



# **Managing the Uncertainties in Growing and Marketing Fruits and Vegetables**

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## Phytophthora Fruit Rot: Lessons Learned

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*Phytophthora capsici* caused serious fruit rot problems in many Michigan fields this season. Several field studies were conducted, and are detailed below. To summarize, fungicides can be helpful if they are applied early and frequently with excellent coverage of the fruit.

In 2001, a study was conducted at a cooperator's farm on a sandy loam soil with a history of *P. capsici*. Plots were 2,640 ft. long with 9 rows per plot, 30 in. between rows and 3 in. between plants. Additional fungicide treatments were applied with a conventional boom sprayer, an air-assisted sprayer, or according to standard grower practices. The conventional sprayer had 8003 nozzles spaced 20 in. apart, operated at 50 psi and delivered 20 gal/A. The air-assisted sprayer had four Proptec nozzles spaced 64 in. apart, and delivered 10 gal/A. Sprays were applied on 8, 13, and 15 Aug. Two large samples of fruit were taken on 17 Aug from each treatment strip and stored four days in bins at ambient conditions. After four days of storage, 200 fruit per bin were evaluated for *P. capsici* infection on 21 Aug. All of the treatments were better in protecting the fruit than the grower standard. The grower relied on Ridomil Gold/Bravo, which was not very effective in this field because resistance to this product had developed.

**Table 1.** Evaluation of fungicides and sprayers to manage *P. capsici* blight on pickles (2001).

Spray regime, treatment and rate/A	Numbers of fruit		% infected <i>Phytophthora</i>
	<i>Phytophthora</i> infected	Healthy	
<b>Air-assisted sprayer</b>			
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb	4.5	184.0	2.2
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb + Ridomil Gold Bravo 76.5WP 2.0 lb . . . . .	3.5	191.5	1.8
<b>Conventional boom sprayer</b>			
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb	15.0	173.0	7.5
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb + Ridomil Gold Bravo 76.5WP 2.0 lb . . . . .	19.0	173.0	9.5
<b>Grower standard</b> . . . . .	59.5	133.0	29.8

In 2002, several studies were conducted at a cooperator's farm on a sandy loam soil with a history of *P. capsici*. In the first trial, plots were 900 ft. long with 9 rows per plot, 30 in. between rows and 3

in. between plants. Fungicide treatments were applied with a conventional boom sprayer or an air assisted sprayer. The conventional sprayer had 8003 nozzles spaced 20 in. apart, operated at 60 psi and delivered 30 gal/A. The air-assisted sprayer had four Proptec nozzles spaced 60 in. apart and delivered 10 gal/A. Sprays were applied on 20, 26, and 29 Aug. These application dates corresponded to fruit sizes of 1, 3 and 5 inches. Three large samples of fruit were taken on 31 Aug from each treatment strip and stored four days in bins at ambient conditions. During harvest the number of infected fruit that came across the transfer belt of the harvester were recorded for a pass of 3 rows by 900 ft (6,750 ft<sup>2</sup>). After four days of storage, 200 fruit per bin were evaluated for *P. capsici* infection on 3 Sep. The results of this trial clearly indicate the need for good fruit coverage when applying fungicide to control fruit rot. While the fungicides helped to limit disease compared to the untreated, the least amount of disease was observed when an air-assisted sprayer was used. This is probably due to the ability of the air-assisted sprayer to more effectively force the fungicide through the plant canopy to cover the fruit.

**Table 2.** Evaluation of fungicides and sprayers to manage *P. capsici* blight on pickles (2002).

Trial 1 Spray regime, treatment and rate/A	Numbers of fruit		% infected <i>Phytophthora</i>
	<i>Phytophthora</i> infected at harvest*	<i>Phytophthora</i> infected after storage	
<b>Air assisted sprayer</b>			
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb ..	16.3 a**	11.7 a	5.9 a
<b>Conventional boom sprayer</b>			
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb ..	89.3 b	55.0 bc	27.5 bc
Gavel 80WG 2.0 lb + Kocide 2000 54WG 1.5 lb ...	70.0 ab	54.7 bc	27.4 bc
<b>Untreated</b> .....	178.0 c	74.7 c	37.4 c

\*Number of infected fruit that came across the harvest belt over a 3 row x 800 ft plot.  
\*\*Column means with a letter in common are not significantly different (Student-Newman-Keuls; P=0.05).

In a second trial, plots were 2,640 ft. long with 9 rows per plot, 30 in. between rows and 3 in. between plants. Each spray treatment was replicated three times in a randomized block design. Fungicide treatments were applied with a conventional boom sprayer equipped with Tee Jet 8002 XR nozzles spaced 20 in. apart, operating at 66 psi and delivering 20 gal/A. Sprays were applied on 18, 22, and 24 Jul. These application dates corresponded to fruit sizes of 1, 3 and 5 inch. Three large samples of fruit were taken on 30 Jul from each treatment strip and stored four days in bins at ambient conditions. After four days of storage, 200 fruit per bin were evaluated for *P. capsici* infection on 3 Aug. Overall, disease in this trial was severe because the weather was very favorable for *P. capsici*. Both Gavel and Acrobat were effective in reducing disease compared to the untreated. Kocide 2000 (copper hydroxide) was mixed with each of these fungicides because previous studies suggest that adding copper may improve disease control.

**Table 3.** Evaluation of Acrobat and Gavel to manage *P. capsici* blight on pickles (2002).

Trial 2 Spray regime, treatment and rate/A	Numbers of fruit		% infected <i>Phytophthora</i>
	<i>Phytophthora</i> infected	Healthy*	
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb	19.3 a**	141.3 a	9.7 a
Gavel 80WG 2.0 lb + Kocide 2000 54WG 1.5 lb . .	21.3 a	152.7 a	10.7 a
Grower Standard . . . . .	65.0 b	113.0 b	32.5 b

\*Number of fruit without *Phytophthora* or *Pythium* infection.

\*\*Column means with a letter in common are not significantly different (Student-Newman-Keuls;  $P=0.05$ ).

In a third trial, plots were 900 ft. long with 9 rows per plot, 30 in. between rows and 3 in. between plants. Each spray treatment was replicated three times in a randomized block design. Fungicide treatments were applied with a conventional boom sprayer equipped with Tee Jet 8003 XR nozzles spaced 20 in. apart, operating at 60 psi and delivering 30 gal/A. Sprays were applied on 11, 15, and 20 Aug. These application dates corresponded to fruit sizes of 1, 3 and 5 inch. Three large samples of fruit were taken on 22 Aug from each treatment strip and stored four days in bins at ambient conditions. After four days of storage, 200 fruit per bin were evaluated for *P. capsici* infection on 26 Aug. Disease in this trial was somewhat less severe, and the fungicides were able to limit *P. capsici* fruit rot fairly effectively.

**Table 4.** Evaluation of Acrobat and Gavel to manage *P. capsici* blight on pickles (2002).

Trial 3 Spray regime, treatment and rate/A	Numbers of fruit		% infected <i>Phytophthora</i>
	<i>Phytophthora</i> infected	Healthy*	
Acrobat 50WP 6.4 oz + Kocide 2000 54WG 1.5 lb	11.0**	168.3	5.5
Gavel 80WG 2.0 lb + Kocide 2000 54WG 1.5 lb . .	1.7	193.0	0.8
Untreated . . . . .	39.0	150.3	19.5

\*Number of fruit without *Phytophthora* or *Pythium* infection.

\*\*There were no significant differences among treatments (Student-Newman-Keuls;  $P=0.05$ ).

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