



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

SF 094 / HL0191

Minimising pesticide residues in
strawberry through integrated
pest, disease and
environmental crop
management

Annual 2009

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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.

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

Project Number: SF 094 / HL0191

Project Title: Minimising pesticide residues in strawberry through integrated pest, disease and environmental crop management

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GROWER SUMMARY

Headline

Some early progress has been made in developing novel, non-pesticide control methods for important pests and diseases of strawberry.

Background and expected deliverables

The overall aim of the project is to develop alternative, sustainable, non-pesticidal methods for managing powdery mildew, Botrytis, blackspot, capsids, aphids and blossom weevil on strawberry, so greatly reducing pesticide use and eliminating the occurrence of reportable pesticide residues on harvested fruit. The methods developed for the individual pests and diseases will be combined with existing non-chemical methods for other pests and diseases in an overall Integrated Pest and Disease Management (IPDM) system, and this will be tested and refined in commercial strawberry production over two seasons.

Summary of project and main conclusions

Progress on each objective of the project is summarised below

Strawberry powdery mildew

Inoculum in planting material

Experiments were conducted to investigate the extent of powdery mildew inoculum on initial planting materials (cold-stored runners and tray plants). Results so far suggest that the level of mildew in commercial planting materials is very low. The survival of mildew on runners in cold-store is currently being studied.

Alternative products

Preliminary results suggested that potassium bicarbonate and Serenade (a BCA, recently registered in the UK) can control mildew as effectively as Systhane when applied before inoculation. This will be reassessed in a field study to be conducted in 2009.

Powdery mildew forecasting

The prediction scheme developed by CSL and University of Hertfordshire has been developed as a computer programme. In 2009, this prediction scheme (and Botrytis model) will be evaluated on farms for its prediction accuracy and usefulness for disease management.

Botrytis

Latent infection in planting material

Botrytis cinerea was detected within the crown tissue of cold-stored runners of A+ grade cv. Elsanta received from five growers in May-June 2008. The incidence of infection determined by isolation onto agar ranged from 6% to 38% of plants. There was no obvious relationship between the incidence and quantity of *B. cinerea* in plants. *B. cinerea* was also detected in green petiole stubs in all samples, at levels ranging from 6–55% of plants. Further sampling will be done in 2009 to confirm these results.

Latent flower infection by Botrytis

Field sampling revealed a very low level of latent flower infection on the variety Elsanta but a very high level of infection on an everbearer variety. Further sampling in 2009 is necessary to confirm whether this is generally true or just a one-off event. These data will be used to validate a *Botrytis* prediction scheme developed at EMR based on open-field data.

Control of fruit infection using Binab (*Trichoderma* spp.)

Binab was applied once as a spray (Binab TF WP) and subsequently as a dry powder (Binab T-Vector), which is transmitted to flowers by honey bees and bumble bees. The efficacy was evaluated for control of flower infection, fruit infection and fruit rot in a replicated experiment at ADAS Boxworth. *Trichoderma* spp. were successfully transferred to flowers by the bees. The incidence of latent flower infection by *B. cinerea* was significantly reduced using the Binab products compared with untreated and fungicide-treated plants. However, Binab products did not significantly reduce either latent fruit infection or visible fruit Botrytis. The proportion of total fruit weight visibly affected by Botrytis rot was 4.0% in untreated plants and was not significantly reduced by any of the treatments, including use of Binab products (4.7%), a four-spray fungicide programme (2.9%) or a combined Binab/fungicide programme (4.8%) during flowering.

Black spot

Colletotrichum acutatum was isolated from the crowns of three of the five samples. Neither *C. acutatum* nor *Podosphaera aphanis* were detected in crown tissue by PCR tests for these fungi.

European tarnished plant bug

It was hoped to quantify the relative attraction of candidate herbaceous flowering plants and cover crops to the European tarnished plant bug (*Lygus rugulipennis*). *Chenopodium album* (fat hen) and *Matricaria recutita* (mayweed) were sown as they are known to attract *L. rugulipennis*; these plants then acted as a source in experiments to compare the attractiveness of other plant species to the pest. The chosen trap plants were *Artemisia vulgaris* (mugwort), *Matricaria recutita* (scented mayweed), *Medicago sativa* (lucerne-alfalfa), *Sinapsis arvensis* (charlock-mustard) and *Vicia sativa* (common vetch). All, except mugwort, germinated well. Samples of arthropods were collected from the trap plants and results showed that, overall, the highest numbers of *L. rugulipennis* nymphs were collected from mustard and mayweed. Lower numbers of *L. rugulipennis* adults were collected from lucerne than from the other three plant species.

A mark-recapture experiment was undertaken to quantify the attractiveness of the trap plants to *L. rugulipennis*. Source plants were sprayed with a protein marker and the trap plants sampled for *L. rugulipennis* adults 2 and 5 days after treatment. The ELISA analysis of these collected individuals is currently in progress.

In order to develop suitable lures for hexyl butyrate (a compound that will be tested as a repellent for *L. rugulipennis* in field experiments in 2009), measurement of release rates from different types of dispenser are in progress in a laboratory wind tunnel. Results obtained show that it will be possible to develop a vial dispenser that will continue to dispense hexyl butyrate for more than 77 days in the field.

Aphids

To evaluate the effectiveness of flowering plants to attract aphid predators and parasitoids, *Medicago sativa*, (lucerne), *Silene dioica* (red campion) *Galium verum* (lady's bedstraw), *Leucanthemum vulgare* (ox eye daisy), and a mixture of *Centaurea cyanus* (cornflower) + *Chrysanthemum segetum* (corn marigold) and *Anthemis arvensis* (corn chamomile) were sown in a replicated block design around a commercial strawberry plantation. Unfortunately

many of the plots became overgrown with thistles and it was only possible to sample the flower mix plots. Both predatory arthropods and the pest *L. rugulipennis* were found on these plots.

To evaluate the effectiveness of plant derived semiochemicals to attract aphid predators and parasitoids, laboratory experiments are assessing the effect of different release rates of four plant volatiles on *Orius laevigatus*, a predator that is often abundant in selectively sprayed plantations. One of the volatiles is methyl salicylate which has been shown to be attractive to beneficial species in other crops. This work is being done in olfactometry choice test experiments.

Suitable dispensers for methyl salicylate and one other attractive volatile are currently being developed. Initial work has focussed on determining release rates of methyl salicylate from two types of polyethylene sachet. Release of the compound was rapid; all the material (100 mg) was released within 10 days. Further work using polythene vials is in progress.

Strawberry blossom weevil super trap

Excellent progress has been made towards developing a highly attractive 'super' trap for strawberry blossom weevil that combines visual, host plant volatile and sex aggregation pheromone attractants.

Work in collaboration with Bioforsk, Norway has shown that the attractiveness of the strawberry blossom weevil aggregation pheromone can be increased by > 3 fold by synergising the pheromone with a volatile substance from strawberry flowers. Work in 2009 will test whether additional benefit can be gained from other common volatiles from strawberry foliage and flowers. Importantly, green funnel traps with white cross-vanes were shown to be more effective and practical than the sticky stake traps formerly used with the pheromone. Thus two important steps towards developing a 'super' trap were made in the first years work.

Financial benefits

Botrytis, mildew, black spot, aphids, blossom weevil and capsid bugs are very common problems wherever and however strawberries are grown in the UK. A very high percentage of strawberry plantations are infected by these pests and diseases. No quantitative data on losses is available but conservatively assuming 10% of the crop is lost as a result of these infestations, this is equivalent to 5,074 tonnes of strawberries, worth £21 million.

To calculate the expected annual added value that might result from a successful project, it is assumed that it will lead to an average halving in losses in the current crop to 5%, i.e. an additional £10,623 million of UK sales. In addition, the improved consumer acceptability of UK strawberry growing compared to foreign competitors will reduce imports by 10%, yielding an additional £17 million of sales. It is possible that increased consumer confidence in strawberries will also grow the overall market marginally.

Action points for growers

There are no action points for growers at this early stage of the project.