

WSU Plant Pathology Seminar

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What Doesn't Kill You Makes You Stronger: Priming for Transgenerational Crop Protection



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Abstract: Plant defense priming enhances plants' ability to respond more effectively to various stresses. This process is triggered by the recognition of molecular patterns from microbes or plants, pathogen-derived effectors, colonization of beneficial microbes, chemical inducers, or physical wounding (Conrath et al., 2011). Exposure to these stimuli induces a latent but heightened defense state, resulting in enhanced resistance to subsequent stress challenges (van Hulten et al., 2006). Recent studies suggest that defense priming can be inherited across generations through epigenetic mechanisms, a phenomenon known as transgenerational memory (Ramirez-Carrasco et al., 2017). In *Arabidopsis*, progeny chemically primed with β -aminobutyric acid (BABA) demonstrated enhanced resistance to *Pseudomonas syringae* pv. tomato DC3000 (*Pst* DC3000), with a more than threefold increase in the expression of *PR-1*, a salicylic acid (SA)-dependent marker gene associated with plant resistance (Slaughter et al., 2011). DNA methylation has been identified as a crucial mediator of transgenerational memory. In one study, *Arabidopsis* mutants deficient in DNA methylation (*ddc: drm1 drm2 cmt3* triple mutant) exhibited constitutive resistance to *Pst* DC3000, mimicking the effects of transgenerational priming observed in wild-type progeny of previously infected plants. This was demonstrated by significantly enhanced *PR-1* gene induction and pathogen resistance in both primed wild-type and unprimed *ddc* progeny. These findings suggest that pathogen-induced DNA hypomethylation, particularly in response to *Pst* DC3000, plays a key role in transgenerational memory and resistance to pathogens (Luna et al., 2011). These insights hold

significant promise for the development of innovative plant breeding and pest management strategies, offering new avenues for enhancing crop resilience in a perpetually changing environment.

References

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Short Biography of Sasha Zvenigorodsky

Sasha Zvenigorodsky is an M.S. student in the Department of Plant Pathology at Washington State University (WSU). She conducts research on fungicide resistance in Ascochyta blight of chickpea in Dr. Weidong Chen's lab, focusing on fungal isolation and propagation, fungicide efficacy testing, and PCR testing. She received her bachelor's degree in Crop Sciences from the University of Illinois at Urbana-Champaign. Outside of her research, Sasha serves as the secretary of the Plant Pathology Graduate Student Organization (PPGSO) and participates in the WSU Women in STEM mentorship program.

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