SYMBIOSIS

R you friend or foe?

Establishing a productive symbiosis requires that the two interacting species tolerate each other, even in the presence of an immune system. In a recent issue of the *Proceedings of the National Academy of Sciences, USA*, Yang and colleagues describe how innate immunity proteins in legumes determine the host range of plant–bacterium interactions.

Legumes form a root nodule — a compartment that houses symbiotic, nitrogen-fixing rhizobial bacteria — with a defined, narrow range of bacteria; nodule formation can be triggered by a bacterium in a plant that restricts a closely related bacterial species. To resolve how this specificity is determined, the authors mapped two loci in soybeans, *Rj2* and *Rfg1*, that are known to regulate the specificity of soybean–bacterium interactions. Using crosses of plants that restrict either *Bradyrhizobium japonicum* or *Sinorhizobium fredii*, they identified genetic regions of 47 kb and 69 kb that contain the *Rj2* and *Rfg1* loci, respectively. Interestingly, these regions overlapped and contained the ORF Glyma16g33780, which encodes a member of the Toll/interleukin receptor–nucleotide-binding site–leucine-rich repeat (TIR–NBS–LRR)

MACMILLAN SOUTH AFRICA

protein family. TIR–NBS–LRR proteins are part of the resistance (R) protein family that confers resistance to pathogens but that had not previously been implicated in the establishment of symbioses. Complementation assays confirmed the role of Glyma16g33780 in symbiosis.

Among 21 soybean strains, the authors found three different responses to *B. japonicum* and *S. fredii*: the plants restricted one, the other or neither of the two species (no strain restricted both). Sequencing of Glyma16g33780 revealed sequence variations in the NBS and LRR domains that correlated with the restriction of *B. japonicum* or *S. fredii*. Furthermore, when the authors tested the restriction of an *S. fredii* mutant

lacking the type III secretion system, they found that this strain was not restricted by plants that restrict its wild-type parent, indicating that a secreted effector of the type III secretion system is the likely target of the Glyma16g33780 gene product.

The finding that R proteins have a role in defining the symbiotic relationship in the root nodule provides insight into the intricate interaction between bacteria and plants.

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ORIGINAL RESEARCH PAPER Yang, S. et al. R gene-controlled host specificity in the legume–rhizobia symbiosis. *Proc. Natl Acad. Sci. USA* **107**, 18735–18740 (2010)

FURTHER READING Deakin, W.J. & Broughton, W.J. Symbiotic use of pathogenic strategies: rhizobial protein secretion systems. *Nature Rev. Microbiol.* **7**, 312–320 (2009)