Secret life of bees now a little less secret

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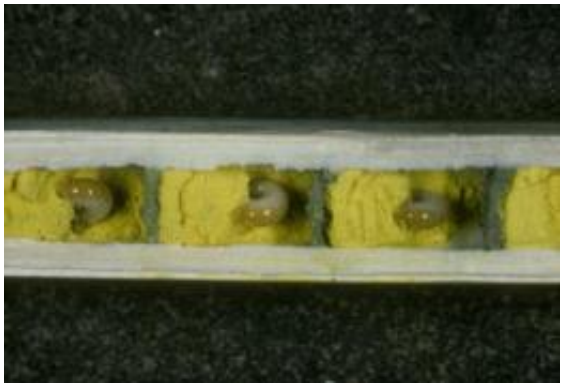

These are *Osmia bicornis* brood cells. Credit: Copyright Albert Krebs

Many plants produce toxic chemicals to protect themselves against plant-eating animals, and many flowering plants have evolved flower structures that prevent pollinators such as bees from taking too much pollen. Now ecologists have produced experimental evidence that flowering plants might also use chemical defences to protect their pollen from some bees. The results are published next week in the British Ecological Society's journal *Functional Ecology*.

In an elegant experiment, Claudio Sedivy and colleagues from ETH Zurich in Switzerland collected pollen from four plant species - buttercup, viper's bugloss, wild mustard and tansy - using an ingenious method. Instead of themselves collecting pollen from plants, the researchers let bees do the leg work, harvesting pollen from the nests of specialist bees which only feed on one type of plant.

They then fed the pollen from each of the four plants to different broods of the larvae of two closely-related generalist species of mason bee (*Osmia bicornis* and *Osmia cornuta*) to see how well the larvae developed.

They found that despite the fact that the two generalist mason bees have a wide diet of different pollens, they showed striking differences in their ability to develop on pollen from the same plant species.

According to Claudio Sedivy: "While the larvae of *Osmia cornuta* were able to develop on viper's bugloss pollen, more than 90% died within days on buttercup pollen. Amazingly, the situation was exactly the opposite with the larvae of *Osmia bicornis*. And both bee species performed well on wild mustard pollen, while neither managed to develop on tansy pollen."

This is *Osmia bicornis*. Credit: Copyright Albert Krebs

"As far as we know, this is the first clear experimental evidence that bees need physiological adaptations to cope with the unfavourable chemical properties of certain pollen," he says.

Plants would have good reason to protect their pollen against bees. Bees need enormous amounts of pollen to feed their young, pollen that could otherwise be used by the plants for pollination. The

pollen of up to several hundred flowers is needed to rear one single larva, and bees are very efficient gatherers of pollen, often taking 70-90% of a flower's pollen in one visit. Because they store this pollen in special hairbrushes or in their gut, this means the pollen is not used to pollinate the flower.

Sedivy explains: "Bees and plants have conflicting interests when it comes to pollen. While most plants offer nectar to visiting insects as a bait for insects to transport the pollen from flower to flower, bees are very efficient pollen collectors. Therefore, plants have evolved a great variety of morphological adaptations to impede bees from depleting all their pollen. This study provides strong evidence that pollen chemistry might be at least as important as flower morphology to constrain pollen loss to bees."

More information: Claudio Sedivy et al (2011), 'Closely related pollen generalist bees differ in their ability to develop on the same pollen diet: evidence for physiological adaptations to digest pollen', doi:10.1111/j.1365-2435.2010.01828.x , is published in *Functional Ecology* on 1 February 2011.

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