



Do we use a 'bouquet' or a 'KISS' to win a natural enemy's heart?

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Summary

There is a controversy surrounding the approach used to provide flowers in conservation biological control. One approach involves the provision of a single flower species ('KISS'), while the other involves multiple flower species ('bouquet'). We compared these approaches and found no differences in their effect on natural enemy survival and pest control. However, the complex mixture patch conserved a greater diversity of beneficial species and bloomed over a longer period, but did not improve pest control.

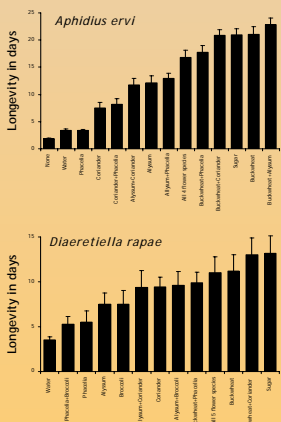
Introduction

The reliance of many natural enemies on nectar and/or pollen provides the opportunity to enhance biocontrol via the provision of flowers. Some practitioners recommend the use of a single flower species to conserve a few target natural enemies (i.e., a 'Keep It Simple, Stupid' or 'KISS' approach). Others argue that the use of multiple flower species results in improved pest suppression because mixtures support a greater assemblage of beneficial species (i.e., a 'bouquet' approach). In this study we examined the influence of single and multi-species flower patches on the fitness and abundance of natural enemies and on pest populations in adjacent crops.



Methods

In the laboratory, single and mixtures of flower species were ranked for their affect on the longevity of two aphid parasitoids. The influence of single and multi-species flower patches on various beneficial insects was also tested in broccoli and lucerne crops. Flower patches comprised buckwheat (*Fagopyrum esculentum*) only, phacelia (*Phacelia tanacetifolia*) only, a simple mixture of buckwheat and phacelia, a complex mixture of buckwheat, phacelia and a commercial seed blend, or the existing crop as a control. Assessments of natural enemy density and impact on pest suppression were conducted in flower patches and in the adjacent crop.



Results

The parasitoids *Aphidius ervi* and *Diaeretiella rapae* (Hymenoptera: Braconidae) did not live longer on a 'bouquet' of flower species than its best component species (Fig. 1). In the field, the complex mixture flower patch bloomed significantly longer than other flower patches (Fig. 2).

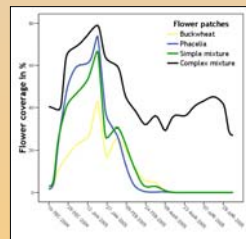


Fig. 2. Blooming period of flower patches in broccoli

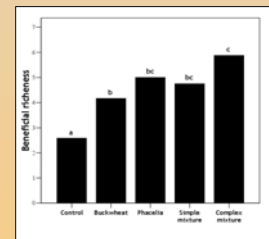


Fig. 3. Beneficial richness in flower patches

Patches that contained buckwheat had the highest density of brown lacewings (*Micromus tasmaniae*) and ichneumonid wasps. Patches with phacelia had the highest densities of bumble bees (*Bombus hortorum*), honey bees (*Apis mellifera*) solitary bees (*Lasioglossum* spp.) and hoverflies (*Melanostoma fasciatum*). The complex mixture flower patch supported a greater diversity of natural enemies and pollinators than did the buckwheat only flower patch (Fig. 3). But there was no difference between the simple mixture of buckwheat and phacelia and the complex mixture that included a commercial random seed blend. The increased abundance and diversity of beneficials did not result in boosted pest control in the adjacent broccoli and lucerne.

Fig. 1. Longevity of two aphid parasitoids on single and multiple flower species

Conclusion

Our results highlight the potential to 'engineer' the suite of beneficial species in agroecosystems by 'customising' floral resources provided. We recommend the use of customised flower mixtures to boost pest control. Such mixtures allow for selective conservation of beneficial species and provide an extended flower supply because flowering periods overlap. These results can also inform decisions on arthropod conservation policy and practice on farmland.