Cover Stories:

Major Scientific Publications Featuring NRI-funded Research

Knowledge For Tomorrow's Solutions

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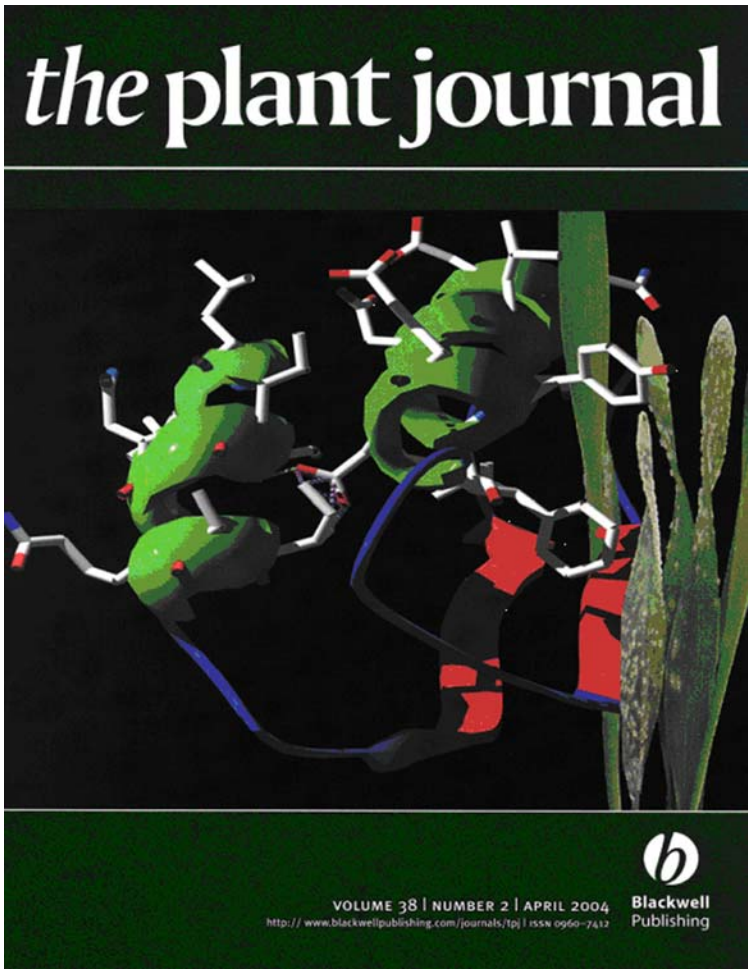

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D. Halterman and R. P. Wise. 2004. A Single Amino Acid Substitution In The Sixth Leucine-Rich Repeat Of Barley MLA6 And MLA13 Alleviates Dependence On RAR1 For Disease Resistance Signaling. The Plant Journal 38(2): 215-226.

Plants are under constant attack from invading pathogens, but are protected by identifying pathogen molecules that attempt to suppress their innate defense responses. This recognition capacity is encoded by resistance (*R*) genes. The most prevalent class of plant *R* genes encode putative intracellular receptors containing highly conserved motifs, including an N-terminal coiled coil (CC) or Toll/Interleukin-1 receptor-like (TIR) domain, a nucleotide binding site (NBS), and C-terminal, leucine-rich repeats (LRR).

A plant's response to pathogens is governed by resistance-protein-mediated signaling via the SCF (Skp1, Cullin, F-box) ubiquitin ligase complex. In barley, the CC-NBS-LRR type Mildew Resistance Locus (MLA) specifies resistance to the powdery mildew fungus, *Blumeria graminis* f. sp. *hordei*, which may or may not require R-protein mediated Resistance (RAR1), and the Suppressor of G-two allele skip1 (SGT1), which forms part of the SCF complex to activate downstream components. The research demonstrates that a single glycine to aspartate substitution in the 6th LRR of RAR1-dependent MLA proteins redirects downstream signaling, but retains the original resistance response.

Plant resistance specificity is usually controlled by residues within the LRR domains, which are hypervariable and targets for diversifying selection. A predicted tertiary structure of the 6th MLA LRR, shown on the Plant Journal's cover, illustrates the aspartate residue (center) within a helical domain distinct from those within the β-sheets (lower right) hypothesized to specify resistance. These results suggest that host-pathogen interactions that regulate resistance signal transduction between R proteins and RAR1 may be subject to subtle intra- or intermolecular folding between repeat motifs. The discovery that a single amino acid determines downstream signaling in plant disease resistance has advanced our understanding of how R proteins transmit signals to activate defense responses. The application of this knowledge will ultimately lead to better plant health and increased agricultural productivity.

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