Biology

Fungus spores use superglue

Biologists working to understand a devastating and costly fungal infection in rice plants, called rice blast disease, have happened upon a natural adhesive that sticks to smooth surfaces like Teflon, even underwater.

Researchers from E.I. du Pont de Nemours and Co. in Wilmington, Del., were studying how the rice blast fungus *Magnaporthe grisea* adhered to a rice leaf surface, which is extremely smooth and water repellent. Scientists have traditionally thought that when a fungus spore alights on a leaf, it spends several hours manufacturing a tube that pierces the leaf like a harpoon and finally anchors the spore.

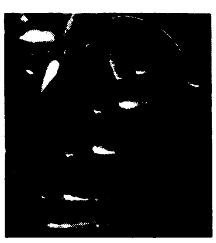
But the du Pont biologists discovered that *M. grisea* spores have a built-in superglue that allows them to hold onto surfaces within minutes of landing. This sticky fibrous matrix, called spore tip mucilage, is originally packaged in unhydrated form within the tip of the spore, but bursts through the cell wall of the spore in the presence of water. Within 20 minutes of being deposited on a Teflon film, which mimics the surface of a rice leaf, 90 percent of the spores had attached themselves. Hours after sticking to the surface, these spores began to develop the infection structures that scientists had originally believed held the spores to the leaf.

According to the researchers, whose report appears in the Jan. 15 SCIENCE, this discovery shows that *M. grisea* is more complex than previous theories had predicted. Without expending any metabolic energy, the spores are able to attach themselves to a leaf, an event that is the first stage in the infection process. The discovery may help in controlling the spread of rice blast disease. And if researchers are able to learn enough about the substance and how to reproduce it, the adhesive eventually may prove useful in medicine and other areas.

Leaf shelters are mite-y amenities

It's a mite-eat-mite world out there on the leaf surfaces of trees and shrubs, and survival may go to the bug that takes better advantage of the ins and outs of its terrain. Such are the findings of U.S. Department of Agriculture research scientists studying the mutually beneficial relationship between tiny, insect-like mites and the plants they inhabit.

Robert W. Pemberton of the Rangeland Insect Laboratory in Bozeman, Mont., and Charles E. Turner of the Western Regional Research Center in Albany, Calif., are finding that minuscule pits, pores and crypts on the undersides of leaves are "home" to large numbers of beneficial mites. In lieu of rent, the leaf-abiding bugs dine on such pests as leaf-damaging spider mites and the spores of harmful fungi. It's not clear why beneficial mites take better advantage of the tiny, cave-like shelters, called leaf domatia, than their ill-mannered relatives.



USDA

Domatia are found at the junction of the main and lateral leaf veins of at least 1,000 species of plants and are popular places for beneficial mites to molt, Pemberton says. They also appear to provide the humid environment necessary for proper hatching of some mite eggs. He notes that some plants without domatia have evolved tufts of tiny fibers that provide similar protection to beneficial mites and that spraying with pesticides may do more harm than good on plants that harbor their own mite militias. Rather, plant geneticists may want to develop trees and shrubs with more numerous or larger domatia.

Computers

A superhighway for channeling data

Transmitting vast quantities of data over a conventional cable link from a high-speed computer to another computer or to a display terminal is like trying to funnel traffic on a superhighway across a one-lane bridge. Inevitably, a traffic jam results, considerably slowing the transfer of data. To circumvent this bottleneck, researchers are now developing a new, computer-to-computer link capable of carrying as many as 1,600 million bits of data per second.

The new "high-speed channel" was originally developed by Don Tolmie and his colleagues at the Los Alamos (N.M.) National Laboratory. "We wanted to look at data in a movie fashion," says Tolmie, "and to do that you need very high data rates." For example, a single picture consisting of a 1,000-by-1,000 array of points, or pixels, with each point represented by 8 bits of color information would by itself take up 8 million bits. To create a movie running at a rate of 30 pictures per second requires a flow of at least 240 million bits per second.

"Computers that can generate data at these speeds are just now becoming available," says Tolmie. And a few manufacturers are already putting custom-built communications channels into their computers to handle high data rates. But what's needed, he says, is a standard link that allows any two computers to be connected — in the same way that just about any personal computer can now be tied to any printer using a standard cable. The Los Alamos invention, with some modifications, is likely to be adopted as a computer industry standard by the end of this year.

The Los Alamos channel is essentially a package of wires and integrated-circuit chips that distribute and control the flow of electrical pulses. The new design allows more electronic traffic to travel along wider, shorter routes than in previously built communications links. A cable carries this information to another computer or a terminal capable of receiving the data. Eventually, that information may travel along glass fibers instead of copper wires, permitting the linking of computers over longer distances.

"We'll soon be able to tie together all kinds of high-speed computers and computer terminals," says Tolmie. "It helps both the manufacturers and the users." A variety of manufacturers, many of whom are involved in developing the standard, have already indicated an interest in using the new channel.

"It's very important for us to see such a standard," says Newt Perdue of Ultra Network Technologies in San Jose, Calif. That company is developing a high-speed network for linking fast computers. "That lets our company concentrate on performance," he says, instead of having to worry about how to link up with all the different kinds of computers available.

Initially, high-speed channels and networks using the channels will be most in demand for scientific and engineering applications at places such as the national laboratories, NASA and automotive and oil companies, says Perdue. There's also a growing market in the health sciences because of the need to process large volumes of data from X-ray machines and other imaging devices.

A new computer security law

President Reagan earlier this month signed into law the Computer Security Act of 1987, which directs federal agencies to improve their computer security practices. The law requires the National Bureau of Standards to develop standards and guidelines for all government computer and telecommunications systems except those classified for national security reasons. It also blunts the effect of National Security Decision Directive-145, which allowed the Department of Defense to play a role in safeguarding nonclassified data in government and private data bases (SN: 5/16/87, p.314).