IMPROVE CONTROL OF CABBAGE STEM FLEA BEETLES ON OIL SEED RAPE

A fera led collaborative R&D model

ENIGMA

Cabbage stem flea beetle (CSFB) is a pest that primarily affects crops in the brassica family, such as oilseed rape (OSR), cabbage and other cruciferous plants. Since the 2013 ban on neonicotinoid seed treatments, controlling cabbage stem flea beetles in OSR crops has primarily relied on pyrethroid insecticides.

Unfortunately, this has led to resistance in beetle populations, making these insecticides less effective. Farmers are now struggling to protect their crops and are producing smaller yields of this important crop.

Grown mainly for its oil rich seed, it is the third-largest source of vegetable oil in the world. Oilseed rape is an important part of many arable rotations for UK farmers.

Since the ban on neonicotinoid seed treatments, farmers have limited options to manage CSFB infestations, causing the heavy reliance on pyrethroid insecticides.

The overuse of such insecticides and the lack of viable alternatives has caused the beetles to develop a resistance, minimising the profitability of growing OSR.

As resistance continues to grow, traditional chemical solutions are no longer sustainable, threatening not only the viability of OSR as a crop but also the broader agricultural landscape, which relies on OSR for oil production, livestock feed, and soil health.

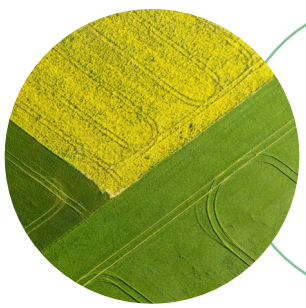
The challenges of growing OSR have significantly reduced its hectarage over the last decade, so there is a pressing need for the industry to collectively address the aforementioned challenges and ensure OSR remains a profitable and viable crop for UK farmers.

Oilseed rape is most vulnerable at emergence when feeding damage to the cotyledon and first leaves caused by adult CSFB can completely destroy the plant and ultimately the crop. Those plants which do survive are susceptible to larvae which burrow into and feed in young plants reducing the yield further.

The resistance of CSFBs to pyrethroids is primarily due to metabolic resistance, which is a result of increased activity of detoxifying enzymes, which protects insects by making insecticides less effective. These detoxification enzymes can be inhibited by botanical compounds which can help restore the effectiveness of conventional insecticides allowing them to work as intended.

This approach not only enhances insecticide efficacy but also contributes to more sustainable pest management practice by reducing the need for higher doses of chemical treatments and lowering the risk of further resistance development.

Combining botanical biopesticides with traditional insecticides represents a forward-thinking strategy to combat metabolic resistance, safeguarding crop yields and promoting a more sustainable approach to pest control.



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Field-rates doses (FRD) of pyrethroids were largely ineffective when tested in the laboratory against populations of adult CSFB collected from farms near York, demonstrating high resistance to pyrethroids.

When used in combination with botanical oils, the efficacy of pyrethroids is not only restored, the amount of pesticide required for effective control can also be substantially reduced.

The combined treatment increases mortality 2.4 - 3.8-fold. To achieve this increase in efficacy the botanical must be applied in advance (at least 30 minutes) of the pyrethroid treatment.

ENIGMA V

The primary aim of this Enigma project is to transfer the efficacy of combined products demonstrated in the laboratory into practical use in the field, towards improving OSR yields through a sustainable use of pesticides.

Enigma VI will assess the effectiveness of biopesticides, which contain botanical oils that were effective under laboratory conditions.

The botanical biopesticides and pyrethroid insecticide will be evaluated against adults CSFBs on plants in glasshouse trials. Each product will be evaluated both alone and in combination to compare their performance and determine whether the botanical biopesticide can enhance the efficacy of the pyrethroid.

Field Trials Based on the results from our glasshouse trials, we will select the most promising biopesticide and pyrethroid combinations for field testing. We will set up at least four plots for each treatment—no treatment, pesticide only, biopesticide only, and a combination of biopesticide and pesticide.

Each plot will be monitored for damage from adult CSFBs and larval infestation.

Non-Target Impacts To assess the broader environmental impact, we will monitor non-target species. Enhancing the effectiveness of pyrethroids against CSFBs could potentially increase their toxicity to other insects.

We will use various methods, such as pitfall traps for ground-dwelling insects and yellow pan traps for flying insects, to evaluate the effects on non-target invertebrates. These will be compared between treated and untreated plots, and the invertebrates will be classified into different groups.

OUTPUTS

- CONFIRMING WHETHER THE EFFICACY OF A PYRETHROID PESTICIDE CAN BE RESTORED TO REDUCE CSFB DAMAGE TO OSR.
- DETERMINING THE OPTIMAL PESTICIDE / BIOPESTICIDE COMBINATION FOR EFFECTIVE CONTROL.
- WORKING WITH PROJECT PARTNERS TO INVESTIGATE METHODS TO IMPROVE ORS YIELDS AGAINST CABBAGE STEM FLEA BEETLES THROUGH A SUSTAINABLE USE OF PESTICIDES.
- AN UNDERSTANDING OF THE LEVEL OF RESISTANCE WITHIN FIELD POPULATIONS OF CABBAGE STEM FLEA BEETLES.

HANNAH FENTON
SENIOR SCIENTIST AND PROJECT MANAGER
ENIGMA V

NEIL AUDSLEY
SCIENCE LEAD
ENIGMA V