

P 102 Disturbing ant-aphid mutualism for better biological control of aphids

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Introduction

- Ants and myrmecophilous aphids have a complex mutualistic relationship.
- Rosy apple aphid, *Dysaphis plantaginea* (Passerini), is a serious pest of apple, and is commonly attended by the ant, *Lasius niger* (L.).
- Ants feed on the sugar rich honeydew of aphids and provide protection against natural enemies.
- Sticky barriers exclude ants from trees, but application is time consuming, and may exclude important natural enemies (e.g. *Forficula auricularia* L.).

Objective

- Can effective biological control of *D. plantaginea* on apple be achieved by disturbing ant-aphid mutualism by application of an alternative sugar source for ants?



Material and methods

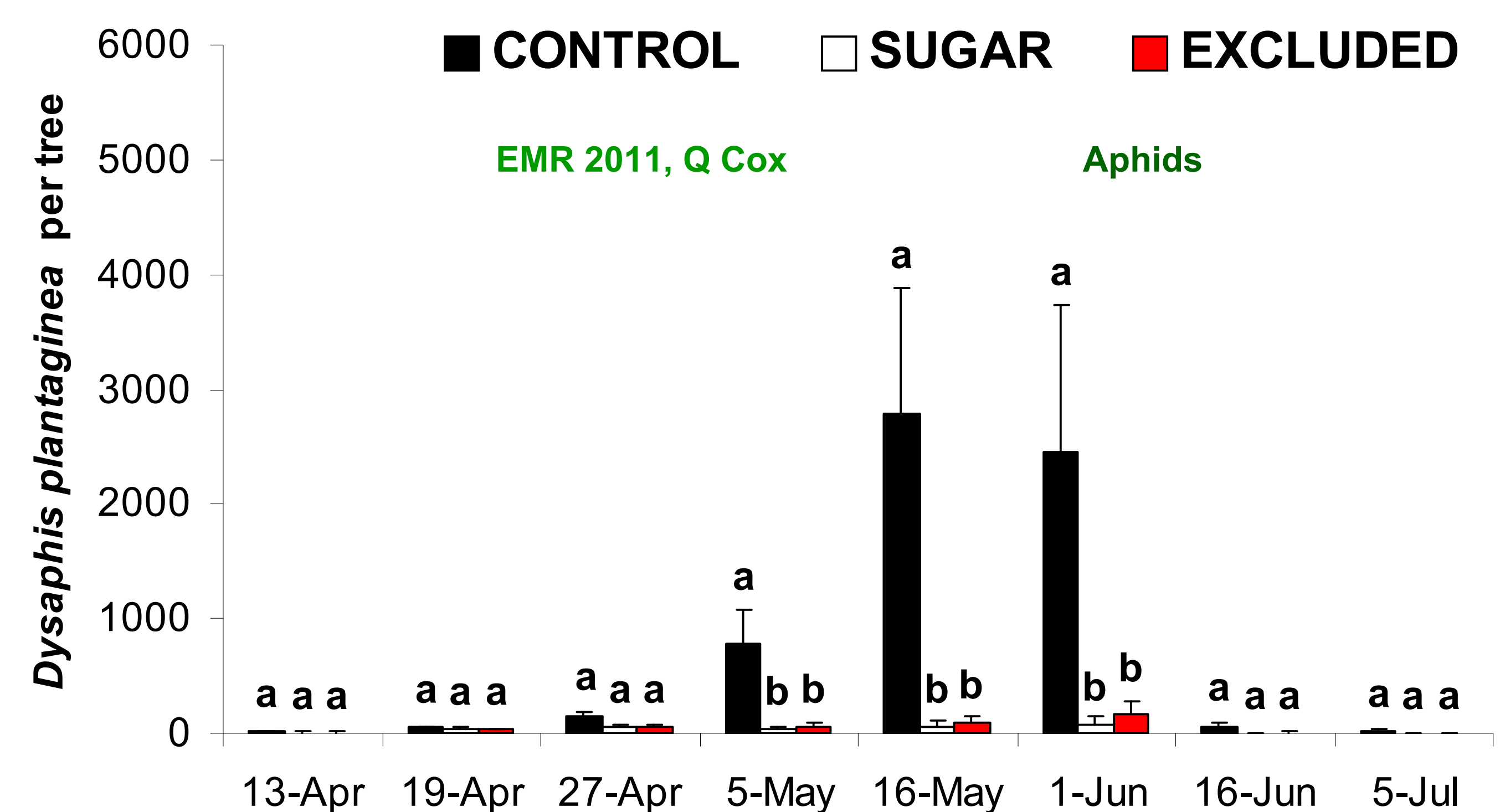
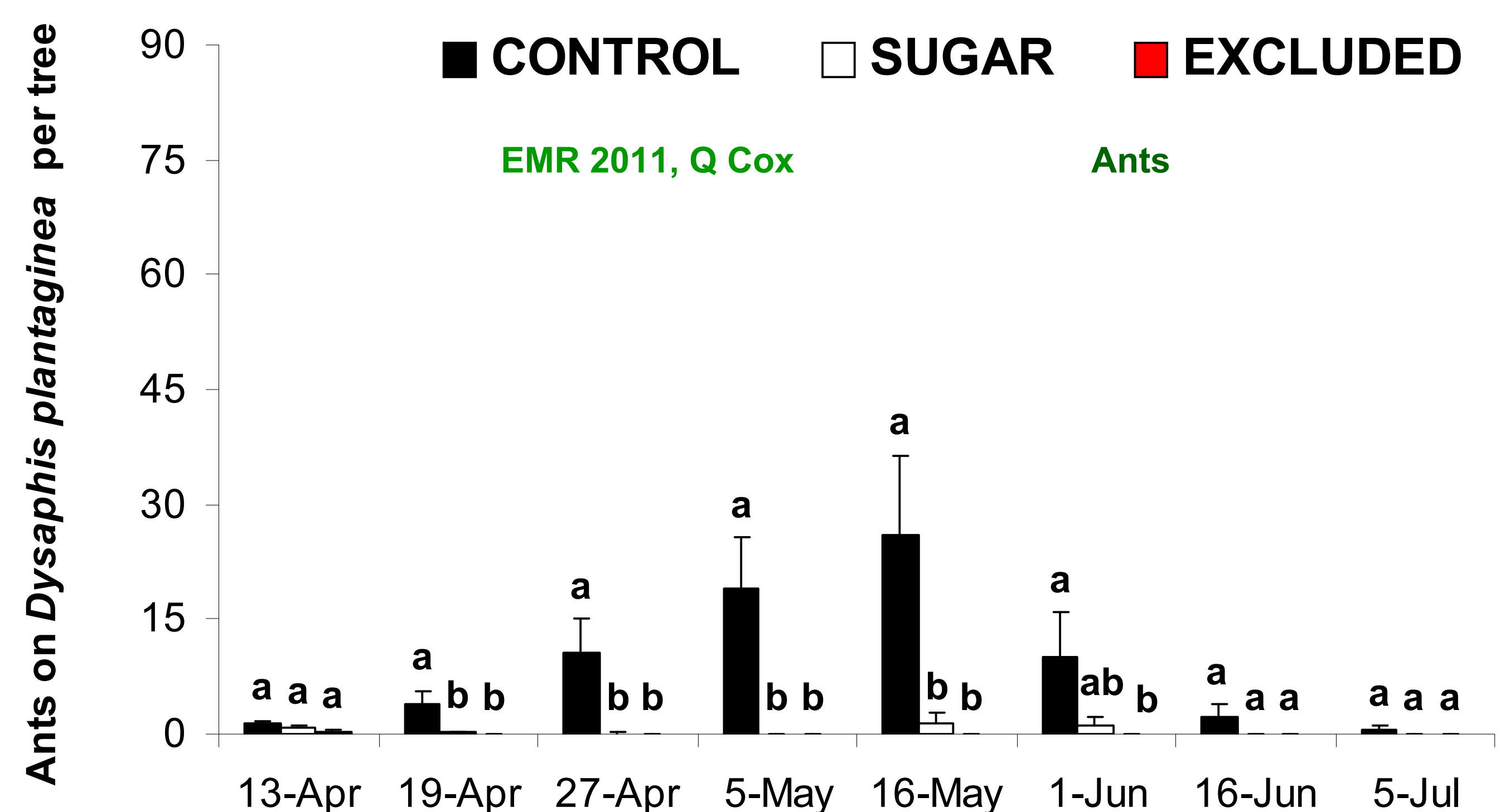
- Replicated orchard experiment in three organic apple orchards (East Malling Research (EMR, UK) in 2011 (cv. Queen Cox and Bramley) and 2012 (cv. Fiesta)) and (Research and Extension Centre for Fruit Growing, Újfehértó (Hungary) in 2013 (cv. Topaz))
- There were 3 treatments (see pictures on left):
 1. Sucrose solution in bottle feeders at the base of tree trunks
 2. Sticky barrier bands around tree trunks (positive control)
 3. Untreated trees (negative control)
- Preparation of aphid colonies for assessments:
 - Labelling of the original fundatrices (EMR, UK, 2011, 2012)
 - Artificial aphid infestation (Újfehértó, Hungary, 2013)
 - Marking the original and new colonies
 - Numbering of leaves within each colony
- Sampling:
 - Spring, early summer
 - Regular field counts of aphids, ants and predators

Results

- Sticky barriers on the tree trunks excluded most ants from the tree canopy, resulting in a rapid decrease of *D. plantaginea* populations as a result of increased activity of natural enemies (see pictures below).
- Sticky barriers, but not sucrose feeders, prevented *F. auricularia* climbing the trees.
- Sucrose feeders reduced the activity of *L. niger* in the tree canopy. Ants were distracted from aphid searching or abandoned the colonies they were already tending.
- The loss of ant protection caused rapid reduction in *D. plantaginea* numbers by increasing the activity of natural enemies.
- Occasionally, the ants did not completely stop visiting the colonies, but they stopped or reduced their efforts in protecting the aphids.
- Similar results were found for all 4 apple varieties, but only results for cv. Cox are shown (right).

Conclusions

- Application of sucrose solution can be an alternative way to reduce the level of protection of the aphid colonies by ants, and through this to support biological control of *D. plantaginea* by natural enemies.
- This method is likely to be applicable to organic growing systems.
- Further work is needed to develop an economical and more practical sugar feeder formulation, which could be used in commercial orchards.



Above: numbers of ants and aphids through the growing season

Left: Common natural enemies on apple trees

