Final Project Summary

Project title	Validation of an integrated pest management (IPM) strategy for pollen beetle to minimise the development of insecticide resistance.		
Project number	2140005	**Final Project Report**	PR590
Start date	May 2013	**End date**	March 2017
AHDB Cereals & Oilseeds funding	£120,000	**Total cost**	£120,000

What was the challenge/demand for the work?

Recent AHDB Cereals & Oilseeds funded studies on pollen beetle (AHDB project No. 495 Ellis & Berry, 2012, and AHDB Project No. 504 Cook et al, 2013), have produced updated thresholds and tools for Integrated Pest Management of this pest and stimulated much discussion. The widespread occurrence of pyrethroid-insecticide resistant pollen beetles in the UK makes it imperative that treatments are not applied unless necessary to protect yield.

This project was designed to provide farmers and agronomists with clear information on how to assess the risk of pollen beetle damage in order to make rational decisions about the need for pest control. In particular, this related to validating and refining the threshold and also considering how best to monitor the pest and make use of on-line tools to predict the timing of migration.

How did the project address this?

This project was done in response to industry feedback to refine guidelines for pollen beetle control. Specific objectives were:

1. To investigate the impact of different numbers of pollen beetles on the yield of winter and spring oilseed rape in the presence or absence of insecticide treatments in crops with a range of plants/m^2 and canopy size.
2. To simulate pollen beetle feeding damage by pruning buds to provide data on crop tolerance at a range of levels of bud loss to supplement data from objective 1.
3. To investigate the impact of pigeon grazing and plant population on the ability of plants to compensate against pollen beetle damage by simulating pigeon grazing using a defoliation treatment (mowing).

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4. To investigate whether or not infestation by cabbage stem flea beetle (CSFB) larvae has an impact on response of oilseed rape plants subjected to simulated pollen beetle damage by bud pruning.
5. To calibrate pollen beetle traps developed in project No. 504 against field populations of the pest.
6. To provide guidelines on how best to monitor pollen beetle numbers.
7. To validate the accuracy of the Bayer Pollen Beetle Predictor on-line decision support tool for pollen beetle immigration risk under local conditions and investigate effects of use on spray timing and control.

What outputs has the project delivered?

- Pollen beetle numbers did not exceed the insecticide spray threshold in field experiments suggesting that that sub-threshold populations of the pest are the norm rather than the exception.
- There was no evidence to suggest that simulated pollen beetle damage (removing 100% of buds from the primary raceme) caused yield loss, whereas simulated pigeon damage (mowing) reduced yield but less than anticipated. Yield was significantly reduced by 0.17 and 0.54 t/ha at two of four sites but may have been partly caused by plants being mown after they had started to extend.
- Simulated pigeon damage (mowing) did not increase susceptibility to simulated pollen beetle damage (bud pruning) and crops with low plant populations were no more susceptible to simulated pollen beetle damage than those with high plant populations.
- There was no evidence to suggest that crops with up to seven CSFB larvae/plant had an increased susceptibility to simulated pollen beetle damage.
- An Oecos pollen beetle monitoring trap with an attractive lure was more effective than unbaited yellow sticky traps. The trap can be used to detect pest movement and abundance but as yet it has not been calibrated to detect threshold numbers of pollen beetles.

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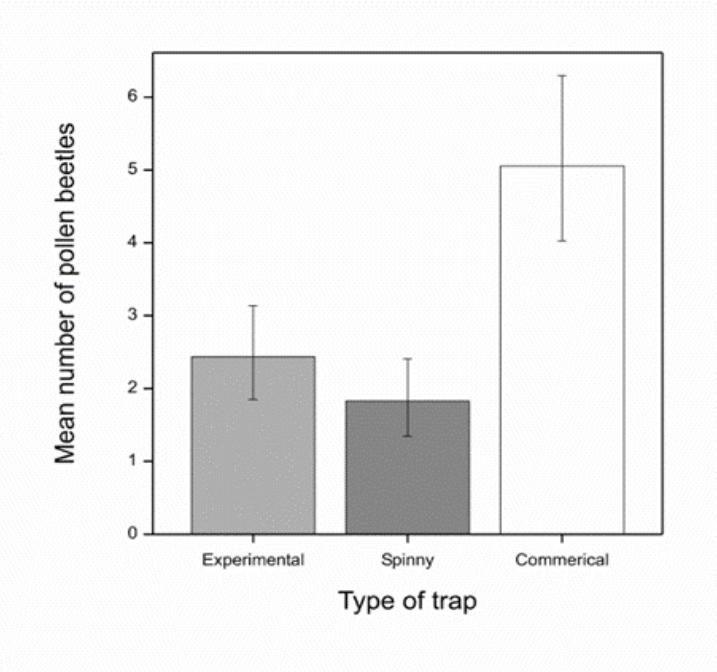

Figure 1. Numbers of adult pollen beetles caught on three types of monitoring trap (Commercial Oecos Pollen Beetle Monitoring trap, baited with volatile lure, Experimental yellow sticky trap (unbaited) used in AHDB Project 504 (RD-2007-3394) and a Spinning version of the Experimental trap) at Rothamsted Farm in 2014

- Pollen beetle immigration is usually greatest on the north east side of the field (opposite to the SW prevailing wind) and this should be the focus for location of traps and crop walking.
- The Bayer Pollen Beetle Predictor (BPBP) accurately predicted the peaks of pollen beetle migration helping to focus monitoring effort to when it is most needed. It reduced monitoring effort by about a third compared with weekly in-field assessments and also provided early and accurate detection of when the threshold was exceeded.
- Monitoring (weekly or via use of the BPBP) resulted in a reduction in insecticide use by about one-third compared with prophylactic treatment.
- In line with other experiments in this project, insecticide use (at sub-threshold levels) did not significantly increase yield in comparison with untreated controls.

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- Overall the project has demonstrated that pollen beetle numbers in the UK rarely reach damaging levels and that current thresholds and available tools for monitoring and risk assessment provide a good basis for an IPM strategy for this pest that minimises unnecessary insecticide treatment.

Who will benefit from this project and why?

The project will benefit farmers and agronomists by improving their confidence to not spray against pollen beetle when numbers are below threshold. This should help to limit the further development of pollen beetle resistance to pyrethroids. Both the threshold and the monitoring tools have been shown to be vital components of an IPM strategy against the pest. The threshold has been further refined and the monitoring trap and Pollen Beetle Predictor allow monitoring effort to be focussed to when it is most needed, reducing monitoring costs. Limiting insecticide use will save growers money and will also benefit non-target species some of which provide natural control of pollen beetle and other pests of oilseed rape.

If the challenge has not been specifically met, state why and how this could be overcome

It was difficult to locate crops that were above threshold for pollen beetle but control of numbers below threshold did not increase yield. This should give farmers/agronomists greater confidence not to treat against this pest when at sub-threshold levels. Numbers of pollen beetles recorded in this study are consistent with the FERA pollen beetle survey data from 2004 to 2014; this survey found that over the 11 years of sampling, only 16 sites exceeded the original 15 beetles per plant threshold out of a total of 462 studied (3.5%), and five of these were in 2004. Therefore the numbers of beetles observed in experiments done in this study can be considered typical and representative of the vast majority of UK sites.

Lead partner	Dr Steve Ellis, ADAS UK Ltd
Scientific partners	Dr Sam Cook, Rothamsted Research
Industry partners	Oecos (in kind)
Government sponsor	N/A