; and a need to comply with legislation and industry initiatives (e.g. Water Framework Directive and the Voluntary Initiative). These pressures lead to a need for a more rational approach to pesticide use, and for the full exploitation of the range of methods available for maintaining pest populations below the economic damage thresholds. This project tests methods of enhancing conservation biological control of Brassica pests by providing supplementary resources that will increase the density, diversity and activity of naturally colonising biological control agents.

Typically in intensive agricultural and horticultural systems, the effectiveness of biological pest control is critically limited by the absence of alternative or supplementary food sources. Many biological control agents depend on flowering plants as a source of energy-rich nectar and pollen. The scarcity of floral resources in modern horticulture severely constrains predator survival and activity, undermining the effectiveness of biological pest control. This bottleneck can be addressed by diversifying the cropping system with flowering plant species. This can be achieved by planting selected flowering non-crop vegetation in field margins. While this approach has been proven to be effective, it reduces the area available for crop cultivation. This project aims to test and promote combined cropping as an alternative technology to provide predators with floral resources, without compromising acreage. This studentship aims to select a variety of nectar/pollen providing crops and test their impact on the efficiency of both generalist and specialist biocontrol agents when grown adjacent to vegetable crops lacking floral resources.

The project focusses on combinations of marketable crops with a view to optimize economic as well as ecological benefits. Two classes of nectar and pollen providing crops will be studied in the project: - vegetable crops which produce both extrafloral nectar as well as flowers (e.g. broad beans) and pharmaceutical flowering crops (e.g. borage, evening primrose and St John’s wort).

The medicinal plant industry is currently expanding at a great rate across the globe. Currently valued at more than €45B annually, it is growing steadily at c. 8% p.a. with the EU as the leading importer of medicinal plants and extracts (Williamson & MacTavish 2007). The UK complementary medicines market was estimated to be worth £147M in 2004 having grown by 47% since 2004 (Williamson & MacTavish 2007). Currently, >700 species are traded in the UK, of which 90% are collected from the wild. There is considerable concern over the quality and identity of much imported material and meany species are CITES listed as concern grows over their conservation status. Consequently, there is growing interest in the expansion of medicinal plant crops in the UK (Williamson & MacTavish 2007).

Overall aim of the project

The project aims to develop novel technologies to harness biodiversity benefits for sustainable pest control in horticulture, without compromising crop acreage.

Specific objectives

1) To determine the potential of selected pharmaceutical flowering plant species as pollen and nectar sources for biological control agents in adjacent crops lacking floral resources.

2) To determine the potential of extrafloral nectar producing vegetable crops as supplementary food sources for biological control agents in adjacent crops lacking floral resources.

3) To establish the impact of pollen and nectar feeding on the effectiveness of biological control agents in controlling pests under field conditions.

4) To determine the impact of in-field supplementary resource provision on crop yield (quantity and quality) in Brassicas.

Summary of the project and main conclusions

Field trials of several marketable flowering plant species examined whether the presence of floral-resource strips intercropped within a Brassica crop affect natural enemy (parasitoids and predators) abundance and subsequent control of pest herbivores. These field trials were undertaken at Stockbridge Technology Centre, Myerscough Agricultural College, Lodge Farm in Wistow and Huntapac, a commercial grower in Lancashire.

Throughout the growing season flying insects were trapped in the flowering plots and samples were analysed for the abundance of key potential biological control agent groups including rove beetles, ladybirds, parasitic wasps, hoverflies and several other predaceous fly groups. The abundance of predators in the adjacent Brassica crop was also recorded, as was the abundance of the key pests (butterfly and moth larvae and aphids).

Trials revealed that the floral-resource providing species do increase the abundance of important groups of biological control agents, and can help them persist for longer in the crop. Specialist biological control agents such as parasitic wasps were more abundant closer to the floral-resource strips, whereas generalist predators, such as rove beetles, were found either in the middle of the crop, or at the furthest distances from the floral-resource strips. This suggests the parasitic wasps are utilising the floral resources and then flying to search for pests, whereas generalist predators are following pest aggregations in the crop. The variability in natural enemy abundance and in the effectiveness of the flower species at different sites however, warrants further investigation.

Financial benefits

The pharmaceutical plant species used in this project are commercially useful, especially buckwheat which has multiple uses and can be cropped twice in the same growing season. Growers should be aware that intercropping can reduce the need for pesticides as part of IPM, which could have a financially significant effect on crop production in Brassicas.

Action points for growers

Growers should note:

- There is potential for intercropping floral-resource species, specifically buckwheat and borage, to enhance natural enemy numbers in Brassica crops.
- The site can have a very influential effect on the effectiveness of intercropping in promoting biological pest control.

This project and previous research suggest that there should be no more than approximately 15m in between floral-resource strips.