An Update on the Status of SDHI Mutations Affecting *Alternaria solani*, the Early Blight Pathogen

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Introduction: The potato industry relies heavily on the application of foliar fungicides for the management of early blight. Resistance to single-site mode-of-action fungicides has plagued pathogens in the species *Alternaria* for decades. Five mutations in the *Sdh* gene of *A. solani* have been previously identified that result in reductions in the efficacy of SDHI fungicides (Mallik et al. 2014).

Methods: *Sdh* gene mutations were characterized in nearly 1,500 *A. solani* isolates collected in 2020, 2021, and 2022 using previously developed nethods (Mallik et al. 2014). Over 60% of isolates were found to have none of the five *Sdh* gene mutations. The SdhB, C, and D sub-units of a sub-set of 29 *A. solani* isolates displaying reduced-sensitivity to SDHI fungicides were sequenced. Isolates were collected from numerous potato growing regions in North America.

Results : We uncovered two novel mutations in the SdhB and SdhD sub-units of these 29 *A. solani* isolates, and some isolates contained more than one mutation (Fig. 1). Reduced-sensitivity to fluopyram and adepidyn was observed in *in vitro* fungicide sensitivity assays when compared to baseline isolates (Fig. 2). This was further supported by greenhouse evaluations conducted across a range of fungicide concentrations (Fig. 3). Disease control was significantly reduced in some isolates (Fig. 4). Results from both *in vitro* (r = 0.877; *P* <.0001) and greenhouse (r = 0.859; *P* <.0001) assays indicate cross-sensitivity in most isolates across the two SDHI fungicides (data not shown).

Conclusions: This work will aid in our understanding of fungicide resistance development in *A. solani*, and our ability to make relevant early blight management recommendations. Fungicide efficacy should be closely monitored in potato fields and isolates from early blight lesions tested for fungicide sensitivity if reduced efficacy is observed.

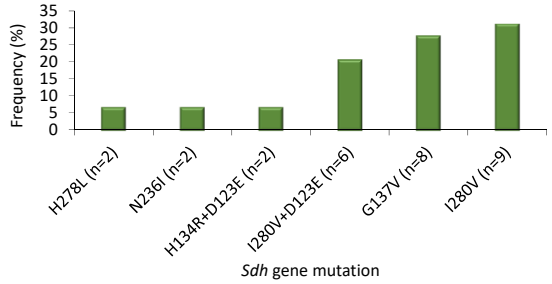

Figure 1: Frequency of *Sdh* gene mutations that affects SDHI fungicide sensitivity in a sub-set of 29 *A. solani* isolates collected from across North America.

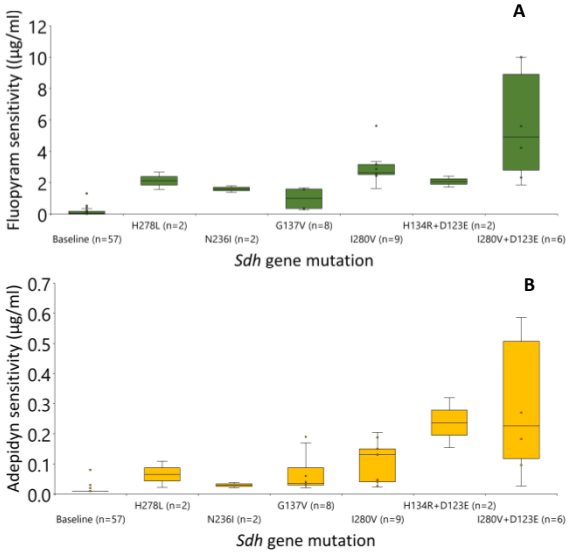

Figure 2: *In vitro* fluopyram (A) and adepidyn (B) sensitivity of 57 baseline and 29 *Sdh* mutant *A. solani* isolates.

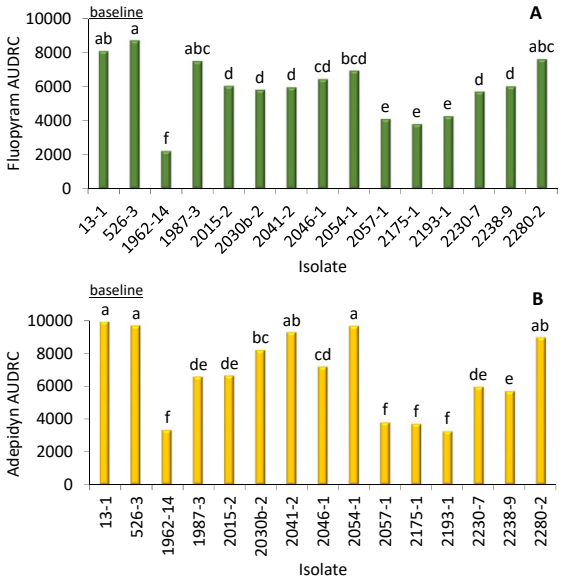

Figure 3: Area under the dose response curve (AUDRC) for fluopyram (A) and adepidyn (B) for 2 baseline and 13 *Sdh* mutant *A. solani* isolates as determined in greenhouse assays.

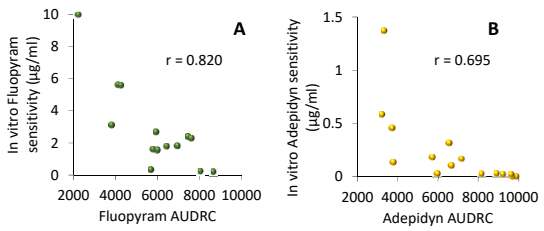

Figure 4: Pearson correlation comparing sensitivity determined *in vitro* and in greenhouse assays of fluopyram (A) and adepidyn (B) for 2 baseline and 13 *Sdh* mutant *A. solani* isolates.

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