Molecular battles between plant and bacteria in the phyllosphere

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The phyllosphere of terrestrial plants provides one of the most important niches for microbial inhabitation. Although, most microbes may complete the life cycle on the leaf surface, pathogen must enter the leaf and multiply aggressively in the apoplast. Natural surface openings, such as stomata, are important entry sites for bacteria. Stomata are known for their pivotal role in water transpiration and gas exchange essential for plant growth. Historically, stomata have been considered as passive portals of entry for plant pathogenic bacteria. However, recent studies have shown that stomata can play an active role in limiting bacterial invasion of both human (*Escherichia coli* O157:H7) and plant pathogenic bacteria [*Pseudomonas syringae* pv. *tomato* (*Pst*) DC3000] as part of the plant innate immune system. Innate immunity in animals and plants can be activated by highly conserved pathogen/microbe-associated molecular patterns (PAMPs or MAMPs), such as bacterial flagellin and lipopolysaccharide. These PAMPs trigger stomatal closure, which requires the FLS2 receptor, production of nitric oxide, salicylic acid homeostasis, and abscisic acid signaling components. As counter-defense, the plant pathogen *Pst* DC3000 uses the virulence factor coronatine to suppress stomatal closure. This action of coronatine in plants requires the F-box protein COI1. COI1 interacts with and target substrate proteins to the 26S proteasome for degradation. To identify coronatine-dependent targets of COI1, I screened an Arabidopsis yeast-two-hybrid (Y2H) library using coronatine and COI1 as bait protein. I found 31 clones expressing a protein of unknown function. This protein was named JAZ9 as it is a member of the JAZ (jasmonate ZIM-domain) protein family. Remarkably, the interaction of COI1 and JAZ9 is dependent on the presence of coronatine or a biologically active jasmonate (JA-isoleucine). This study uncovers a novel and crucial early battleground in host-pathogen interactions in the phyllosphere and has broad implications in the study of bacterial pathogenesis, host immunity, and molecular ecology of bacterial diseases.

Key words: coronatine, stomatal defense, hormone signaling