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UC Davis Study Finds Gray Mold Adapts to Each Crop

Research suggests the fungus behind billions in crop losses tailors its attack to different plants, complicating resistance breeding

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A fungus that causes billions of dollars in crop losses each year may be harder to stop than scientists once thought, according to new research from the University of California, Davis, that suggests both plants and the pathogen itself are more variable than breeding programs have assumed.

The fungus, Botrytis cinerea, better known as gray mold, attacks hundreds of plant species and is familiar to many consumers as the fuzzy spoilage that can spread through blueberries, tomatoes and other produce. It also damages grapes, lettuce, soybeans and cut flowers. The new studies, published in the Proceedings of the National Academy of Sciences, argue that decades of efforts to breed resistant crops have focused too narrowly on the plant side of the equation and have overlooked how the fungus adapts to each host.

Dan Kliebenstein, a professor in UC Davis' Department of Plant Sciences who led the work, said scientists had long assumed that plants respond to fungal attack in broadly similar ways, with only small differences from one species to another. His team found something different. In their experiments, each plant mounted its own distinct defense response, even when comparing closely related crops. In some cases, Kliebenstein said, the response was so different that it was not just a variation on the same theme but a fundamentally different strategy.

That finding helps explain why resistance breeding has produced only limited gains against gray mold. If one plant's defense does not translate well to another crop, then moving resistance traits from one species to another becomes far more difficult than researchers expected.

The second study looked at the fungus itself and reached an equally important conclusion. Rather than acting like a one-size-fits-all pathogen with a single method for infecting any plant it encounters, Botrytis cinerea appears to detect what it is growing on and adjust its attack. Kliebenstein described it as if the fungus can tell whether it is on a strawberry or a tomato and then switch tactics accordingly.

In practical terms, that means the pathogen may be reading chemical cues from each host and tailoring its response to overcome those defenses. The researchers said this ability could be one reason gray mold has remained so successful across such a wide range of crops.

The work points to a possible shift in strategy for plant disease control. Instead of trying only to strengthen the plant or weaken the fungus in general terms, researchers may need to identify the genes Botrytis uses to recognize its host and then find ways to

confuse that sensing system. If the fungus cannot tell what it is attacking, its infection process could break down long enough for the plant’s own defenses to work.

The stakes are high because gray mold is estimated to cause 5% to 10% crop losses across many fruits and vegetables. The studies were supported by the National Science Foundation and included co-authors Ritu Singh, Anna Jo Muhich, Cloe Tom, Celine Caseys, Jack McMillan, Karishma Srinivas and Lucca Faieta of UC Davis.