

Virulence of fungicide-resistant *Botrytis cinerea* isolates on detached grapes, peppers, blueberries, and tomatoes treated and untreated with boscalid and fluopyram

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Introduction

Botrytis cinerea is the causal agent of gray mold disease causing both pre- and post-harvest infections of specialty crops such as grapes, strawberries, peppers, tomato, and blueberry (Droby & Lichter, 2007). Fungicide resistance is an increasingly common problem in California specialty crops and resistance monitoring programs are essential to protect the efficacious use of currently available fungicides. Little research has been published on the virulence of fungicide resistant *B. cinerea* isolates assayed on different hosts, and therefore was the objective of this study. Succinate dehydrogenase inhibitors (SDHIs) are a group of fungicides that have a mode of action affecting respiration in fungi specifically at the target site complex II: succinate-dehydrogenase and require resistance management per FRAC (Fungicide Resistance Action Committee) guidelines (www.frac.info). Two commonly used SDHIs for the management of gray mold are fluopyram and boscalid, which were the fungicides evaluated in this study.

Type III Tests of Fixed Effects for Disease Incidence 1st Evaluation Date.

Effect	Num DF	Den DF	F Value	Pr > F
Bin	13	1287	0.58	0.8734
Isolate	16	1287	8.17	<.0001
Host	3	1287	19.03	<.0001
Fungicide	2	1287	20.35	<.0001
Isolate*Fungicide	32	1287	1.91	0.0018
Host*Fungicide	6	1287	0.9	0.4937
Host*Isolate*Fungicide	72	1287	1.42	0.0139
Host*Isolate	36	1287	6.12	<.0001

Type III Tests of Fixed Effects for Disease Severity 1st Evaluation Date.

Effect	Num DF	Den DF	F Value	Pr > F
Bin	13	1277	1.03	0.4145
Isolate	16	1277	14.23	<.0001
Host	3	1277	137.51	<.0001
Fungicide	2	1277	69.36	<.0001
Isolate*Fungicide	32	1277	2.99	<.0001
Host*Fungicide	6	1277	14.94	<.0001
Host*Isolate*Fungicide	72	1277	2.51	<.0001
Host*Isolate	36	1277	7.16	<.0001

Acknowledgments

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Methods

- Seventeen isolates collected from small fruits in CA and identified as resistant or susceptible to boscalid and fluopyram were used to inoculate detached grapes, mini-peppers, cherry tomatoes, and blueberries with and without fungicides.
- For fungicide treated fruit, fungicides were diluted to a label rate equivalent of 0.0812 g/L and 0.2896 g/L for fluopyram and boscalid respectively. Control fruit were inoculated with sterile distilled water.
- The detached fruit were inoculated with 20 µL of a conidial concentration of 1x10⁵ conidia/mL or water. Three replicate fruit per treatment, repeated two times.
- Disease severity (virulence), lesion width, and incidence (calculated) were recorded to determine the impact of fungicide resistance on postharvest gray mold disease control using fluopyram and boscalid fungicides for mini-peppers and grape (5 and 9 days post inoculation), tomatoes (4 and 7 dpi), and blueberry (7 and 9 dpi).
- Disease severity was rated visually according to a percentage scale (0-100%). Disease incidence was calculated by dividing the number of pieces of produce exhibiting disease symptoms by the total number of produce
- Statistical analysis was done using PROC GLIMMIX procedure of SAS and post-hoc tests used Tukey-Kramer difference test ($P < 0.05$).



Inoculating freshly wounded fruit in a safety bio-cabinet.

Results

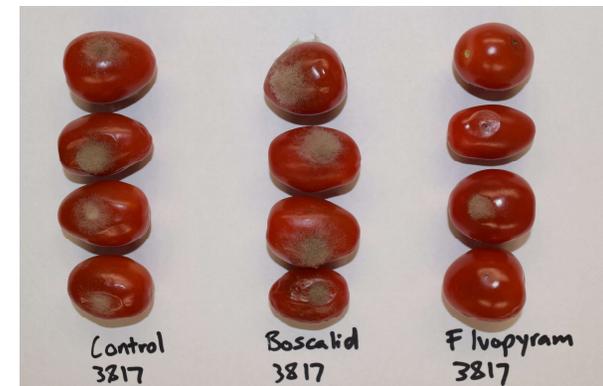
Significant differences ($P < 0.05$) for host, isolate, fungicide, and their interactions for disease severity, disease incidence, and lesion width (not shown) were detected. Results indicated significant differences for certain *B. cinerea* isolates among the hosts tested and indicate that some fungicide resistant isolates may have a host interaction.

Conclusions

High variability was observed among and between treatments for most of the hosts evaluated. No consistent significant differences in virulence or incidence were observed for boscalid or fluopyram-resistant *Botrytis* isolates with or without the presence of fungicides compared to the control treatment.



Isolate A14 was isolated from strawberry and has a fungicide resistance profile of boscalid resistant/ fluopyram resistant, seen above assayed on tomato.



Isolate 3817 was isolated from grape and has a fungicide resistance profile of boscalid resistant/ fluopyram sensitive, seen above assayed on tomato.

Literature Cited

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