

Female plant 'communicates' rejection or acceptance of male

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(PhysOrg.com) -- Without eyes or ears, plants must rely on the interaction of molecules to determine appropriate mating partners and avoid inbreeding. In a new study, University of Missouri researchers have identified pollen proteins that may contribute to the signaling processes that determine if a plant accepts or rejects individual pollen grains for reproduction.

Like humans, the mating game isn't always easy for plants. Plants rely on external factors such as wind and animals to bring them potential mates in the form of pollen grains. When pollen grains arrive, an introduction occurs through a "conversation" between the pollen (the male part of the flower) and the pistil (the female part of the flower). In this conversation, molecules take the place of words and allow the pollen to identify itself to the pistil. Listening in on this molecular conversation may provide ways to control the spread of transgenes from genetically-modified crops to wild relatives, offer better ways to control fertilization between cross species, and lead to a more efficient way of growing fruit trees.

"Unlike an animal's visual cues about mate selection, a plant's mate recognition takes place on a molecular level," said Bruce McClure, associate director of the Christopher S. Bond Life Sciences Center and researcher in the MU Interdisciplinary Plant Group and Division of Biochemistry. "The pollen must, in some way, announce to the pistil its identity, and the pistil must interpret this identity. To do this, proteins from the pollen and proteins from the pistil interact; this determines the

acceptance or rejection of individual pollen grains."

In the study, researchers used two specific pistil proteins, NaTTS and 120K, as "bait" to see what pollen proteins would bind to them. These two pistil proteins were used because they directly influence the growth of pollen down the pistil to the ovary where fertilization takes place.

Three proteins, S-RNase-binding protein (SBP1), the protein NaPCCP and an enzyme, bound to the pistil proteins. This action suggests that these proteins likely contribute to the signaling processes that affect the success of pollen growth.

"Our experiment was like putting one side of a Velcro strip on two pistil proteins and then screening a collection of pollen proteins to see which of the pollen proteins have the complementary Velcro strip for binding," McClure said. "If it sticks, it's a good indication that the pollen proteins work with the pistil proteins to determine the success of reproduction."

In previous studies, McClure showed that S-RNase, a protein on the pistil side, caused rejection of pollen from close relatives by acting as a cytotoxin, or a toxic substance, in the pollen tube.

For their study, the MU team used *Nicotiana glauca*, a relative of tobacco commonly grown in home gardens as "flowering tobacco." The study, "Pollen Proteins Bind to the C-Terminal Domain of *Nicotiana Glauca* Pistil Arabinogalactan Proteins," was published in the Journal of Biological Chemistry and was co-authored by McClure; Kirby N. Swatek, biochemistry graduate student; and Christopher B. Lee, post-doctoral researcher at the Bond Life Sciences Center.

Provided by University of Missouri-Columbia

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