

# Boosting the population of natural helpers

## Summary

Most of us are aware of the importance of predatory insects in keeping pests under control. However for them to do their optimum job we need to make our garden environment a favourable place for them to feed, breed and rest. Many predators such as hoverflies and lacewings require a plentiful supply of pollen and nectar, to feed the adults so they have enough resources to lay their eggs. Their egg laying is often targeted in places where the larvae can hatch out and eat copious amounts of aphids. One of the key challenges is to ensure that we have enough predators around, early in the growing season to control the aphids in June and early July.

In 2019 we decided to test coriander, fennel, phacelia, buckwheat and sweet alyssum, to assess their effectiveness in attracting predatory insects. We wanted to compare buckwheat and sweet alyssum, which were new to us, with coriander, fennel and phacelia, which we had already tested in 2005. Ideally we wanted plants that were easy to grow, produced many flowers over a long period and were attractive to beneficial insects, especially hoverflies.

Observations of numbers of cabbage aphids and black bean aphids showed the greatest numbers in June, decreasing in July, down to much lower levels in August. This confirms that early flowering is vital to support a good predator population in June and July.

Alyssum was the first to flower (average 10<sup>th</sup> June) but buckwheat started flowering only 5 days later, and continued to flower for a longer period of 88 days, the longest duration of all the species tested. It was also the most reliable at flowering, and the most vigorous, with 90% of participants stating it produced many flowers covering the plant.

When looking at the predators, we focused on hoverflies, as lacewings, ladybirds and parasitic wasps visited the plants in much lower numbers.

Different plants attracted different numbers of hoverflies in different months through the growing season. Alyssum attracting the most hoverflies in June, whilst coriander, phacelia and buckwheat attracted far more in July. Buckwheat and phacelia attracted most in August.

Overall we think buckwheat was the most solid performer. It may be the least familiar of the plants but it deserves to be grown more widely. It was reliable, vigorous, rapid to flower, and attracted predators over the longest period. As it is so rapid to flower, we would recommend throwing a few seeds down whenever you have a bit of spare growing space to bring in a few more predators.

## Background

Natural helpers make a big contribution to pest management in organic growing. Creatures such as ladybirds, hoverfly larvae, lacewings, spiders and carabid beetles are all predators that consume insect pests such as aphids (Verkerk, 2001; Solomon *et al*, 1999). There are also specialist parasites such as parasitic wasps that have evolved a life cycle that kills aphids and other pests.

It is clear that these natural helpers can be highly effective in controlling pest populations, but in order for this to happen, they have to be around in sufficient numbers in the right place at the right time.

Providing food sources such as pollen and nectar can help to sustain or augment populations of these predators and increase their effectiveness (Colley and Luna, 2000). Research has shown the choice of plants is key to this. Firstly, the plant has to have a suitable shape and structure, so that the insects are able to feed from the flowers. This has been studied in detail by van Rijn and Väckers (2016) who found that hoverflies were only able to access the nectar from shorter flowers, with plants in the apiaceae family (eg coriander or fennel) and buckwheat being particularly suitable. Phacelia, a common attractant plant, has a flower structure that provides accessible pollen, but the nectaries are more difficult to access. The study also showed that hoverflies showed better lifespan and fecundity when feeding from plants that provided good access to both pollen and nectar.

Secondly it must be flowering at a time when the natural helper is needed for pest control. Data from AHDB showed that Brassica aphids (*Brevicoryne brassicae*) and the most common lettuce aphids (*Myzus persicae*) showed peak populations in June. Black bean aphids (*Aphis fabae*) peaked a bit later in July and all aphids were at very low levels in August. Therefore early flowering plants are essential to boost predator populations in the June period.

Garden Organic last did a similar trial in 2005, and found that although phacelia was easy to grow, other species, particularly coriander and fennel were more attractive to predators. We wanted to repeat this experiment, including some of the same plants as before, and additionally investigating at the potential of buckwheat (Laubertie *et al*, 2012) and sweet alyssum (Colley & Luna, 2000) which are easy to grow and have also been shown to be effective at attracting predators.

## Aims

The aim was to examine how effective 5 different plants are at attracting predators throughout the growing season in a range of gardens around the UK. These were: Coriander (*Coriandrum sativum*), Fennel (*Foeniculum vulgare*), Phacelia (*Phacelia tanacetifolia*), Buckwheat (*Fagopyrum tataricum*) and Alyssum (*Lobularia maritima*) The work examined growth, time of flowering and the number of beneficial insects each plant type attracted at different times during the growing season. Aphid infestations on surrounding vegetable plants were also examined.

## Results

### Response rate

216 people signed up to do the experiment, 54 responses were returned, response rate 25%. This was lower than the typical rates which are generally above 40%.

### Growth of plants

The phacelia and the buckwheat were the most vigorous, with 80 – 90% of participants stating that they either grew well or were vigorous. Fennel and alyssum were the least vigorous. However, common experience has shown that both of these plants are easy to grow. Fennel can also grow as a perennial and can self-seed so is often more vigorous in subsequent years.

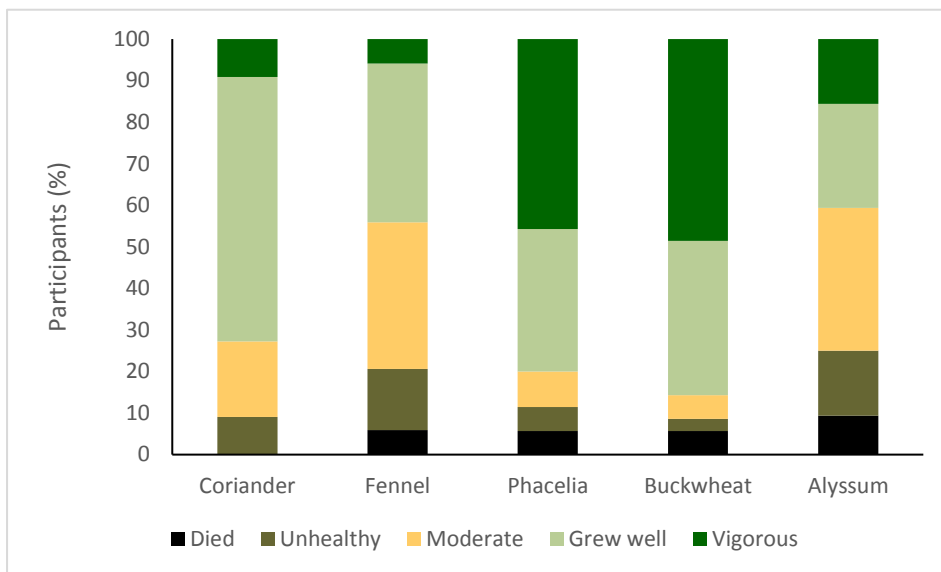
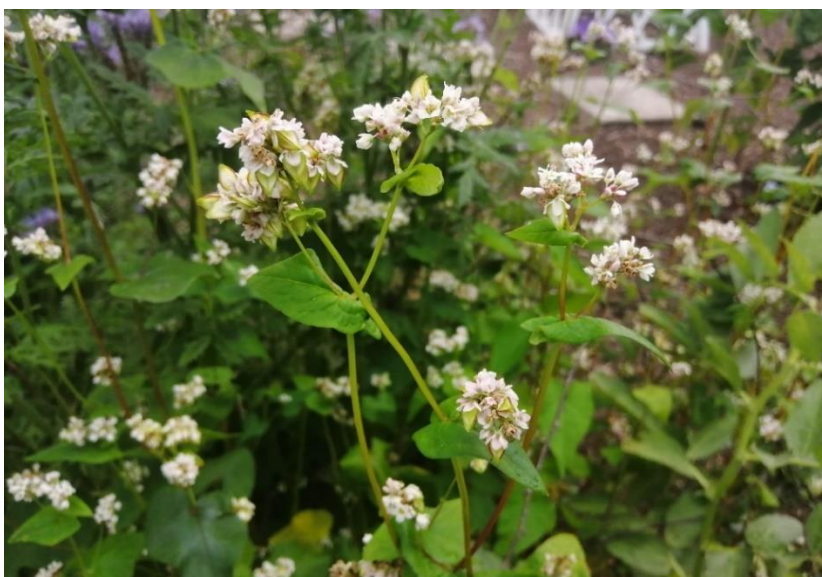


Figure 1 Growth of the plants



Buckwheat showed vigorous growth and was rapid to flower

## Flowering

Phacelia and buckwheat were the most reliable at flowering, with over 90% of participants reporting that the plants produced flowers in many places on the plant. Fennel was the least reliable at flowering, but as it is a perennial may be more likely to produce more flowers in subsequent years.

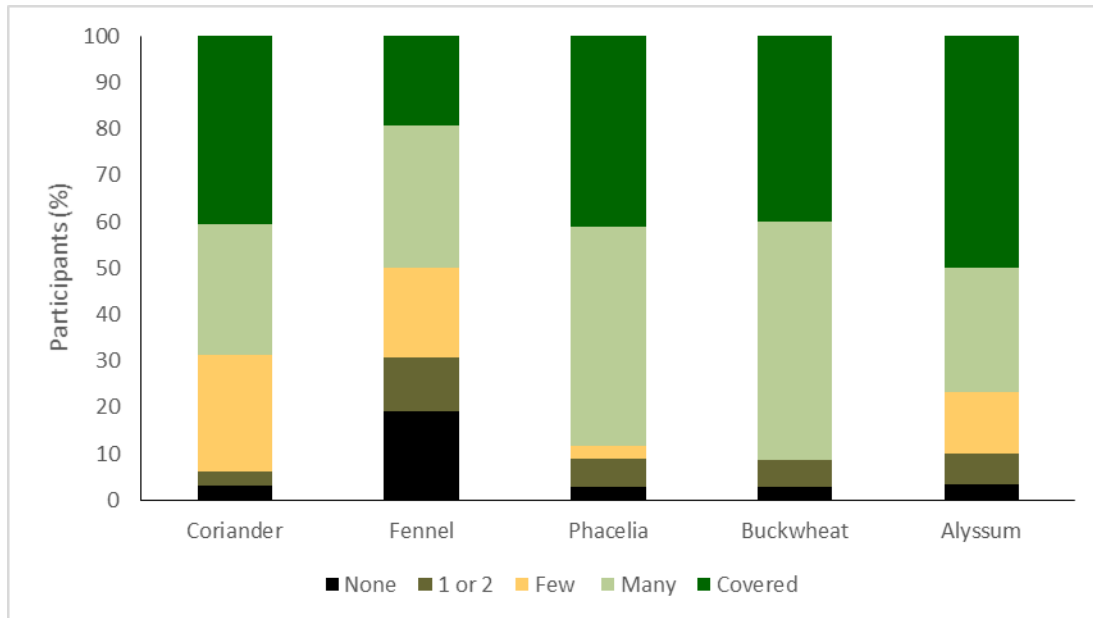


Figure 2 Profuseness of flowering

Alyssum was the earliest to flower, starting to flower on 10<sup>th</sup> June, on average. However Buckwheat flowered not long after, commencing flowering on the 15<sup>th</sup> June. Overall buckwheat also had the longest flowering duration, flowering for 88 days.

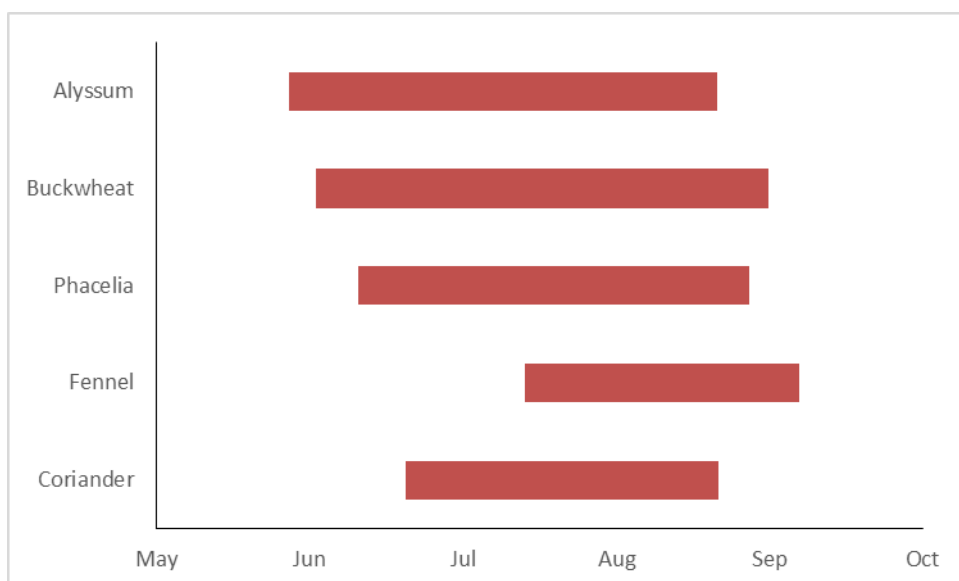


Figure 3 Flowering period

### Attractiveness to beneficial insects

Hoverflies were by far the most abundant of the insects reported with ladybirds, lacewings and parasitic wasps reported in much lower numbers. Only hoverflies are reported here, as it was difficult to discern any consistent trends with the other insects, which were only present in small numbers.

The average abundance rating was derived from assessments made by participants in a 1 m strip throughout the season, (0 = no insects, 1 = 0-5 insects, 2=5-10 insects, 3 = >5 insects).

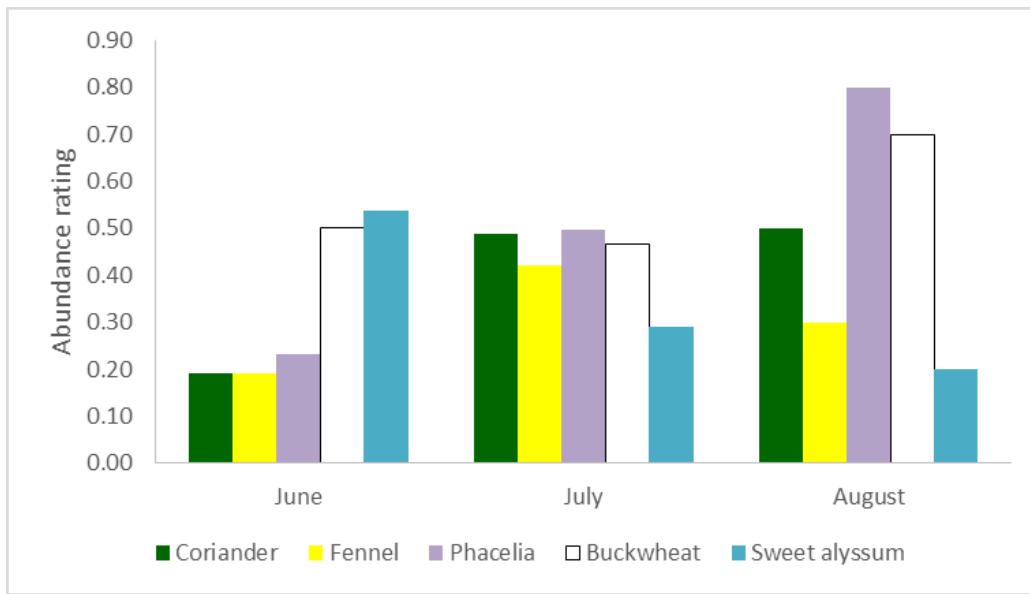


Figure 4 Abundance rating of hoverflies

The abundance of visits varied by month. In June, buckwheat and alyssum attracted most hoverflies. In July, there were fewer visits to the alyssum, and more visits to phacelia, buckwheat and coriander. In August there were most visits to buckwheat and phacelia. Overall buckwheat was a useful plant as it was early to flower and continued to attract hoverflies throughout the season.



Hoverflies on coriander (left) and fennel (right)

## Aphid monitoring

We also asked participants to monitor numbers of aphids on brassicas and beans in order to gain an idea of the aphid populations in relation to the predator populations.

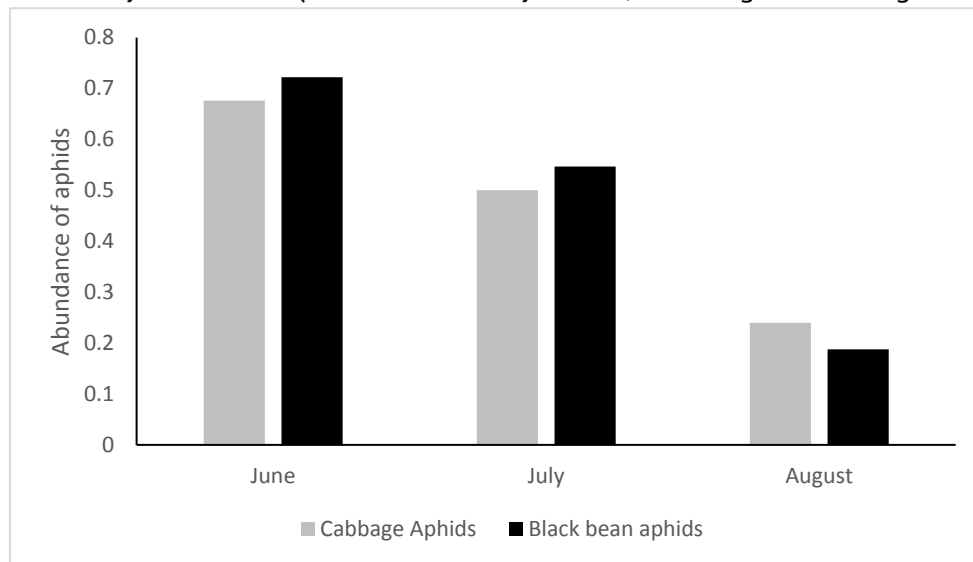
The aphid populations were assessed on a visual basis where:

0 = No aphids

1 = Few aphids (1 or 2 on a few leaves)

2 = Moderate infestation (colonies forming on some of the leaves)

3 = Heavy infestation (colonies on many leaves, crinkling and curling of leaves)



*Figure 5 Abundance of aphids*

The observations showed that aphid populations were highest in June, decreased in July and even more significantly in August. These trends were consistent with figures from the Agricultural and Horticultural Development Board, gathered from traps around the UK (AHDB, 2019). This reinforces that fact that it is important to have a good predator population early in June and July to control aphids during these weeks. Both Alyssum and buckwheat attracted predators early in the season, and buckwheat continued to attract predators throughout the season too.

## Conclusions

Here we have drawn conclusions as to the properties of each plant with respect to attracting predatory insects.

### Coriander

This plant is good at attracting hoverflies in July and August. Other studies have shown that coriander is attractive to hoverflies along with other members of the Apiaceae family (Morris & Li, 2000, Colley & Luna, 2000). It proved quite susceptible to slug damage compared to other plants. However, if coriander is being grown as a culinary herb, then, if space permits, it is worth leaving in place to continue to flower to attract hoverflies.

## **Fennel**

This was the latest to flower of the varieties, and the least reliable in establishing. This is consistent with other studies (Colley & Luna, 2000) that have shown that fennel is effective at attracting predators later in the season, when other species have finished flowering. It is also worth noting that fennel is a short-lived perennial, so, once established this would increase the reliability and result in earlier flowering times in subsequent years.

## **Phacelia**

Phacelia is a commonly grown plant used to attract beneficials and pollinators into crops. It is vigorous, has a long flowering period and attracts large numbers of bees and hoverflies. However, hoverflies are only able to access the pollen, not the nectar from this plant (van Rijn & Wäckers, 2016) so it does not provide a source of carbohydrate. Some studies (eg Hickman & Wratten, 1994) have shown that planting phacelia resulted in increases in hoverfly populations. However, in these cases, hoverflies were able to source an alternative source of carbohydrate from the honeydew from aphids. This may not always be available though, so other plants such as coriander or buckwheat are more dependable sources of food.

## **Buckwheat**

Buckwheat is a vigorous and early flowering plant that is easy to grow. It attracted many hoverflies throughout from June to August and has the advantage that its short flower shape provides both nectar and pollen for hoverflies, helping to sustain their populations (Laubertie *et al*, 2012, van Rijn & Wäckers, 2016). We would recommend it as a quick flowering plant that is attractive to predators and easy to establish.

## **Sweet alyssum**

This the earliest flowering of the plants, but not particularly vigorous, and attracted less predators in July and August than other plant species. Some studies have cited this plant as being particularly attractive to hoverflies and more attractive than coriander (Amorós-Jiménez *et al.*, 2014) whereas other studies (Colley & Luna, 2000) cite other species such as coriander as being more attractive. It is useful for compact spaces as it is smaller than the other plants.

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