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Environment

Clove and thyme oils stop invasive beetles eating palm trees

Gary Hartley

THE red palm weevil, a beetle known for its devastating effect on palm trees, can be stopped in its tracks by clove and thyme oils – offering hope of new control options for crop growers affected by the insect.

Researchers at the University of Malaysia, Terengganu, tested the effect of eight chemicals derived from the two essential oils on feeding by red palm weevil larvae (*Rhynchophorus ferrugineus*). It is one of the world's most invasive species and severely affects the date, coconut and palm oil industries.

In a study of 225 larvae over two weeks, daily consumption of blocks of sago palm soaked with clove or thyme oil derivatives was at least 35 per cent lower than that consumption of untreated blocks (*Insects*, doi.org/gpg6). Of the chemical compounds found in these oils, ethers reduced weevil feeding more than esters, and two stood out as particularly effective.

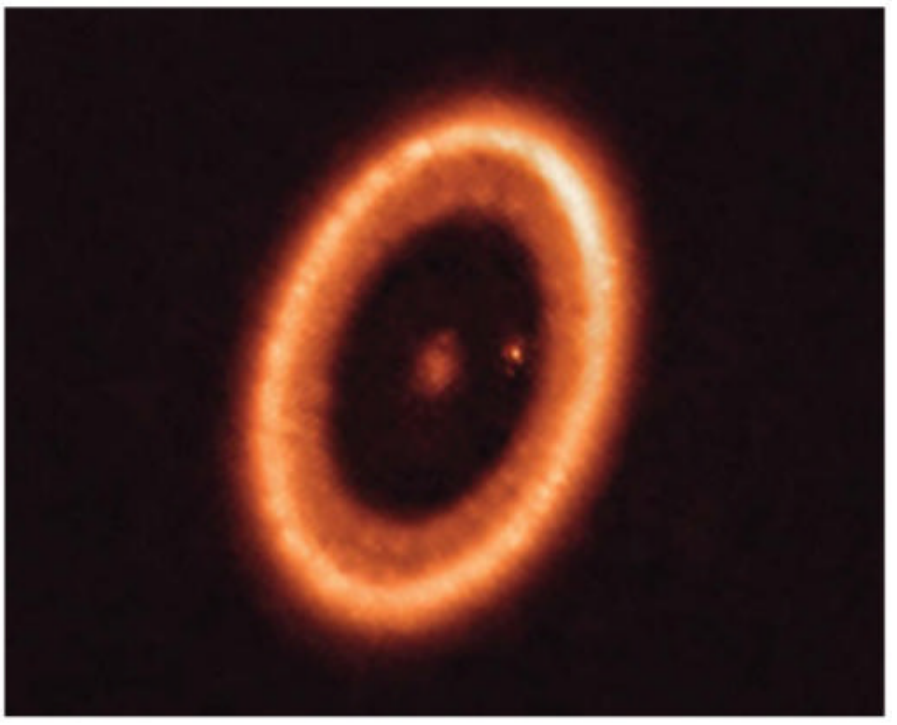
"Botanical biopesticides are seen as increasingly important crop-protection tools. This stems, in part, from the reduced availability of synthetic pesticides," says Tom Pope at Harper Adams University in Edgmond, UK, who wasn't involved in the work. These reduce the risk of resistance developing that comes with conventional pesticides, and they linger in the environment for less time, he says.

The problem is how to deliver such deterrents outside the lab, says Michel Ferry at the French National Institute for Agriculture, Food and Environment, who wasn't involved in the research. This study focused on already infested palms, he says, meaning some beetles couldn't be reached by spraying the plants with the biopesticide. Instead, it would have to be injected into the plant tissue, he says. "The injection issue is very complex and requires studies on the possibilities of injectable formulations." ▮

Astronomy

Birth of an alien moon glimpsed for first time

Leah Crane



ALMA (ESO/NAOJ/NRAO)/BENISTY ET AL.

The star PDS 70 (centre) and planet PDS 70 c (right of star)

WE MAY be watching the birth of a moon for the first time. Astronomers have spotted a disc of debris around a distant planet called PDS 70 c, and it is massive enough that the young exoplanet might be in the process of forming exomoons.

When a new stellar system is forming, the planets coalesce out of a cloud of debris called a circumstellar disc. Then, the planets can suck gas and dust from that cloud to form their own circumplanetary discs, which feed the planets' growth and provide the material for moons to form.

The star PDS 70, which is about 370 light years from Earth, has provided researchers with a unique laboratory to study this process. Its two giant planets, PDS 70 b and c, are the only two that have been observed while still embedded in their circumstellar disc. Now Myriam Benisty at the Université Grenoble Alpes in France and her colleagues have confirmed that PDS 70 c – and maybe PDS 70 b as well – also has a circumplanetary disc.

The work will appear in *The Astrophysical Journal Letters*.

"We know lots of planets, but those are done planets, and we have to use models to try to understand how planets form by looking at the final product," says Alessandro Morbidelli at Côte d'Azur Observatory in France, who wasn't involved in this work. "With these two, we are directly seeing how giant planets and their moons form, so these planets are exceptional."

"We are directly seeing how giant planets and their moons form, so these planets are exceptional"

The researchers spotted this disc using the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile. There had been hints of a circumplanetary disc in this system before, but never anything conclusive.

They found that, depending on the size of the dust grains in the disc around PDS 70 c, it probably contains a total dust mass that is about 0.7 to 3.1 per cent the mass of Earth. "We cannot identify any moons that are being formed, but there is enough material to form them, and it is very likely that satellites are forming there," says Benisty. The planet is a few times more massive than Jupiter, so it may eventually form many moons just like Jupiter has, she says.

"Looking outward from the planet, it would be similar to how the Milky Way looks on a really dark night, this shining stripe across the night sky, but it would be much, much broader," says team member Richard Teague at the Harvard-Smithsonian Center for Astrophysics in Massachusetts. PDS 70 b probably also has a disc, but it isn't as bright, which could mean that it is made of smaller dust grains or just gas, says Benisty.

The researchers also found streams of dust flowing from the outer circumstellar disc towards the star, into the area where, if this stellar system is like our own, smaller rocky planets could form. "The streamers are bringing material from the outer disc to the inner disc, and that is not only important for the formation of Earth-like planets, but also the star is still a baby star so it's still accreting matter to grow," says Benisty.

This system provides us with a window to study the formation of planets and moons generally, but with its two giant planets mirroring Jupiter and Saturn, it is also reminiscent of our own solar system, albeit larger. It could help us understand how the planets and moons in our solar system formed and evolved. ▮