

Research reveals way to improve nitrogen production in legumes

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Legumes plant. Credit: Hongyan Zhu

A group of University of Kentucky scientists have discovered a more efficient way for legumes to fix nitrogen.

Legumes have long been known for their nitrogen-fixing properties. Through a symbiotic relationship with rhizobia, which are [soil bacteria](#), legumes can provide their own nitrogen needs and leave nitrogen in the soil for other plants to use. This reduces the need for [nitrogen fertilizers](#), which are costly and can cause environmental pollution. But legumes differ significantly in their nitrogen fixation efficiency, and will act differently in different environments and with different bacterial strains, sometimes fixing little to no nitrogen.

Hongyan Zhu, a professor in the UK College of Agriculture, Food and Environment, and his team of researchers found two antimicrobial peptides in the model legume *Medicago truncatula* that kill certain rhizobial bacteria as the nitrogen fixation process begins. This model legume is closely related to the forage legume alfalfa.

"This finding offers scientists a strategy to improve nitrogen fixation in legumes by selecting or manipulating these genes to accept more bacteria," Zhu said. "This could potentially allow [legumes](#) to fix more [nitrogen](#)."

Zhu believes the original function of these antibacterial genes was to kill bacteria as they entered the plant, but they have evolved to manipulate certain bacteria to start the [nitrogen fixation](#) process. Bacteria that do not tolerate the peptides die almost immediately.

In addition to the UK researchers, scientists from Brigham Young University, University of Massachusetts, Cornell University and collaborators from Hungary and the Netherlands contributed to the study.

Zhu's research findings were published by the *Proceedings of the National Academy of Sciences*.

More information: Qi Wang et al. Host-secreted antimicrobial peptide enforces symbiotic selectivity in, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1700715114](https://doi.org/10.1073/pnas.1700715114)

Shengming Yang et al. Microsymbiont discrimination mediated by a host-secreted peptide in, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1700460114](https://doi.org/10.1073/pnas.1700460114)

Provided by University of Kentucky

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