

# Plants release chemical weapons and deploy insect armies in their defence

March 31 2014, by Angela White

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Did you say ants? Credit: Roland H., CC BY

Animals have an easy life. They can run, hide, or bite back when predators are on the prowl. Plants cannot. Instead they have evolved to deploy a range of defence mechanisms including chemical warfare and insect armies.

To live in a hostile world, plants need defences. Some of these are

structural ones. Thorns deter herbivores from chomping on juicy fruits. Hairs or wax on leaves turns the surfaces into tricky obstacle courses for tiny insects.

There are a few [carnivorous plants](#), such as those that digest attacking insects by trapping them in plant-made pitchers of digestive juices. The pitcher plant does the trapping passively by making insects slip on its waxy surface, whereas the Venus fly trap does so by closing the "wings" of its special trap.

## **Rabbits need gas masks?**

Using chemical weapons is a more common strategy. Almost all plants that scientists have looked at [use some form of it](#).

In response to being eaten, plants release chemicals which warn nearby members of the same species that herbivores are about. These plants are able to activate defence genes, reducing their vulnerability. The wounding hormone, called jasmonic acid, is used to co-ordinate a chemical response. It increases production of anti-herbivore defence chemicals both locally and within the whole plant.

Leaf hairs can be modified into weapons. Stinging nettles inject a dose of the animal protein histamine, which causes an allergic reaction and nasty sting. Some leaf hairs can irritate the mouths and throats of mammals.



The Black Walnut has a dark secret. Credit: Wikimedia, CC BY

Plants even use chemicals to defend their territory against other plants. Black walnut trees have a toxic chemical in their leaves and roots which is released into the soil and prevents seedlings of other species from establishing.

In response to herbivores, plants such as lima beans, cucumber, tomato, corn and cabbage release chemicals which attract predators of those herbivores. The predatory insects are alerted of a free lunch and come to the [plants'](#) aid.

## **Insect defence militias**

Chemical bombs might be common, but recruiting insect armies takes plant defence to a whole new level. Some African trees such as acacias

have evolved a full-board hotel service for ants. They receive food and lodging in return for defending the acacias against [herbivores](#) such as insects or even giraffes.

Hollowed-out structures within the acacia tree provide a home for ant colonies. Additional nectaries – separate from the floral nectaries for attracting pollinator [insects](#) – are a special food source for these ants.

Recent papers suggest that these ants can have other benefits too. Writing in the journal [Functional Ecology](#), Renee Borges of the Indian Institute of Science suggests that resident ants can contribute to the nutrition of acacia by providing the nitrogen that they excrete for the plant to absorb.

They can also provide defence against bacterial attacks, suggests Marcia González-Teuber of Max Planck Institute for Chemical Ecology in a recent paper in [New Phytologist](#). She shows that the presence of mutualistic ants can reduce the likelihood of bacterial attack on acacias. The mechanism is still unknown but could be linked to other bacteria living on the ants' legs.

Some resident ants go beyond their line of duty to protect the acacias. They destroy seedlings growing at the base of their host plant. This protects the tree against competition for light and other resources, allowing it to invest more resources in the essential processes of growth and reproduction.

Plants may look docile. They are anything but.

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