Annual Project Report
August 2021 to July 2022

Project title	Testing insecticide resistance management strategies		
Project number	21120163		
Start date	01 August 2020	**End date**	31 July 2023

Project aim and objectives

Aim: Identify optimal insecticide resistance management (IRM) strategies.

1. Experimentally validate changes to resistance management guidance.
 1.1 Test the effect of IRM strategies on the build-up of resistant populations.
 1.2 Data analysis.
2. Reporting and KE.

Key messages emerging from the project

- The quantitative PCR (qPCR) assays developed in year 1 have been optimised to allow accurate determination of the proportion of aphids with MACE and super-kdr resistance in a mixed sample.
- The third IRM experiment shows that the methodology works; the IRM strategies drove selection for resistance and the qPCR assays enabled selection to be measured for each strategy.

Summary of results from the reporting year

- qPCR assay for MACE resistance optimised by testing shorter PCR primers. Five candidate primers identified and tested. All showed an improvement on the previously used primer. Two candidate primers were taken forward for further testing, resulting in the identification of a primer that improved the accuracy and reproducibility of the assay.
- Tested new primers, probes, and a range of annealing temperatures for the qPCR assay for super-kdr resistance. No improvement over assay developed in previous year was found.
- Both qPCR assays were sufficiently accurate and reproducible for the purposes of the IRM experiments. This is the first time quantitative assays have been developed to determine the proportion of resistant individuals in a sample of peach-potato aphid (*Myzus persicae*). This presents the potential to develop these assays for wider uses, such as testing a sample of aphids taken from a crop for a range of resistance mechanisms. This is a substantial shift from currently available methods.

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- Third IRM experiment of the project was conducted, investigating the rate at which resistance builds up in cage populations of *M. persicae*. Three IRM strategies were compared: 1) rotation of mode of action (MoA) (each applied at their 'label' rate), 2) mixtures of two MoA (each mixed at their 'label' rate) and 3) reduced dose mixtures of two MoA (each mixed at lower than 'label' rate so that mixture itself provides a similar level of control to that in strategy 1).
- The experiment ran for 12 weeks, and six rounds of insecticides were applied. There were no significant differences between the numbers of aphids under each strategy throughout the course of the experiment.
- Differences in the build-up of resistant aphids was evident between the strategies. Statistical analysis is yet to be completed.
- Results will be shared once further experiments are completed.

Key issues to be addressed in the next year

- Analyse data from the third IRM experiment.
- Carry out four more IRM experiments and analyse the data.
- Disseminate findings and complete the final report.

Lead partner	ADAS
Scientific partners	Rothamsted Research
Industry partners	BBRO, Corteva
Government sponsor	n/a

Has your project featured in any of the following in the last year?	
Events	***Press articles***
	'From theory to field' article in Crop Production Magazine – in press
Conference presentations, papers or posters	***Scientific papers***
Update to Insecticide Resistance Action Group (IRAG) – 9/11/21 Update to IRAG – 27/4/22	
Other	