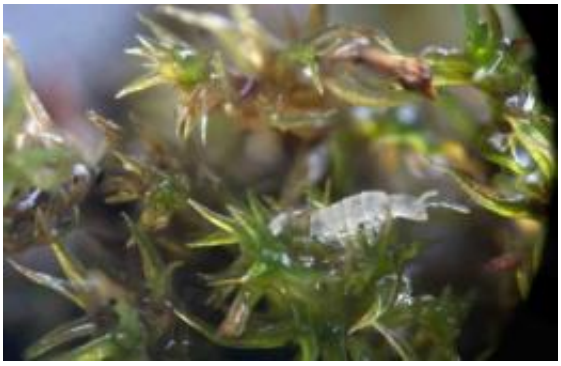
Friends with benefits: Study finds insects aid in moss sex

July 18 2012



Springtail (Folsomia candida) in patch of moss (Ceratodon purpureus). Photo by Rocky Cookus, Portland State University

(Phys.org) -- Researchers at Portland State University have discovered how mosses can use chemical cues to recruit small creatures to help with fertilization, via a process similar to pollination in flowering plants.

In a new study published by Nature, the team found that despite a lack of sweet smelling flowers, mosses produce scents than can entice primitive insects (microarthropods) called springtails to help spread the plants' sperm. The study, "Sex-specific volatile compounds influence microarthropod-mediated fertilization of moss," was released this week.

Sarah Eppley, lead author, and her PSU colleagues have shown that female mosses release scents like those of flowering plants, to which

springtails are attracted. In doing so, the microarthropods that inhabit these mosses transfer sperm from male to female plants and thus increase fertilization rates substantially.

“We were extremely surprised to find such an amazing array of scents in female mosses, and finding that the springtails were in fact acting like pollinators means we must totally rethink our understanding of plant-animal interactions in moss ecology,” said Eppley.

Before this study, moss reproduction was primarily thought to depend on individual sperm swimming through a water layer between male and female plants. Though recent research has hinted that microarthropods help disperse sperm in mosses, nothing was known about whether moss plants, like flowering plants, also use chemical signals to entice animal visitation.

As part of research into species that live in “extreme” environments, Eppley and Rosenstiel, both faculty members of PSU’s Center for Life in Extreme Environments, have studied mosses for years. Mosses are one of the most adaptive species on Earth and one of the few found on all seven continents, including Antarctica. The mosses used in this study are “what grows on our rooftops here in Portland,” which are fairly hostile environments for plant life, Rosenstiel said.

Working with James Pankow, the team analyzed the biogenic volatile organic compounds (VOCs) of the mosses, essentially creating a unique chemical profile of the plants’ emissions. The results showed distinct “scents” for male and female mosses. Development of new state-of-the-art approaches for measuring VOCs at PSU enabled the discovery of this unknown pollination-like syndrome.

Mosses and microarthropods represent two of Earth’s most ancient terrestrial lineages, dating back at least 450 million years. These results

suggest that microarthropods not only likely impact the ecology of mosses found throughout Portland and the Pacific Northwest but that these microscopic friends may have played a key role in shaping the evolution of plants, ultimately leading to the many insect-pollinated crops on which humans have come to rely.

Funding for this research was provided by 3M Corporation and the National Science Foundation.

More information: www.nature.com/nature/journal/ … ull/nature11330.html , DOI: 10.1038/nature11330

Provided by Portland State University