

### Evaluation of fungicides for control of Phytophthora blight of peppers, 2006.

The experiment was conducted at the Ohio Agricultural Research and Development Center's North Central Agricultural Experiment Station in Fremont, OH on Rimer loamy fine sand. Potassium (240 lb/A K<sub>2</sub>O), phosphorous (92 lb/A P<sub>2</sub>O<sub>5</sub>) and nitrogen (105 lb/A urea) were incorporated into the test field, which was then chisel plowed on 10 Oct 05. On 19 Jul 2006, an additional 28 lb/A nitrogen was applied. On 18 Apr, the field was cultivated and raised beds on 5 ft centers were prepared. 'Paladin' (resistant to Phytophthora root and crown rot) pepper seeds were treated by agitating them in a 25% Clorox (sodium hypochlorite) solution for 1 min followed by a 5 min rinse under running tap water and air-drying, and sown on 17 Apr into 200-cell plug trays containing Metromix 360 seedling mix. The herbicides Dual II Magnum (0.75 pt/A), Command ME (1 pt/A), and Round-Up Ultra (1 qt/A) were applied to the test field on 30 May. Mustang Max (3 fl oz), Warrior T (3 fl oz/A), Pounce 3.2 EC (6 fl oz/A), Dimethoate 400 (1 pt/A), and Metasystox MSR (2 pt/A) plus Spintor 2SC (6 fl oz/A) were applied on 19 Jul and 1 Sep; 31 Jul; 11 Aug; 15 Aug and 1 Sep; and 21 Aug, respectively to control insect pests. On 8 Jun, seedlings were transplanted 1 ft apart into single rows 40 ft long on the beds. A starter fertilizer (N-P-K 10-34-0; 0.7 qt/50 gal water) was applied in the transplant water. Plots were arranged in a randomized complete block design with four replications. Plots consisted of three rows alternated with an untreated border row. The field was cultivated on 27 Jun, and 6 and 18 Jul, hand weeded and hoed on 7 and 19 Jul. Inoculum of *P. capsici* was produced by placing a 0.28 in. disc cut with a #3 cork borer from the edge of an actively growing colony of *P. capsici* produced on PIBNC medium into a 0.28 in. diam hole cut with a #3 cork borer through the rind of a mature 'Taybelle' winter squash fruit. The rind removed by the cork borer was replaced after inoculation and the fruits were incubated at room temperature under ambient light for 2 days. Pepper plants were inoculated on 27 Jul by placing a *P. capsici*-infected squash fruit in the center of the middle row of each plot for all four replications. Treatments were applied using a tractor-mounted CO<sub>2</sub>-pressurized sprayer (55 psi, 36 gal/A, 2 mph). The sprayer was fitted with three nozzles with the center nozzle positioned over the center of the row, and two angular drops down, mini side booms connected to the main boom on each side to insure spray penetration to the lower portion as well as the base of the plants. Ten applications were made on a 7-10 day schedule beginning 28 Jun and ending 8 Sep. On 31 May, the Ridomil Gold EC treatment was broadcast and incorporated into the soil at 1pt/A prior to transplanting; 30 days later 50 ml Ridomil Gold EC solution was applied to the base of each plant. The ProPhyt 4L treatment was applied by drenching seedlings in the greenhouse two days prior to transplanting at the rate of 4 pt/100 gal water. On 8 Jun, all treatments except Ridomil Gold EC were drenched at transplanting by applying 50 ml of fungicide solution within a 6 in.-diam circle around the base of each plant using a backpack CO<sub>2</sub>-pressurized sprayer. The number of plants killed by Phytophthora blight and those with foliar symptoms were determined separately on 11, 20, and 27 Jul, 3, 10, 17, 24, and 29 Aug, and 7 Sep. Fruits were harvested from all plot rows (120 ft) on 17 Aug and from the middle of each plot row (37.5 ft) on 11 Sep. Number and weight of marketable fruit, healthy cull fruit, fruit infected with Phytophthora, fruit with other minor fruit rots, and fruit with physiological or insect damage were recorded. Average maximum temperatures for 8-30 Jun, Jul, Aug, and 1-11 Sep were 79.4, 84.9, 83.9, and 75.7°F; average minimum temperatures were 52.6, 59.8, 55.7, and 49.6°F; and rainfall amounts were 4.91, 5.07, 2.51 and 0.42 in., respectively. Data were analyzed by ANOVA using SAS statistical software. Means were separated using Fisher's protected least significant difference test.

Phytophthora blight did not appear naturally in this trial and disease pressure was low-moderate after inoculation. Despite inoculation, disease incidence was variable in this trial. An average of 22.7% of the pepper plants in the untreated control plots were killed or exhibited symptoms of foliar blight by the end of the season. The percentage of plants with Phytophthora blight at the end of the season was not significantly different among the untreated control and treated plots. The AUDPC also did not differ significantly among treatments and the untreated control when based on plant mortality or combined plant mortality and foliar blight. However all of the treatments, except the ProPhyt 4L basal drench followed by Kocide 2000 + ProPhyt 4L foliar spray, significantly reduced foliar blight development. Marketable yield based on total tonnage, and percentage of marketable fruits was not affected by any treatment. The percentage of fruits infected by Phytophthora was low, ranging from 1.8-9.5%, and all treatments significantly reduced fruit rot by *P. capsici*. There were no significant differences among treatments in percentage of fruit with Phytophthora blight. Treatment with Maestro or Folpan resulted in the highest percentage of healthy fruit.

Treatment and rate/A (application time <sup>z</sup> )	Phytophthora 7 Sep <sup>x</sup>	AUDPC <sup>y</sup>		
		Mortality <sup>x</sup>	Foliar blight	Total disease <sup>x</sup>
Ranman 400SC 2.75 oz basal drench at transplanting then foliar + Silwet L-77 2 fl oz (1-10) .....	20.0 a <sup>w</sup>	231.4 a	50.2 b	281.5 a
SA-110201 10% SC 32 fl oz basal drench at transplanting then foliar (1-10) .....	12.2 a	162.0 a	60.3 b	222.3 a
V-10161 4FL 4 fl oz basal drench at transplanting then foliar (1-10).....	7.9 a	47.8 a	42.2 b	89.9 a
Maestro 80DF 6 lb basal drench at transplanting then foliar (1-10).....	9.5 a	73.6 a	29.6 b	103.2 a
Folpan 80WGD 6 lb basal drench at transplanting then foliar (1-9) .....	17.9 a	79.6 a	60.7 b	140.3 a
NOA 446510 250 SC 8 fl oz basal drench at transplanting then foliar + Activator 90 0.125% V/V (1-10) .....	10.6 a	64.4 a	54.0 b	118.4 a
Ridomil Gold EC 1 pt pre-plant soil incorporation and drench/basal spray 30 days later + Ridomil Gold/Copper WP 2.5 lbs (1-10).....	10.9 a	85.4 a	60.8 b	146.3 a
Prophyt 4L 4 pt/100 gal basal drench prior to and at transplanting + Kocide 2000 DF 1.5 lb + Prophyt 4L 4 pt (1-10).....	17.9 a	78.5 a	87.1 ab	165.6 a
Untreated Control.....	22.7 a	113.9 a	155.1 a	269.0 a
<i>P</i> value	0.6321	0.9085	0.0605	0.7375

<sup>z</sup>Application times were: 1= 28 Jun-5 Jul; 2= 6-13 Jul; 3= 14-19 Jul; 4= 20-30 Jul; 5= 31 Jul-6 Aug; 6= 7-13 Aug; 7= 14-21 Aug; 8= 22-30; 9= 31 Aug-7 Sep; 10= 8-11 Sep

<sup>y</sup>Area under the disease progress curve (AUDPC) was calculated based on plant number; AUDPC calculated according to the formula:  $\sum[(x_i+x_{i-1})/2](t_i-t_{i-1})$  where  $x_i$  is the rating at each evaluation time and  $(t_i-t_{i-1})$  is the time between evaluations.

<sup>x</sup>“Percent Phytophthora” is based on the total number of plants killed by Phytophthora blight plus plants with foliar blight symptoms. AUDPC values calculated separately for plants killed by Phytophthora (mortality), those with foliar blight and the combination of the two (total disease) at each evaluation period. Data for percent Phytophthora and AUDPC for mortality and total disease were square root transformed prior to analysis; non-transformed means are reported.

<sup>w</sup>Values are the means of four replicate plots; treatments followed by the same letter within a column are not significantly different at  $P \leq 0.07$ . Means were separated using Fisher’s protected least significant difference test.

Treatment and rate/A (application time <sup>z</sup> )	Marketable yield (ton/A) <sup>y</sup>	% marketable yield fruit <sup>y</sup>	% Phytophthora infected fruit <sup>y</sup>	% healthy fruit <sup>y</sup>
Ranman 400SC 2.75 oz basal drench at transplanting then foliar sprays + Silwet L-77 2 fl oz (1-10) .....	3.9 a <sup>x</sup>	75.0 a	3.2 b	90.9 ab
SA-110201 10% SC 32 fl oz basal drench at transplanting then foliar sprays (1-10) .....	3.6 a	72.9 a	3.6 b	89.5 ab
V-10161 4FL 4 fl oz basal drench at transplanting then foliar sprays (1-10).....	4.0 a	72.0 a	3.6 b	86.9 bc
Maestro 80DF 6 lb basal drench at transplanting then foliar sprays (1-10).....	4.6 a	73.2 a	1.8 b	93.4 a
Folpan 80WGD 6 lb basal drench at transplanting then foliar sprays (1-9).....	3.8 a	72.6 a	2.3 b	91.9 a
NOA 446510 250 SC 8 fl oz basal drench at transplanting then foliar sprays + Activator 90 0.125% V/V (1-10).....	3.7 a	72.1 a	5.1 b	89.4 ab
Ridomil Gold EC 1 pt pre-plant soil incorporation and drench/basal spray 30 days later + Ridomil Gold/Copper WP 2.5 lbs (1-10) .....	3.8 a	68.9 a	3.6 b	88.9 abc
Prophyt 4L 4 pt/100 gal basal drench prior to and at transplanting+ Kocide 2000 DF 1.5 lb + Prophyt 4L 4 pt (1-10) .....	3.3 a	70.2 a	2.1 b	88.5 abc
Untreated Control .....	3.7 a	70.8 a	9.5 a	84.3 c
<i>P</i> value	0.7054	0.9575	0.0388	0.0400

<sup>z</sup>Application times were: 1= 28 Jun-5 Jul; 2= 6-13 Jul; 3= 14-19 Jul; 4= 20-30 Jul; 5= 31 Jul-6 Aug; 6= 7-13 Aug; 7= 14-21 Aug; 8= 22-30; 9= 31 Aug-7 Sep; 10= 8-11 Sep

<sup>y</sup>Calculated based on fruit count.

<sup>x</sup>Values are the means of four replicate plots; treatments followed by the same letter within a column are not significantly different at  $P \leq 0.05$ . Means were separated using Fisher’s protected least significant difference test.