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PLANT INNATE IMMUNE RESPONSE: QUALITATIVE AND QUANTITATIVE RESISTANCE

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Plant diseases, caused by microbes, threaten world food, feed, and bioproduct security. Plant resistance has not been effectively deployed to improve resistance in plants for lack of understanding of biochemical mechanisms and genetic bedrock of resistance. With the advent of genome sequencing, the forward and reverse genetic approaches have enabled deciphering the riddle of resistance. Invading pathogens produce elicitors and effectors that are recognized by the host membrane-localized receptors, which in turn induce a cascade of downstream regulatory and resistance metabolite and protein biosynthetic genes (R) to produce resistance metabolites and proteins, which reduce pathogen advancement through their antimicrobial and cell wall enforcement properties. The resistance in plants to pathogen attack is expressed as reduced susceptibility, ranging from high susceptibility to hypersensitive response, the shades of gray. The hypersensitive response or cell death is considered as qualitative resistance, while the remainder of the reduced susceptibility is considered as quantitative resistance. The resistance is due to additive effects of several resistance metabolites and proteins, which are produced through a network of several hierarchies of plant R genes. Plants recognize the pathogen elicitors or receptors and then induce downstream genes to eventually produce resistance metabolites and proteins that suppress the pathogen advancement in plant. These resistance genes (R), against qualitative and quantitative resistance, can be identified in germplasm collections and replaced in commercial cultivars, if nonfunctional, based on genome editing to improve plant resistance.

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