Occurrence of boscalid and penthiopyrad resistance in populations of *Alternaria solani* on potato in Michigan

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**Introduction**

Early blight of potato is caused by *Alternaria solani* and occurs annually in Michigan. The disease is commonly managed using succinate dehydrogenase inhibitor (SDHI) fungicides. Recent studies have shown that SDHI resistance in *A. solani* populations has increased dramatically over the past three years in Idaho (1). Potato leaves with typical early blight symptoms were collected from fields in Michigan in 2012 to determine if a similar trend was occurring in Michigan.

**Materials and Methods**

- Early-blight-symptomatic leaf samples (Fig. 1) were collected from Montcalm and Ionia Counties, MI in 2012.
- Nineteen *A. solani* isolates were obtained and each was screened for sensitivity to the SDHI fungicides boscalid, penthiopyrad, and fluopyram, using a 50 ppm discriminatory dose based on EC₅₀ values previously determined (2; Fig. 2).
- An isolate was considered highly resistant if fungal growth relative to control plates exceeded 50%, moderately resistant if it was between 35-50%, and sensitive if it was less than 35%. A sensitive *A. solani* isolate (AS11) from Bonners Ferry, ID was used as a control in these experiments.
- Isolates in this study that were identified as highly resistant to any of the SDHIs were screened for the H227R and H133R mutations which have recently been correlated with the resistant phenotype (2).

![Figure 1](Image)

**Results**

Of all the isolates tested, 11% were highly resistant to both boscalid and penthiopyrad and 5% were moderately resistant to both fungicides. 21% were moderately resistant to penthiopyrad alone, and the remaining isolates (89 and 74% respectively) were sensitive to the two fungicides. None of the isolates tested were resistant to fluopyram.

All of the isolates that were highly resistant to both boscalid and penthiopyrad (M-2 and M-24) were found to contain the H133R mutation in the SdhD subunit, which correlated with the strongest resistance phenotype.

![Figure 3](Image)

**Conclusion**

This is the first report of resistance to SDHI fungicides in populations of *A. solani* on potato in Michigan. These results correlate with those from studies carried out in Idaho where there has been a dramatic increase in resistance to the SDHI fungicides over the past 3 years. These data suggest that boscalid resistant isolates have recently emerged in Michigan and are concerning as cross-resistance between boscalid and penthiopyrad has already developed, despite penthiopyrad not yet being in regular use in Michigan. Although all of the isolates tested were sensitive to fluopyram, the discovery of isolates resistant to boscalid and penthiopyrad suggests that all SDHI fungicides should be considered at high risk of resistance development in Michigan.

![Figure 4](Image)