

# Eat up all of your Brussels sprouts -- unless you're an aphid

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Aphids that eat Brussels sprouts are smaller than normal and live in undersized populations, which has a negative knock-on effect up the food chain according to new research published today in *Science*.

The study shows for the first time that the nutritional quality of plant food sources for herbivores has a far-reaching impact on an ecosystem as a whole, potentially impeding important functions that the ecosystem performs, such as the natural predation and control of agricultural pests.

The scientists compared aphids living on sprouts to aphids living on wild cabbages in a field experiment which took place on a farm in the Netherlands. They could see that the sprouts were of a lower nutritional value for aphids than the cabbages, because the aphids feeding on them were smaller in size, and the number of aphids living on them was fewer.

They then traced the effects up through the food chain to discover that the implications of poor nutritional quality in plants spread throughout the extended network of feeding relationships in an ecosystem known as a food web. This means that the sprouts affect not only the herbivore aphids that eat them, but also the primary parasitoid wasp predators that mummify and eat the aphids, and the secondary parasitoid wasps that in turn eat the primary parasitoid wasps.

The scientific team made this discovery by analysing the food webs associated with both types of plants. They found that food webs based on sprout-eating aphids are less complex and involve a less diverse network

of predators than those food webs based on higher quality plants like wild cabbage.

This is because larger, cabbage-eating aphids produce larger primary parasitoid predators, which in turn attract more of the opportunistic generalist feeders among the secondary parasitoids, leading to a greater diversity of species and complexity in the ecosystem. This shows that plant quality indirectly influences the foraging decisions taken by individuals higher up the food chain which ultimately determines the structure of the food web.

One of the paper's authors, Dr Frank Van Veen from Imperial College London's NERC Centre for Population Biology, explains why this is important:

"The diversity and complexity of food webs have long been seen as good indicators of how well an ecosystem is functioning, and how stable it is, but until now we had very little idea of the processes that determine diversity and complexity. Our study has shown that changing just one element, in this case plant quality, leads to a cascade of effects that impact on predators across the food web.

"If we are to predict how environmental change is going to affect ecosystems and the functions they perform, an important part of the puzzle is to understand the mechanisms by which an effect on one species propagates through the complex network of interacting species that make up an ecosystem."

Dr Van Veen adds that their research has no implications for human sprout consumption: "Our aphid study certainly does not mean sprouts aren't good for humans to eat - our nutritional requirements differ enormously from those of insects."

Source: Imperial College London

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