Scientists link genes to disease resistance

WASHINGTON, D C — Agricultural scientists have discovered that genetic material called plasmids in corn and sorghum may be a key to breeding desirable traits, such as disease resistance, into these crops

Daryl R Pring, plant pathologist with the U.S Department of Agriculture's Agricultural Research Service, reported the finding Monday at the opening session of a three-day symposium on genetic engineering at the Beltsville, Md., Agricultural Research Center

But don't look for quick development of new plants that could prevent disease from wiping out today's hybrid crops, Pring cautions.

Future use of the plasmids in breeding will require a great deal of research, Pring said Capitalizing on the plasmid's potential, he emphasized, will have to wait perfection of the genetic engineering techniques involved, and this could take many years

Pring, who does research for USDA's Agricultural Research Service in Gainesville, Fla., said the discovery is significant because it may give plant breeders the ability to overcome the disease susceptibility that can accompany male sterility in corn

Plasmids could be a new source of male sterility in corn, he said In the past, a source called the T cytoplasm had been relied on to produce this sterility, but it caused corn to be susceptible to disease

Pring said plasmids may carry the genetic information that produces male sterility in corn It is a genetic trait prized in plant breeding

When plant breeders produce hybrid offspring, they cross-pollinate different plants of the same species – such as corn – to transfer genetic traits between them Usually, the pollen or male part of the flower is removed by hand to guarantee male sterility

Use of the plasmid may guarantee sterility and save a lot of hand work, Pring said Male sterility insures that the seeds produced are hybrids—that such seeds produce plants that have been cross-pollinated to capture desirable traits such as increased yield, improved seed quality and drought resistance

Earlier, Pring and geneticist C S Levings of North Carolina State University discovered the plasmids while studying male sterility in corn in cell structures known as the mitochondria, which are energy-producing bodies in cells

After the discovery in corn, Pring and his associates and USDA geneticisit K F Schertz at College Station, Tex , found similiar plasmids in male sterile sorghum These plasmids also were located in the mitochondria Pring said that because corn and sorghum plasmids are chemically similar, the findings suggest a common mechanism of male sterility in these two plants

'Our studies are designed to alter the T cytoplasm gene to eliminate disease susceptibility in corn," the scientist said

On the other hand, our sorghum work is preventive medicine," Pring said In sorghum, male sterility is not linked to disease susceptibility We want to broaden the cytoplasmic base of sorghum to avoid potential disease or insect problems "

Pring and an interdisciplinary team of USDA and state scientists began to suspect that plasmids were responsible for male sterility while undertaking studies on corn mutants—plants in which genetic alterations occur naturally and are unexplained

What the scientists found was evidence of the possible evolutionary origin of male sterility in corn They located free plasmids" — independent, tiny molecular entities associated with the mitochrondria — in the cytoplasm of one male-sterile mutant of corn These plasmids may have come originally from fertile corn, Pring said, but were cut out during the evolutionary process, converting the plant from male fertile to male sterile

At the University of Illinois, geneticists J R Laughnan and S J Gabay-Laughnan found corn mutants Then, Pring and Levings, working with the Illinois collaborators, found evidence that the plasmid had been integrated back into the mitochrondrial genetic material, making the plant self-fertile.

Pring said plasmids are widely found in microorganisms and often are associated with antibiotic resistance bacteria Genetic engineering technology is successfully being applied to microorganisms and will work in higher plants, according to the scientist

USDA's Agricultural Research Service, the USDA Competitive Grants Program and the Florida Agricultural Experiment Station supported the cooperative research, with input from state collaborators and the Plant Breeding Institute, Cambridge England