

Molecular perspectives of plant-pathogen interactions: An overview on plant immunity

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Abstract

In nature, there is constant arm race is going on in between plants and pathogens. These plant-pathogen interactions are complex and multifaceted. To tackle the invading pathogens, plants have developed multiple resistance responses at several levels. On the contrary, adapting capabilities and evolution of new effector molecules help the phytopathogens to outrun plant defenses and proliferate in the host cells. Although, many theories and models have been proposed to address these interactions, none of them are exhaustive and fully understood. In this review, two crucial pathways of plant immune response, including the pathogen-associated molecular patterns (PAMP)-triggered immunity (PTI) and effector-triggered immunity (ETI) has been discussed elaborately. In addition, a comparative discussion of the different models proposed for understanding the ETI has been presented. Understanding of these complex interactions can facilitate the unravelling of the involvement of different plant resistance pathways. Moreover, the review will serve as a basic layout to have an overview of the molecular mechanisms of plant immune responses against phytopathogens.

Keywords: Plant immunity, PTI, ETI, plant-pathogen interactions

Introduction

Being sessile, plants are constantly exposed to an array of biotic stresses including bacteria, fungi, and nematodes. The plant homeostasis is challenged by these pathogen invasions. However, plants don't possess a well characterized and systematic immune system, like in animals to overcome such stresses. Plants employ their survival strategies against the biotic stresses, which is further fine-tuned by several lines of defense. Epidermis, the outermost layer of plants, operates as a corporal wall for the external stress and threats. Further, deposition of lignin, resins or silica on the epidermal layer, and/or development of modified leaves such as trichomes, spines, thorns and prickles restricts pathogen invasion. Plants deploy the use of secondary metabolites as the second line of defense against the invading pathogens and their effector molecules. Hypersensitive responses (HR), programmed cell death, tissue reinforcement at the site of infection and expression of defense-related proteins are often regarded as the third line of defense by plants in response to pathogen or herbivore attacks. The induced local responses at the site of