Biologists Solve Part Of Puzzle

ITHACA, N.Y. — Familiarity breeds contempt. Nonfamiliarity produces seed.

Just as humans have a natural aversion toward marrying kin, some food crop plants have genes that allow them to avoid being fertilized by "self-related" pollen. Now Cornell University's biologists have solved one more piece of the puzzle of how plants' self-incompatibility works on the molecular level.

The discovery, as reported in the journal Science (Sept. 7, 2001), could enable genetic engineers to short-circuit the reproduction process and more easily hybridize improved varieties of plants.

Many commercial crops are genetic hybrids. Obtaining seed to plant commercial quantities of these crops, such as tomatoes, for example, requires the labor-intensive work of manual crossing. Without the process of manual crossing, the plants would not have the desired qualities of hybrids. But nature has come up with an efficient system for making hybrid seed, which, when understood at the molecular level, can have applications on a commercial scale. This process, termed self-incompatibility, "prevents inbreeding and promotes out-crossing and variability in plants," says June Nasrallah, Cornell professor of plant biology, and the lead author on the Science paper.

In addition to Nasrallah, coauthors of "Allele-Specific Receptor-Ligand Interactions in Brassica Self-Incompatibility" include Mikhail Nasrallah, Cornell professor of plant biology; Aardra Kachroo, Cornell postdoctoral researcher in plant biology; and Christel R. Schopfer, a former Cornell postdoctoral researcher who now conducts research in Germany. Funding for the research was provided by a four-year grant from the National Institutes of Health for the purpose of understanding cellular communication systems. The Nasrallah group examined the reproductive processes of Brassica plants. Like humans and animal species, plants use eggs and sperm in order to make seed and multiply. On the plant's pistil is the stigma, which is the site for capturing pollen. Pollen, which carries the male sperm, is released by stamens and is carried by wind or insects, and it is drawn to a plant's stigma.

If genetically unrelated (nonmatching) pollen lands on the stigma, the pollen germinates and produces a pollen tube that then runs through the plant's pistil and into the plant's ovaries. Fertilized eggs then develop into seed ready to be grown in a garden or a producer's field.

However, if "self-related" pollen lands on the stigma, the stigma's outer (epidermal) layer genetically recognizes the type of pollen and precipitates a self-incompatible reaction that inhibits the pollen tubes from growing. The Cornell group found that pollen recognition is based on highly specific lock-and-key interactions between receptors (the lock) on the stigma surface and ligands (the key) on the pollen surface. "If the pollen is matching kin, the receptor on the stigma is activated to prevent pollen tube growth," said Kachroo. "If the pollen is nonmatching, the receptor is not activated and pollen tubes can grow."

With this revelation, scientists are one step closer to understanding the reproductive barriers of flowering plants and their evolution. "The potential is to finally grasp — at the molecular level — which genes are needed for pollen rejection," said Mikhail Nasrallah. "The ability to silence, mutate and transfer the genes that control the self-incompatibility barrier could be a boon to breeders. Even self-fertilizing crops like tomatoes and rice can benefit from increased genetic variability."

2002 Pork Checkoff Budget Approved By Board

DES MOINES, Iowa — The members of the National Pork Board have approved plans for spending $55.6 million in checkoff-funded programming in 2002. Of that, $45.8 million is for programming determined at the national level and $9.8 million will be returned to states for local checkoff-funded programs.

"Throughout the eight-month budgeting process, pork producers volunteered their time to share ideas and work with industry experts to determine the most efficient and effective ways to increase demand for pork in the U.S., increase exports, and to communicate those checkoff-funded programs with pork producers and others," explains Marlin Pankratz, a pork producer from Mt. Lake, Minn., and chairman of the National Pork Board Plan of Work/Budget Task Force. "Pork producers invest in the pork checkoff and direct how those funds will be used. Changes in overall spending targets for 2002 as compared to 2001 include pork producers' changing priorities."

Pork producers on the Plan of Work/Budget Task Force, including seven board members and five other pork producers, recommended increased expenses for programs related to biosecurity, animal welfare and communications. The National Pork Board approved these recommendations during a meeting in Des Moines. In other areas, funding for specific projects increased or decreased while the overall budget was stable. The 2002 pork checkoff budget is based on expectations for checkoff revenue of $49.1 million and expenses of $55.6 million, for a deficit of $6.5 million.

Overall for 2002, the producer leaders of the National Pork Board and state associations directed 59 percent of the checkoff funds be directed to promotion, 27 percent to research and 14 percent to consumer information.

Nationally, the Board directed 65 percent of checkoff programming for promotion, 28 percent research and 7 percent consumer information. At the state level, 40 percent of the checkoff programming is for consumer information, 37 percent promotion and 23 percent research.

The approval of the plan and budget by the volunteer producer members was the final step for the National Pork Board in the checkoff budget process, which began in the spring. Now the USDA must approve the budget, which is expected to occur in December.

Ornamental Plant Disease New To Ohio Poses Threat To Daylilies

COLUMBUS, Ohio - An ornamental plant disease, first diagnosed in Ohio recently, can pose a serious threat to daylilies.

Daylily rust, caused by a rust fungus of the *Puccinia* species, has been reported in Franklin and Cuyahoga counties. First reported in the southeastern U.S. last year, it also exists in Kentucky, Indiana, and other midwestern states, and poses potential problems for nursery, greenhouse and garden growers.

"Daylily rust is a pretty serious disease," said Steve Nameth, an Ohio State University plant pathologist. "In Florida, if the disease is found in a greenhouse, that greenhouse is immediately quarantined. The ODA (Ohio Department of Agriculture) hasn't made any quarantine decisions as of yet, but we are following the situation closely to see what will happen."

The disease germinates on daylily leaves, producing lesions that cause leaf dieback. Since photosynthesis, the process of how the plant obtains food, is conducted through the leaves, limited number of leaves on the plant reduces its chances of surviving through winter. The disease spreads easily from plant to plant via spores carried by wind-driven rain and has a short incubation period, infecting leaves two to three days after inoculation.

In addition, it can not only germinate on its host plant, but can also produce spores via a secondary host — a weed of the *Patrinia* species, which is also grown as a perennial. The presence of a secondary host increases the severity of infection. Six species of *Patrinia* are sold and grown in the U.S. as ornamentals.

Since little is known about the disease — its biology, exactly how it reproduces, and what is needed for it to survive — Nameth and OSU plant pathologist Mac Riedel will team up with Pat Henley, a daylily expert formerly with ODA, to conduct variety and fungicide studies beginning in September.

"We will study multiple varieties to see which ones show the most resistance to the disease. Pat has literally hundreds of varieties that we can use for the project," said Nameth. "We will also study which fungicides have the most impact on the disease. There are no fungicides on the market that are labeled specifically for rust on daylilies."

Nameth speculates that the wet spring aided in the development of the disease, which may have found its way to Ohio via transport of infected plant material. Growers concerned about the disease infecting their daylilies should cut the plants back to two to three inches above the ground, said Nameth.

The disease is characterized by a rusty spore mass that streaks along the leaf veins. Any leaves found with the disease should be removed from the plant and disposed of either through burning or placed in lawn bags and discarded.

"We are not recommending that people use the infected leaves as compost," said Nameth. "Also, prevent as much overhead watering as possible. Spores need moisture to germinate. If need be, water in the morning rather than at night so that the water has a chance to evaporate. If spores penetrate the leaves in damp conditions overnight, the plants will be infected by the next morning."