

Resistance to multiple fungicides in *Botrytis cinerea* isolates from commercial strawberry fields in the eastern USA

Fernández-Ortuño, D.^{1,2}, Grabke, A.¹, Bryson, P.K.¹, Li, X.P.¹, de Vicente, A.², Schnabel, G.¹

¹School of Agricultural, Forest, & Environmental Sciences, Clemson University, Clemson, SC 29634, USA.

²Instituto de Hortofruticultura Subtropical y Mediterránea "La Mayora"-Universidad de Málaga-Consejo Superior de Investigaciones Científicas (IHSM-UMA-CSIC), Dept. de Microbiología, Campus de Teatinos, 29071 Málaga, Spain. Email: adevicente@uma.es

Chemical control of gray mold of strawberry caused by *Botrytis cinerea* Pers. is essential to prevent pre- and postharvest fruit decay; however, resistance to multiple chemical classes of fungicides including APs (cyprodinil), DCs (iprodione), MBCs (thiophanate-methyl), PPs (fludioxonil), QoIs (pyraclostrobin), SBIs (fenhexamid), or SDHIs (boscalid) is a well-known and well-described phenomenon in *B. cinerea* from strawberry fields in Florida, Germany, North Carolina, and South Carolina. As part of a resistance-monitoring program conducted during 2012 and 2013, a total of 1,890 *B. cinerea* isolates were collected from 10 states in the eastern USA. The isolates were analyzed for fungicide resistance using a mycelial growth assay. The overall resistance frequencies in 2012 for thiophanate-methyl, pyraclostrobin, boscalid, cyprodinil, fenhexamid, iprodione, and fludioxonil were 76, 42, 29, 27, 25, 3, and 1%, respectively. Frequencies in 2013 were 85, 59, 5, 17, 26, 2, and 1%, respectively. Isolates were resistant to either one (23%), two (18%), three (19%), four (14%), five (3%) or six (0.1%) chemical classes of fungicides in 2012. In 2013 this distribution was 24%, 29%, 26%, 8%, 2%, 0.3%,

respectively, and also 0.3% (6 isolates) were resistant to all classes of fungicides. Resistance to thiophanate-methyl, iprodione, boscalid, pyraclostrobin and fenhexamid was based on target gene mutations in β -tubulin, *bos1*, *sdhB*, *cytb*, and *erg27*, respectively. Isolates were MDR1 or MDR1h dependent on sensitivity to fludioxonil and variations in transcription factor *mrr1*. Expression of ABC transporter *atrB* was highest in MDR1h isolates. The discovery of *B. cinerea* isolates resistant to all registered site-specific fungicides for gray mold control represents an unprecedented milestone of resistance development in *B. cinerea* that signals a failure of current anti-resistance management strategies.

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