# Research illuminates new element of plant immune defense response to biotic stress

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Plants are at the mercy of many stresses, both abiotic, such as drought and heat, and biotic, such as pathogens. Researchers know that the plant immune system often responds to infection with an increased cytosolic calcium concentration, which activates immune response regulators. Previous research has studied the cytosolic calcium response in *Physcomitrella patens* (a moss plant often used in studies) as a result of abiotic stress but until recently scientists have not explored the relationship between cytosolic calcium response, *P. patens*, and biotic stress.

A collaboration between scientists with the Vidali at Worcester Polytechnic Institute and the Centro de Biotecnología y Genómica de Plantas in Madrid resulted in the first article addressing the involvement of cytosolic calcium oscillations and waves in the immune response of *P. patens* to a biotic stress. Specifically, the scientists administered chitin oligosaccharides to simulate a fungal infection.

"The results of the study show that, following exposure to chitin oligosaccharides, cytosolic calcium oscillations propagate across the whole plant," Vidali explained. "Interestingly, the frequency of the cytosolic calcium oscillations increases to a fixed value with the increase in the concentration of administered chitin oligosaccharides. This immediate cytosolic calcium response is an early mediator of the plant immune response to fungi."

This result suggests that chitin-triggered calcium oscillations are

conserved and were likely present in the common ancestor of mosses and vascular plants. "Remarkably, the chitin oligosaccharide treatment causes the dissipation of the apical actin filaments and inhibition of cell growth," said Vidali. Additionally, their research showed that the cytosolic calcium influx affected transcription of defense-related genes, meaning that this oscillation could influence gene expression and allow the plant to mount a defense response to attacking pathogens.

Vidali and his team found that the cytosolic calcium signal originating in each individual cell becomes synchronized, resulting in the cytosolic calcium of the plant pulsating as a whole. This suggests that there may be a mechanism of cytosolic calcium-dependent communication between cells, which allows for a uniform response. This observation opens interesting new lines of investigation in cell-to-cell communication and signaling in plants.

"For us to increase plant resistance to biotic stress, it is necessary to understand the molecular mechanisms related to immune plant response. This paper gets us closer to understanding, widely distributed, and evolutionarily conserved responses to biotic stress," Vidali concludes. Read more in "Chitin Triggers Calcium-Mediated Immune Response in the Plant Model *Physcomitrella patens*."

**More information:** Giulia Galotto et al, Chitin Triggers Calcium-Mediated Immune Response in the Plant Model Physcomitrella patens, *Molecular Plant-Microbe Interactions* (2020). DOI: 10.1094/MPMI-03-20-0064-R

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