CUCUMBER (*Cucumis sativus*)
Phytophthora Blight and Fruit Rot;
Phytophthora capsici

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Evaluation of fungicides to control Phytophthora blight and fruit rot of cucumber, 2002.

A field trial was established at a commercial farm near Bancroft, in central WI, in a field with a history of severe loss due to Phytophthora blight and fruit rot, to evaluate efficacy of several fungicides to control this disease. Seeds of cultivar Vlaspik were planted 10 Jul by the grower, at approximately eight seeds per ft, using standard planting equipment. Areas were staked in late Jul to establish plots arranged in a randomized complete block design with four replications. Each plot consisted of three 6-ft-wide beds with three 20-ft-long rows planted in each bed. Soil type was sandy loam with pH 6.2. Plots were fertilized with 28 gal/A liquid formulation 9-6-6 at planting and 34-0-0, 87 lb/A + Cal Sul 43 lb/A on 1 Aug. Weeds were controlled with application of Sandea, 0.66 oz/A, pre-emergence, on 11 Jul. Acrobat, 6.4 oz/A, was applied by the grower 15 Aug to the commercial field adjacent to the trial. Plants from the this area were evaluated at harvest to provide a grower standard for comparison with experimental treatments. Ridomil Gold was applied with a hand-held boom sprayer at a rate equivalent to 8 gal water/A to selected experimental plot areas at planting. Foliar fungicide treatments, beginning on 1 Aug, were applied at 16 psi with a tractor-mounted boom sprayer with a roller pump, equipped with XR11004 extended range flat fan nozzles (13 nozzles, spaced 20 in. apart) delivering 40 gal/A. Plots were not inoculated, relying on natural infestation of *Phytophthora capsici*. The area chosen for trial was a low, poorly drained, wet area with a history of the problem. All plants from a 5-ft-long section of the center row of each of the three beds in each plot were harvested 6 Sep and evaluated for yield and disease symptoms. Each vine was rated as healthy or showing symptoms of Phytophthora blight, and all fruit > 1.5-in.-long were picked and separated into healthy fruit and those with symptoms of Phytophthora rot. The number and weight of healthy and diseased fruit were recorded. Twenty healthy-appearing fruit were selected at random from the yield from each plot and stored at approximately 60° F and > 90% relative humidity. Incidence of fruit with symptoms of Phytophthora rot was recorded 6 and 10 days after fruit were placed in storage. Rainfall (in.) measured for the field was Jul - 2.4 and Aug – 3.4. An additional 2.2 in. of water was applied as irrigation during the week immediately preceding harvest to foster disease development.

An extended period of above average temperatures and dry weather was not favorable for development of this disease. In spite of planting this trial in a field with previous history of disease and adding additional irrigation to supplement rainfall, very little disease developed across the entire plot. Fruit collected at harvest and incubated in a facility with cool temperature and high relative humidity developed a high incidence of fruit decay symptoms. The incidence of diseased fruit was higher on fruit where the plots were treated with several of the treatments than on fruit from untreated control plots. While storing freshly harvested fruit for a week after harvest is not a grower practice, the lack of control on these stored fruit was unexpected. In previous research, we have usually observed a carryover effect on control of disease on the stored fruit from fungicides applied to the plants during the growing season. In nearby commercial production, treatment of foliage with Acrobat appeared to manage the disease effectively.

Table 1. Summary of treatments applied.

#	Treatment	Rate/Acre		Schedule
		Product	Active ingredient	Summary
1	Untreated control	0		
2	KQ667 68.75 WG alt w/	1.5 lb	1.03 lb	Appl 1, 3
	Bravo WS 6L	2.0 pt	1.5 lb	Appl 2, 4
3	KQ667 68.75 WG alt w/	1.0 lb	0.69 lb	Appl 1, 3
	Bravo WS 6L	2.0 pt	1.5 lb	Appl 2, 4
4	KQ667 68.75 WG alt w/	1.5 lb	1.03 lb	Appl 1, 3
	Manzate 75 WG	2.5 lb	1.88 lb	Appl 2, 4
5	AEC67 65.4 WG alt w/	2.0 lb	1.31 lb	Appl 1, 3
	Bravo WS 6L	2.0 pt	1.5 lb	Appl 2, 4
6	AEC67 65.4 WG alt w/	1.5 lb	0.98 lb	Appl 1, 3
	Bravo WS 6L	2.0 pt	1.5 lb	Appl 2, 4
7	AEC67 65.4 WG alt w/	2.0 lb	1.31 lb	Appl 1, 3
	Manzate 75 WG	2.5 lb	1.88 lb	Appl 2, 4
8	Acrobat 50 WP	0.4 lb	0.2 lb	Weeks 2-4
	+ Kocide 2000 (53.8%)	1.86 lb	1.0 lb	
9	Ridomil Gold	3.2 fl oz	0.1 lb	At planting
	Acrobat 50 WP	0.4 lb	0.2 lb	Weeks 2-4
	+ Kocide 2000 (53.8%)	1.86 lb	1.0 lb	
10	Gavel 75DF alt w/	2.0 lb	1.5 lb	Appl 1, 3
	Dithane 75 DF	2.5 lb	1.88 lb	Appl 2, 4
11	Grower standard: Acrobat 50 WP	0.4 lb	0.2 lb	08/15/02

Application dates for treatments 2-10: 1 – 1 Aug, 2 – 9 Aug, 3 – 16 Aug, 4 – 23 Aug.

Table 2. Effect of fungicide treatment on disease development on vines and fruit, and yield of cucumbers.

Treatment No.	Vines/15 feet of row			Fruit harvested/15 feet of row						Yield of healthy fruit (ton/A, hand harvest)	Relative yield (as % of grower standard)[1]	Adjusted yield, relative to commercial harvest (ton/A) [2]	Cost of chemicals/A ($) [3]	Relative gross value of yield ($) [4]	Net value of yield ($)[5]	Effect of treatment on value ($) [6]	% Diseased fruit after	
	Number		Incidence of diseased vines (%)	Number		Incidence of diseased fruit (%)	Weight (lb)		Diseased fruit (%, by weight)								6	10
	Healthy	Diseased		Healthy	Diseased		Healthy	Diseased									Days in storage	
1	47.8	0.0	0.0	62.8	6.5	10.4	30.9	3.5	10.4	22.4	139	7.5	0	900	900	0	45.0	65.0
2	45.5	0.0	0.0	53.8	11.3	16.7	25.1	5.3	18.7	18.2	113	6.1	---	732	---	---	52.5	61.3
3	48.8	0.0	0.0	56.3	20.8	27.5	22.6	9.1	29.8	16.4	102	5.5	---	660	---	---	55.0	65.0
4	46.5	0.0	0.0	54.0	16.3	22.6	21.6	7.1	25.3	15.6	97	5.2	---	624	---	---	52.5	65.0
5	49.0	0.3	0.5	52.3	19.0	26.5	23.8	9.4	28.1	17.3	107	5.8	---	696	---	---	60.0	70.0
6	51.3	0.0	0.0	45.0	27.3	37.3	19.7	12.7	40.0	14.3	89	4.8	---	576	---	---	53.8	63.8
7	50.3	0.0	0.0	42.5	28.8	42.1	18.5	14.2	46.3	13.4	83	4.5	---	540	---	---	65.0	76.3
8	48.5	0.0	0.0	52.0	29.0	37.9	23.0	13.1	39.0	16.6	103	5.6	39	672	633	-267	70.0	83.8
9	52.3	0.0	0.0	59.3	14.3	18.8	26.0	6.8	21.1	18.8	117	6.3	56	756	700	-200	60.0	72.5
10	52.3	0.0	0.0	64.3	18.0	22.8	25.5	8.7	26.8	18.5	115	6.2	31	744	713	-187	67.5	77.5
11	48.3	0.0	0.0	49.0	15.5	23.7	22.2	7.8	26.7	16.1	100	5.4	8	648	640	-260	60.2	75.2
Pr>F [7]	0.53	0.47	0.47	0.88	0.70	0.77	0.91	0.70	0.79	0.91	---	---	---	---	---	---	0.99	0.99
LSD [7]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	---	---	---	---	---	---	NS	NS

1. Treatment 11 consisted of samples taken from adjacent areas of the commercial field which were not harvested. Commercial harvest was done a week prior to our evaluation so fruit had grown past commercial size and total weight of yield was much higher for our trial than at the time of commercial harvest. Setting the yield for these samples from the commercial field as 100%, relative yield of the other treatments is expressed as a percentage of this.
2. Actual commercial harvest was 5.4 ton/A with a value of $120/ton. Figures in this column are the result of multiplying this value for commercial harvest by the % relative yield (the column to the left).
3. 2002 Season-long cost of chemicals/Acre (rate, number of applications and retail cost are included in calculation). Application costs are not included. Typical retail prices used: Acrobat 50WP - $19.25/lb; Dithane 75DF -$2.5/lb; Gavel 75DF - $4.50/lb; Kocide 2000 - $2.80/lb; Ridomil Gold 4EC - $680/gal. Costs were not calculated for experimental treatments.
4. Adjusted yield x value of $120/ton.
5. Gross value - cost of chemicals.
6. (Net value of yield for treatment) – (net value of yield for the untreated control [treatment #1]).
7. Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated. NS = not significant at $P = 0.10$. * indicates significant at $P = 0.10$ but not at $P = 0.05$.

Disease name reference: Horst, R. K. 1990. Westcott's Plant Disease Handbook, 5th Ed. Chapman and Hill, New York. P 174