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植物与病原微生物互作分子基础的研究进展

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摘要 植物在与病原微生物共同进化过程中形成了复杂的免疫防卫体系。植物的先天免疫系统可大致分为两个层面。第一个层面的免疫基于细胞表面的模式识别受体对病原物相关分子模式的识别，该免疫过程被称为病原物相关分子模式触发的免疫(PAMP-triggered immunity, PTI)，能帮助植物抵抗大部分病原微生物；第二个层面的免疫起始于细胞内部，主要依靠抗病基因编码的蛋白产物直接或间接识别病原微生物分泌的效应子并且激发防卫反应，来抵抗那些能够利用效应子抑制第一层面免疫的病原微生物，这一过程被称为效应子触发的免疫(Effector-triggered immunity, ETI)。这两个层面的免疫都是基于植物对“自我”及“非我”的识别，依靠MAPK级联等信号网络，将识别结果传递到细胞核内，调控相应基因的表达，做出适当的免疫应答。本文着重阐述了植物与病原微生物互作过程中不同层面的免疫反应所发生主要事件的分子基础及研究进展。

关键词: 植物 病原微生物 先天免疫 抗病基因 信号转导

Abstract: Plants have established a complicated immune defense system during co-evolution with pathogens. The innate immune system of plants can be generally divided into two levels. One, named PAMP-triggered immunity (PTI), is based on the recognition of pathogen-associated molecular patterns by pattern-recognition receptors, which confers resistance to most pathogenic microbes. The other begins in cytoplasm and mainly relies on recognition of microbial effectors by plant resistance proteins in direct or indirect ways, which then initiates potent defense responses. This process, termed ef-fector-triggered immunity (ETI), is necessary for defense against pathogens that can secret effectors to suppress the first level of immunity. Activation of these two layers of immunity in plant is based on distinguishing and recognition of “self” and “non-self” signals. Recognition of “non-self” signals can activate signal cascades, such as MAPK cascades, which will then induce defense gene expression and corresponding defense responses. In this review, we focused on underlying mo-lecular mechanisms of plant-pathogen interactions and the latest advances of the PTI and ETI signaling network.

Keywords: plant, pathogen, innate immunity, resistance gene, signaling pathway

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