



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

FV 334

Perennial field margins with combined agronomical and ecological benefits for vegetable rotation schemes.

Annual 2010

Disclaimer

Whilst reports issued under the auspices of the HDC are prepared from the best available information, neither the authors nor the HDC can accept any responsibility for inaccuracy or liability for loss, damage or injury from the application of any concept or procedure discussed.

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

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.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

No part of this publication may be copied or reproduced in any form or by any means without prior written permission of the Horticultural Development Company.

HDC is a division of the Agriculture and Horticulture Development Board.

Headline

- Seed mixtures have been successfully developed for sowing into experimental seed margins and first year data suggests that the margins are benefitting several groups of beneficial insects.
- A pesticide compatibility matrix has been generated for Brassicas.
- The acceptance of seed mixes/margins to the environmental stewardship scheme is being discussed with Natural England.

Background

The horticultural industry faces a range of issues linked to crop protection. These include:

- A reduction in the available products approved for use
- The potential for increasing resistance in target organisms
- Increasing pressures from consumers and retailers for residue-free produce
- A need to comply with legislation and industry initiatives.

These pressures have resulted in a need for a more rational approach to pesticide use and for the full exploitation of the range of alternative methods available for maintaining pest populations below economic damage thresholds.

The development of stewardship schemes that encourage the management of the farmed environment in a way that increases levels of biodiversity, provides an opportunity to combine conservation objectives with the benefit of enhanced pest control (either through conservation biological control or through other methods such as trap cropping). Current stewardship options include pollen and nectar mixes targeting bees and butterflies, as well as separate margin prescriptions to encourage farmland birds.

Previous work by members of the research team involved in the current project has developed the concept of designing flowering field margins for the specific purpose of optimising biological pest control.

The current project looks to build upon the above research and seeks to combine the biodiversity and pest-control benefits of perennial field margins, providing growers with a direct economic benefit in addition to the expected subsidies from stewardship schemes.

The expected deliverables from this work include:

1. Development of a seed mixture for perennial field margins that has the potential to optimise joint pest control and conservation benefits while minimising potential risks for vegetable rotation schemes.
2. Quantification of the impact of field margins on biological control agents, pests, pollinators and farmland birds.
3. Development of the use of flowering field margins as part of insecticide assisted trap-cropping approach.
4. Development of field margins that support predator population build-up through provision of non-pest prey in field margins.
5. Assessment of the feasibility of using banker plants in field margins and development of these plants as sentinels to monitor levels of biological control agents.
6. Development of a database on the compatibility of available chemical control options with various biological control agents to optimize integrated pest management decisions.
7. Quantification of the impact of perennial field margins on pest levels, crop quantity/quality and pest management costs.
8. Communication of best practice to commercial growers in the form of 'blueprints' for margin establishment and management, drawing upon knowledge generated in the proposed project as well as in ongoing European biodiversity projects.

Summary of the project and main conclusions

Objective 1- Development of the seed mixture.

Following discussions with seed companies involved in the project, international research groups, and an extensive review of the available literature considering some 50 potentially useful flowering plant species and more than 20 specific selection criteria, a seed mix consisting of 22 flowering species was formulated for sowing into experimental field margins. The success of this Objective, and hence any conclusions drawn from it, will be determined with continuing work on margin establishment and performance.

Objective 2 – Establish field margins and quantify margin impact on selected species

Despite harsh winter (cold) and spring (dry) conditions numerous flowering plants have established well. Flowering surveys have shown that the selection of flowering plants sown has provided resources continually from the early Spring to late Autumn. More details are provided in the Science Section.

Though only in their first year, there is some suggestion that flowering margins are already benefitting several groups of beneficial insects, including bees, hoverflies and parasitoid wasps, thus stacking benefits for pollinators and pest natural enemies. However, for additional groups such as carabids further analysis is required. Flowering margins did not appear to benefit any of the in-crop pests considered. In some cases trends for increased aphid parasitism at crop sites nearer to the flowering margins were observed, though these trends were not statistically significant (most likely due to high variation existing between plots in many cases).

There appeared to be a greater diversity of farmland bird species recorded from fields surrounding field margins than from a control field on nearby land. However, it is not possible to relate this to the presence of experimental field margins, as STC is a highly diverse site (with regard to natural vegetation, cropping and landscape features) even without them. Results from commercial-scale testing may, however, prove more conclusive.

Objective 3 - Development of the trap-cropping approach.

Using laboratory-reared populations of both carrot and cabbage root fly, host preference tests using selected potential trap crop species have been conducted to ensure that appropriate (i.e. attractive) trap crop plants will be used in the field in 2011. Results of this suggest that chervil and yellow mustard may limit pest development by providing conditions that are not optimal for the larvae whilst still attracting egg-laying females.

Objectives 4 & 5 – Development of banker plant species.

Some of the plant species included in the final seed mix were selected on the basis of having been identified as potential banker plants, and these have been monitored from April 2010 to confirm this potential. Though aphids were slow to move in on potential banker plants, populations were observed on some plants by mid-July, including a number of species not

initially identified as bankers. Of the three originally-proposed banker plants only common vetch was observed to harbour large numbers of aphids, though populations were observed on both cornflower and yarrow elsewhere on site. It is expected that as the margins mature into 2011, the likelihood of banker plants supporting greater aphid loads will increase. Further details are provided in the Science Section.

Results from an experiment with hoverflies have suggested that banker plants are only likely to provide discernable benefits to pest natural enemies when prey populations on crops are absent or low. It is therefore hoped that in the future banker plants will support aphids early in the season, allowing natural enemy populations to establish before crop pests arrive. This same experiment demonstrated the importance of floral resources to aphid pest control. Further details are provided in the Science Section.

Objective 6 – Development of a compatibility database of chemical control options.

Using data from LIAISON (a Fera-held database on approved products), a list of all active ingredients available for application to the crops relevant to the current project has been generated to inform any pest control interventions that may be required during the study period. A compatibility matrix has been generated for Brassicas and used to inform decisions on spraying (undertaken on Brassicas only in 2010). Gaps in this matrix have been identified and may be addressed in future years if resources allow. Further details are provided in the Science Section.

Objective 7 - Quantification of margin impact on pests, crops and pest management costs.

Results concerning pests are reported under Objective 2. Initial yield data have been collected, though further analysis is required to assess if margins have had any influence on crop yield/pest management costs.

Objective 8 – Communicate best practice.

A database has been generated compiling experience from functional biodiversity projects and is in the process of being developed into a more user-friendly format. A project website has been developed and can be accessed at www.ecostac.co.uk. Introductions to the project have been presented to the general public and both industrial and academic audiences.

Delivery of information has varied to include PowerPoint lectures, poster presentations, publications and televised interviews for the BBC. Further details are provided in the Technology Transfer section.

Financial benefits

In accordance with the Government's longstanding policy of minimisation of the use of pesticides, the boosting of native biological control agents in combination with a trap crop approach for key pest species should make it possible to reduce pesticide inputs while maintaining crop yield and quality through the use of functional field margins. In addition to financial savings associated with reduced pesticide use, economic benefits will also result from the expected development of a functional field margin that can count towards stewardship accreditation. Contacts have been made with Natural England to help ensure that this will be the case.

Action Points

There are no action points at this early stage.