Research sheds light on why leafcutter bees may prefer some leaves over others

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Leaves damaged by leafcutter bees. Credit: Victoria Luizzi

Leafcutter bees earned their name by the way they cut circular bits of

leaves to use as building materials for their nests. But the bees seem to prefer some leaves more than others, and researchers now think they know why.

A University of Arizona study found that leafcutter bees prefer leaves that harbor the common mold Aspergillus, a type of fungus found indoors and outdoors. The results of the study suggest that the mold could play a role in enhancing the health and survival of leafcutter bees, which are native pollinators of North America and can be found in regions where flowering plants grow.

The findings, presented Thursday, August 10, at the Ecology Society of America's annual meeting in Portland, Oregon, provide new insights into the ways plants and insects interact.

"The overarching question I had was, 'How can microbes mediate or change the outcome of plant-insect interactions?' And I started focusing on leafcutter bees," said Victoria Luizzi, the study's lead researcher and a graduate student in the UArizona Department of Ecology and Evolutionary Biology. Luizzi's advisers Judith Bronstein, professor of ecology and evolutionary biology, and Betsy Arnold, professor in the School of Plant Sciences, were also involved in the study.

Luizzi spotted leafcutter bees slicing pieces of leaves from rose plants in the University of Arizona Campus Arboretum and noticed that the bees cut an interesting pattern, exhibiting strong preferences for specific leaves in the same plant species and sometimes in an individual plant.

"Some leaves were totally just decimated; they're full of cuts, and the bees were all over them. But a leaf right next to that one is totally untouched," Luizzi said.

The distinctive damage the leafcutter bees caused to the leaves sparked

Luizzi's curiosity. So, they collected a bunch of rose leaves cut by the bees and identified the microbial community the leaves harbored. Luizzi also collected a set of leaves that were undamaged by leafcutter bees, analyzed their microbial community and compared the results to the damaged leaves.

Among the microorganisms that popped up during the microbial analysis was the common mold Aspergillus.

"Aspergillus was much more common on leaves that did get cut than leaves that didn't get cut," Luizzi said.

Luizzi did a follow-up experiment to test leafcutter bees' preference for leaves that specifically harbor Aspergillus. They added additional Aspergillus to a set of leaves in the arboretum plants. The Aspergillus-infused leaves got more cuts from the bees than the leaves that did not have added Aspergillus.

To determine if Aspergillus offers any benefits to leafcutter bees, Luizzi grew the mold in a lab along with another fungus, Ascosphaera, which causes a disease called chalkbrood in leafcutter bees. If the Ascosphaera fungus ends up in bee nests, the bee larvae get killed, Luizzi said. In the lab, Aspergillus inhibited the growth of Ascosphaera, suggesting that Aspergillus could protect leafcutter bees when the bees use leaves bearing Aspergillus as nesting material. That could be the reason leafcutter bees prefer Aspergillus-laden leaves, Luizzi said.

The study's findings could help researchers better understand plant–insect interactions from a different perspective, Luizzi said. These interactions are often thought to be predominantly about insects having preferences for particular plants, and plants in turn using defensive chemistry to protect themselves from those insects.

"This study shows that that's not 100% of the story. There's also this third party, the fungus, that's just hanging out on plant leaves, which can have a pretty important impact on whether that leaf gets damaged or not," Luizzi said.

Leafcutter bees need to be studied more, Luizzi said, especially given that these bees are excellent agricultural pollinators. Conservation of native bees is imperative bearing in mind their concerning population declines, Luizzi added.

"Knowing literally anything about the nesting biology of these bees is super important," Luizzi said.

Provided by University of Arizona

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