

Plant gene management helps control disease

UNIVERSITY PARK — Plant scientists at Penn State have found ways to manage genes to solve some of the age-old problems of protecting crops from diseases. By combining genes into groups, the single genes complement each other in a process called "gene management."

Experiments by Richard R. Nelson and associates in plant pathology use a disease model to evaluate the best strategies for combining genes. Their work is becoming a "breakthrough" in strengthening the diseases resistance of plants.

Nelson is Evan Pugh Professor of Plant Pathology at Penn State. The Evan Pugh designation honors a small group of Penn State faculty members for distinguished achievements in research and teaching.

Nelson claims widespread ef-

orts to control plant diseases with single genes, while often dramatic at first, have taken many plant hosts and their parasites out of balance at a catastrophic cost. As an example he listed the rice blast disease which creates worldwide devastation.

"Historically, natural populations of plants and their parasites have learned to live together over time," Nelson stated. "Plants and parasites attained their ability to co-exist together by each accumulating a number of genes for their own defense. This developed throughout a long co-evolution. Mutual safety and survival were due to number of genes."

Plant varieties with single gene resistance to disease, developed widely today, present a "feast or famine" approach, he observed. In the "gene management" process,

on the other hand, a disease can increase at a slow rate — producing less losses than otherwise and keeping diseases at tolerable levels.

Nelson and associates are now combining genes in ways previously untested. While studying the powdery mildew disease of wheat, they found that disease resistance known as race-specific and race-non-specific are both determined by the same genes. The discovery makes it possible to use more combinations of the race-specific genes in breeding programs.

One immediate practical application of this information will be to control rice blast. The disease is so destructive that rice grown in much of the tropical world must be sprayed weekly with fungicides or the crop will die.

"Major areas of Africa and South America could now be

growing rice were it not for rice blast," Nelson said. "The casual fungus is so genetically explosive that the usefulness of a rice variety lasting more than two years is considered unique."

The Penn Staters are now working with scientists of the International Center for Tropical Agriculture in Cali, Colombia, South America. The project is reorganizing breeding strategies to enable genes to resist rice blast. The project was financed for a number of years by the Rockefeller Foundation through

the Agricultural Experiment Station at Penn State.

Benefits for American farmers will come from this new discovery, it was pointed out, as plant breeders begin to conserve genes for use in combinations instead of discarding them out of frustration.

"Plant breeders may soon be in a position to manage many of the classic diseases of major food crops," Nelson commented. "This will reduce greatly our dependence on fungicides and the prospect of famine."

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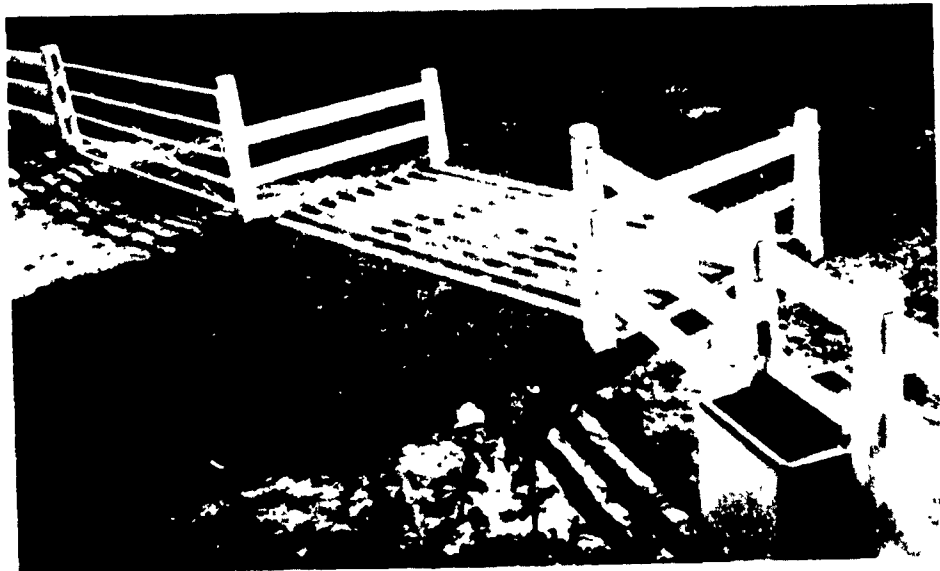
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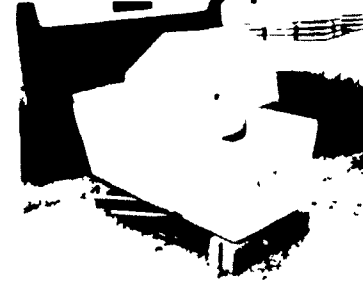
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