

Chapter 39

Evolutionary Aside 39.1--Pathogen-resistance Across Species

The probability that a pathogen can infect two plant species growing next to each other decreases as the phylogenetic distance between the two plants increases. Evolutionary biologists are interested in how a distantly related species might be able to mount an immune response to a pathogen affecting a neighboring plant that is evolutionarily quite distinct.

As more has been learned about pathogen recognition, two layers of recognition mechanisms have been identified. The first utilizes transmembrane proteins that recognize conserved molecular patterns via binding to pattern recognition receptors (PRR). The second layer is pathogen-specific with effectors that are recognized by intracellular proteins call NB-LRR proteins (nucleotide-binding and leucine-rich repeats). An avr protein, for example, is an effector.

The two layers of the immune response provide the basis for the current model for resistance as a function of phylogenetic distance. Closely related species are more likely to use the NB-LRR proteins to respond to effectors, but these NB-LRR proteins are not conserved among more distantly related species. As the distance increases, recognition of pathogens is increasingly the responsibility of the PRRs. The two distinct types of receptor molecules allow for both broad resistance and very specific responses to an invading pathogen.