Toxic treat.
Plants that produce distasteful nectar lose out when pollinators like bumblebees stop visiting.

Credit: Ami Vitale

The Problem with Nasty Nectar

By Jennifer Cutraro
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It's a classic plant dilemma: Flowers rely on animals to distribute their pollen, but they must protect themselves against "nectar robbers" that take the good stuff and run. To fight back, some flowers add toxic or distasteful compounds to their nectar. But a new study suggests this strategy results in fewer offspring, leaving some scientists to wonder if it's better to just let the robbers have their way.

When two species adapt in response to one another--a process called coevolution--both can benefit. An oft-cited example is the partnership between acacia trees and Pseudomyrmex ants, with the tree providing food and housing for the insect, and the insect defending the tree from herbivores. Coevolution also may lead to antagonistic partnerships, however, and some scientists have suggested that toxic nectar arose as a defense against nectar robbers. That's fair enough--but to make evolutionary sense, toxic nectar shouldn't stifle a plant's reproductive success. Scientists have long assumed it doesn't, but until now, no one had actually tested the theory.

So Lynn Adler of the University of Massachusetts, Amherst, and her colleague Rebecca Irwin, a Dartmouth College ecologist, examined bee pollination in Carolina jessamine flowers, which produce nectar tainted with a bitter-tasting compound called gelsemine. They manipulated nectar gelsemine levels in the flowers and dusted their pollen-producing parts with fluorescent dyes to help them track pollen movement. Then, the team sat back and waited for pollinator and robber bees to visit.

Protective plants paid a price. The researchers found that the pollen from extra-bitter flowers ended up in one-half to two-thirds as many flowers as pollen from low gelsemine flowers did. They also found that pollinators spent less time visiting the high-gelsemine flowers, which could explain the drop in pollination. "I was really surprised," says Irwin, whose team reports its findings in the current issue of *Ecology*. "All of the hypotheses proposed about toxic nectar assumed it benefited plants."

Why do the plants continue to make their nectar noxious? One explanation, says John Thompson, an evolutionary biologist at the University of California, Santa Cruz, is that this trait may somehow help a nearby population and might have been carried by pollinators to this group of plants. He also points out, however, that jessamine flowers may just be a case of evolution not producing optimal results. "Evolution works as a tinkerer," he says, "and tinkering doesn't always lead great adaptations."

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