Researchers examine plant's ability to identify, block invading bacteria

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This is a flower of the *Arabidopsis thaliana* plant. Credit: (USDA-Agriculture Research Service photo by Peggy Greb).

Understanding how plants defend themselves from bacterial infections may help researchers understand how people and other animals could be better protected from such pathogens.

That's the idea behind a study to observe a specific bacteria that infects tomatoes but normally does not bother the common laboratory plant arabidopsis. Researchers hoped to understand how infection is selective in various organisms, according to a Texas AgriLife Research scientist.

Dr. Hisashi Koiwa collaborated with colleagues in Germany and Switzerland to examine the immune capabilities of different mutations of the arabidopsis plant. Their findings appeared in the Journal of Biological Chemistry.

In this study, the team was trying to figure out how a plant defends itself rather than how it gets sick, said Koiwa, who provided about 10 different lines of mutant arabidopsis plants grown in his lab at Texas A&M University.

"By learning what is wrong with a sick plant," he said, "we can study how a plant can defend itself, what mechanisms it uses for protection."

The team had to examine the plants at the cellular level where molecules are busy performing different jobs.

To understand the process, one has to examine components such as "N-glycans, receptors and ligands," Koiwa said.

The N-glycan is a polysaccharide that is critical in protein folding, a natural process which if it becomes unstable leads to various diseases, Koiwa explained. A receptor is a protein decorated with N-glycans which awaits signals from the ligands that bind and activate receptor molecules.

In viewing this mechanism across various arabidopsis plants that had been mutated to achieve different N-glycan structures, the researchers found one particular N-glycan that was critical in making sure that the receptor molecules can recognize the targeted bacteria molecule, he said.

If that polysaccharide can recognize a pathogen, it can prevent infection thus making the plant immune to that disease, the scientists noted.

"The question is fundamental. Why are we healthy in an environment of so many different bacteria?" Koiwa asked. "Why can one pathogen infect one kind of organism and not others? In this case, the same bacteria normally infects tomato plants but not arabidopsis."

Koiwa said many researchers are studying the pathway, or molecular road, that a pathogen takes on its journey to infect another organism. They want to find what "gates" exist in an organism that prevent infection with the notion that the same blocks could be adapted in a susceptible organism to prevent disease.

He said eventually using this pathway to develop new plant varieties that do not allow pathogens inside the cells would be better than breeding lines that are merely "resistant" to diseases.

"In the case of resistance, a plant has to try to fend off an infection that has been let in," Koiwa explained. "But a properly working immunity system does not let the pathogen in, so the plant does not get sick in the first place."

Provided by Texas A&M AgriLife Communications

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