

Department of Horticulture Seminar Series

HORT 509/510

Spring 2018 Thursdays, 2:50-3:40 pm Presented at the following WSU campuses and Research and Extension Centers

“Calcium signaling in plants: Role of AtSR1 in immune response”

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Abstract

Calcium (Ca^{2+}) acts as a second messenger connecting the perception of pathogenic microbial signals to the establishment of appropriate immune responses in plants. Accumulating evidence suggests that plants distinguish different pathogenic microorganisms through plasma membrane-localized pattern recognition receptors. The particular recognition events are encoded into Ca^{2+} signatures, which are sensed by diverse intracellular Ca^{2+} -binding proteins. The Ca^{2+} signatures are eventually decoded into distinct downstream responses through transcriptional reprogramming of defense-related genes (Yuan, et al., 2017). Recent observations further reveal that Ca^{2+} signaling-mediated AtSR1/CAMTA3 plays a crucial role in plant immune response. AtSR1 (*Arabidopsis* Signal Responsive 1 also known as CAMTA3, Calmodulin-binding Transcriptional Activator 3) is documented to suppress the expression of defense-related genes. Recent observation revealed that AtSR1 is identified as a guardee monitored by NLR guard proteins (Yuan et al., in press). It has been observed that plants encrypt the perception of different pathogenic stimuli, bacterial-derived flg22 and fungal-derived chitin, into specific intracellular Ca^{2+} signatures/transients and subsequently decrypt these Ca^{2+} transients/signatures into appropriate downstream responses through various Ca^{2+} -binding proteins such as calmodulin to establish appropriate immune response in plants. In addition, recent data revealed AtSR1 was also involved in balancing plant growth through the brassinosteroid- and auxin-mediated pathways. EMSA (electrophoretic mobility shift assay) and other data indicated that AtSR1 was able to interact with multi targeted DNA-motif, in addition to the “CGCG” motif. In addition, AtSR1 was found to regulate transcriptional expression and function of NIM1, NON-INDUCIBLE IMMUNITY 1, which was reported to be a receptor for the plant defense hormone salicylic acid (SA) and a regulator in the SA-mediated systemic acquired resistance (SAR) pathway. In summary, these observations support a major role for Ca^{2+} signaling in launching and fine-tuning plant immune response, as well as AtSR1 acting as a hub for decoding Ca^{2+} signals into appropriate immune response.

Yuan, P., Jauregui, E., Du, L., Tanaka, K. and Poovaiah, B.W. 2017. Calcium signatures and signaling events orchestrate plant-microbe interactions. *Curr. Opin. in Plant Biol.* 38:173-183.

Yuan, P., Tanaka, K., Du, L. and Poovaiah B.W. Calcium signaling in plant autoimmunity: A Guard Model for Calcium Sensor CAMTA3/AtSR1. *Molecular Plant* (in press).