

Researchers find corn gene conferring resistance to multiple plant leaf diseases

24 July 2017, by Mick Kulikowski



Credit: North Carolina State University

Researchers at North Carolina State University have found a specific gene in corn that appears to be associated with resistance to two and possibly three different plant leaf diseases.

In a paper published this week in *Nature Genetics*, NC State researchers pinpoint the gene - caffeoyl-CoA O-methyltransferase - that seems to confer partial [resistance](#) to Southern [leaf](#) blight and gray leaf spot, and possibly to Northern leaf blight, a trio of diseases that cripple [corn plants](#) worldwide.

Finding out more about the mechanisms behind complex traits like [disease resistance](#) has the potential to help plant breeders build the best traits into tomorrow's [corn](#) plants, says paper corresponding author Peter Balint-Kurti, a research plant pathologist and geneticist for the U.S. Department of Agriculture-Agriculture Research Service (USDA-ARS) who is housed at NC State.

Balint-Kurti's group and colleagues identified several regions of the genome where genetic variation had a significant effect on variation in resistance to multiple diseases.

"There were hundreds of genes in this region and identifying the specific genes affecting [disease](#) resistance was a challenge," Balint-Kurti said. "It's like looking for a particular restaurant in a city - without Google to assist you."

Using an approach called fine mapping, NC State postdoctoral researcher Qin Yang winnowed the region down to a small segment of DNA carrying just four genes, and then with a number of collaborators from NC State, Iowa State University, the University of Delaware, Texas A&M University, the University of North Carolina at Chapel Hill, Cornell University and the USDA Agricultural Research Service she performed more tests to narrow those four genes down to one.

"It's interesting that this gene also seems to be involved in lignin production," Yang said. "Generally, more lignin production seems to be linked to more robust disease resistance in plants."

Balint-Kurti says the gene appears to confer a small but important disease-resistance effect.

"It's difficult to see these small effects, but it is also difficult for pathogens to adapt to counter them," Balint-Kurti said. "Much of the resistance to Southern leaf blight and gray leaf spot is conferred by multiple [genes](#) that each have small effects."

Southern corn leaf blight is a moderate problem in the southeastern United States, Balint-Kurti says, and can be a significant problem in Southeast Asia, southern Europe and parts of Africa. Prevalent in hot, humid climates around the globe, it causes small brown spots on leaves. The spots get larger and eventually spread to the whole plant. Severe infections can cause major corn yield losses. Gray leaf spot - which produces an eponymous effect - is found both in the U.S. Midwest and Southeast and is also an important corn disease in Africa. Northern [leaf blight](#) can be found in the Midwestern corn belt and in the Northeast; it causes cigar-

shaped lesions on leaves. All three are so-called necrotrophic pathogens that derive much of their nutrition from dead host tissue.

"This gene is also involved in suppressing programmed cell death," Balint-Kurti says, "which, perhaps counter-intuitively, can be a good defense mechanism against necrotrophic fungi like these three diseases."

More information: A gene encoding maize caffeoyl-CoA O-methyltransferase confers quantitative resistance to multiple pathogens, *Nature Genetics* (2017). [DOI: 10.1038/ng.3919](https://doi.org/10.1038/ng.3919)

Provided by North Carolina State University

APA citation: Researchers find corn gene conferring resistance to multiple plant leaf diseases (2017, July 24) retrieved 12 November 2019 from <https://phys.org/news/2017-07-corn-gene-conferring-resistance-multiple.html>

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