Sex involved in plant defense

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Why do some plants defend themselves from insect attacks better than others? New evidence shows that the difference might be due to whether they're getting any plant love.

In research published in Proceedings of the National Academy of Sciences, scientists from North Carolina State University and Duke University discovered that sexually produced evening primrose plants withstand attacks from plant-eaters like caterpillars better than plant relatives that reproduce by themselves.

The findings are important steps to learning more about how plants have evolved defenses against insect herbivores, says Dr. Marc Johnson, assistant professor of plant biology at NC State and the lead author of the research paper.

"The variation in sexual reproduction has a large impact on the ability of plants to evolve defenses against herbivores," Johnson says.

In the study, the researchers performed both lab and field experiments on evening primrose (*Onagraceae*) plants, a plant family that has 259 different species - 85 percent of which reproduce sexually with the remainder reproducing asexually - to gauge the effects of plant sex on defense mechanisms. The researchers found that so-called generalist herbivores - those that eat a variety of plants - preferred to feed on the asexual species and lived longer while doing so.

The results were a bit different for so-called "specialist" plant-eaters,

however. Those insects that prefer just one kind of food were more apt to munch on sexually reproduced species of plant. This most likely occurs, Johnson says, because specialized plant-eaters evolve alongside their hosts and have found ways to co-opt plant defenses. Instead of being deterred by certain chemical compounds produced as defenses by the plant, the specialized plant-eaters are attracted to them.

Johnson says the nuanced results make sense.

"Sex shuffles up genes and allows individual plants to get rid of bad genes and keep good ones," he said. "That helps them evolve defenses against generalist herbivores. Though there are short-term benefits to asexual reproduction - populations can grow more rapidly and propagate even when pollination is not possible - losing sex puts plants at a long-term disadvantage.

"In the end, asexual reproduction appears to be an evolutionary dead-end."

More information: "Plant Sex and the Evolution of Plant Defenses Against Herbivores." Authors: Marc T.J. Johnson, North Carolina State University; Stacey D. Smith and Mark D. Rausher, Duke University. Published: The week of July 13, 2009, in *Proceedings of the National Academy of Sciences.*

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