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Major Scientific Publications Featuring NRI-funded Research

Knowledge For Tomorrow's Solutions

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A. Deleris, J.Gallego-Bartolome, J.Bao, K. D. Kasschau, J. C. Carrington, and O. Voinnet. 2006. Hierarchical Action and Inhibition of Plant Dicer-Like Proteins in Antiviral Defense. ***Science*** *313 (5783): 68-71.*

Since the beginning of the 20th century, plant biologists and farmers have understood the potential negative impact of viral diseases on crop plants. As a result, virus-resistance is a goal of most public and private breeding programs. Scientists in recent years discovered a major virus resistance mechanism, termed RNA silencing, in plants. This mechanism is "adaptive", meaning plants can sense different viruses and customize a resistance response specific to the invading virus. Scientists learned that RNA silencing limits the accumulation and spread of plant viruses. The immunization imparted by RNA silencing allows plants to recover from severe symptoms and provides protection against infection by closely related viruses. The RNA silencing mechanism, which was first discovered in plants, is now known to be an important molecular mechanism in animals. The researchers used the model plant, Arabidopsis, to reveal how RNA silencing works. Dicer-like (DCL2 and DCL4) enzymes manufacture tiny RNA molecules that serve as unique codes to recognize and initiate an antiviral reaction against an invading virus. The small RNAs manufactured by the dicer-like enzymes bind to the viral RNAs and initiate the production of enzymes to destroy the viral genomes. The researchers found plants require both DCLs to inhibit a variety of viruses and to produce a signal that moves throughout the plant to confer systemic immunity. They also found viruses have ways to counter against the RNA silencing response by forming proteins that inhibit specific DCL enzymes. This research illustrates how plants utilize RNA silencing as a front-line defense against viruses. Understanding the molecular mechanism behind RNA silencing arms scientists with the information to improve plant performance and design defense mechanisms against pathologic viruses.

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