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| **Project title:** | Pests, Plants and Parasitoids: how does climatic variability affect tritrophic interactions in apple orchards? |
| **Project number:** | **CTP_FCR_2017_5** |
| **Project leader:** | Dr.Jake Bishop, University of Reading<br>Dr. Richard Walters, University of Lund<br>Dr. Robbie Girling, University of Reading<br>Dr.Glen Powell, NIAB EMR |
| **Report:** | Annual Report 2020 |
| **Previous report:** | Annual Report, October 2019 |
| **Key staff:** | Stuart Edwards |
| **Location of project:** | University of Reading |
| **Industry Representative:** | National Association of Cider Makers<br>Worldwide Fruits<br>AHDB |
| **Date project commenced:** | October 1st 2017 |

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*[The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.]*

## AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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# GROWER SUMMARY

## Headline

Climate change threatens species interactions in economically important crops leading to potential pest outbreaks.

## Background

Our current understanding is that species are likely to respond to temperature changes at different rates. This has implications for the control of aphid pests of apple in the future. For instance, aphids may be able to reproduce faster than their natural enemies in warmer conditions and escape control by natural means. The effectiveness of biological control may also change making them more or less efficient for pest control in the future. Understanding these changes will be crucial for pest control under future climes.

## Summary

A demand for organic produce combined with ever tightening restrictions of pesticide application has increased the necessity of understanding the intricacies of pest control under predicted future climate regimes. The optimal temperature for development of a pest often contradicts that of its associated natural enemy and this can lead to numerical advantages which vary with the disparity in rates. This project quantifies, both theoretically and using existing data for pest and parasitoid from the literature, the potential outcomes of temperature dependent developmental asynchrony over a range of mean temperatures providing insight to the efficacy of biological control under altering temperature regimes.

## Financial Benefits

Due to the legislation constraints and the potential for financial deficit through damaged crop yields understanding the effects of climatic variability on pest-parasitoid interactions is key to all crop producing practices. Understanding these trophic interactions will lead to the potential of saving money by not spraying crops with valuable pesticides at times not optimal for spraying. For example, should the ratio of pest to parasitoid exist at a level controllable by a parasitoid then it makes sense not to spray pesticides which will risk damaging the biological control population, such damage to the population risks a rebound behaviour in the pest species

## Action Points

Whilst there are no grower action points stemming directly from this project at such an early stage. Early indications from a literature review suggest that supporting communities of natural enemies via increased habitat complexity and through provision of additional resources such as nectar will be crucial in ensuring optimal pest regulation by natural enemies in the future.