FANTASTIC DISCOVERIES IN

PLANT BREEDING

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Intrepid strawberry breeders vanquish
DEVASTATING FUSARIUM WILT!

BELOVED BERRY SAVED!

With protection from a **SINGLE RESISTANCE GENE,** elite strawberry varieties now thwart wilty death without the need for toxic fumigation!

SEE INSIDE FOR DETAILS

THE PROBLEM

Caused by the soil-borne fungal pathogen *Fusarium oxysporum* f.sp. *fragariae*, **FUSARIUM WILT** is a devastating disease of strawberry globally. The soil fumigant methyl bromide has been used to control Fusarium wilt for many decades, but the chemical is highly carcinogenic and damages the ozone layer and was therefore banned in 2005. Just one year later, the first instances of Fusarium wilt in CA were reported and the frequency and severity of the problem have increased rapidly since then. Many modern cultivars, grown on thousands of acres, were bred before **THE ELIMINATION OF METHYL BROMIDE** and are highly susceptible to Fusarium wilt, leading to staggering crop losses. Although some wild and heirloom strawberries are resistant to Fusarium wilt, the extent and types of natural genetic resistance were unknown and thus effectively unavailable for use in breeding programs due to the lack of characterization and high-quality genomic and genetic resources.

THE SCIENCE

In 2015, plant breeders and researchers at UC Davis began searching for natural sources of genetic resistance to Fusarium wilt in a diverse collection of modern strawberry cultivars, heirloom varieties, and wild accessions. By systematically evaluating the level of disease resistance and analyzing the genetic composition of these materials, the researchers performed a **GENOME-WIDE ASSOCIATION STUDY** (GWAS) to identify genes involved in plant disease response. The result? Discovery of a single **DOMINANT RESISTANCE GENE** that provides strong protection against Fusarium wilt under field conditions. With this knowledge, they designed a molecular (DNA-based) assay capable of rapidly identifying resistant plants without the need for onerous inoculations or visible symptoms. Today, thanks to modern genomic tools and **MOLECULAR BREEDING**, all new strawberry varieties released by UC Davis' Strawberry Breeding Program carry strong genetic resistance to Fusarium wilt.

THE IMPACT

As a natural solution, **GENETIC RESISTANCE** offers farmers a sustainable strategy for victory in the evolutionary arms race against crop pathogens like Fusarium. Not only is the resistance discovered and deployed by UC Davis highly effective, it is also free of the harmful environmental and human health impacts of toxins like methyl bromide. In fields infested by the Fusarium pathogen, complete plant death is inevitable in the absence of genetic resistance. To see this, just look at the image on the front, with a row of wilt-resistant **UCD MOXIE** (released in 2018) beside one of the popular but susceptible (and dead) variety **ALBION** (2004).

THE TEAM

UCDAVIS
UNIVERSITY OF CALIFORNIA

LEFT TO RIGHT - Steven Knapp, Omar Gonzalez-Benitez, Hillel Brukental, Glenn Cole, Mitchell Feldmann, Marco Castelacci, Mishi Vachev, Dominique Pincot, Jade Dilla-Ermita, Alicia Sillers, Marta Bjornson, Nico Jimenez, Peter Henry, Isaac Rainwater, Cindy Lopez Ramirez, and Randi Famula

NOT PICTURED - Margaret Honig, Mary Madera, Nayeli Valencia de Puglisi, and Eduardo Garcias

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TO BE CONTINUED...