M. T. McGrath, Cornell University, LIHRL
3059 Sound Avenue, Riverhead, NY 11901

EVALUATION OF BACTERICIDE PROGRAMS INITIATED AFTER DISEASE DETECTION FOR MANAGING BACTERIAL LEAF SPOT OF PEPPER, 1998: The objectives of this study were to determine if bacterial leaf spot (BS) of pepper can be managed effectively with a copper fungicide/bactericide (1) when applications were initiated after disease detection and (2) when the spray interval was lengthened under unfavorable disease conditions (by 1 day for each night that the temperature was <60 F for at least 3 hr). A field experiment was conducted at the Long Island Horticultural Research Laboratory on Riverhead sandy loam soil. Fertilizer (1000 lb/A of 10-10-10) was broadcast and incorporated on 18 May. Seven-wk-old seedlings were transplanted on 2-5 Jun into raised beds with black plastic mulch and drip irrigation. Weeds were controlled by applying Devrinol 50DF (2 lb/treated A) between rows, mechanically cultivating with a rototiller and hand-weeding. Insects were controlled by applying Spintor 25C (5 fl oz/A)four times, Orthene 75S (1.3 lb/A) thrice, and Sevin 50WP (1 lb/A) once. Average monthly high and low temperatures (F) were 77/60 in Jun, 85/66 in Jul, 86/66 in Aug, 79/61 in Sep, and 65/51 in Oct. Rainfall (in.) was 6.72, 3.16, 2.28, 3.03, and 2.35 for these months, respectively. Plots consisted of 22 plants in two staggered rows with plants spaced 15 in. apart within and between rows. There was a single guard row on each side of the treatment rows. A double spreader row ran the length of the field between pairs of plots. It was inoculated late in the day on 16, 17 and 20 Jul with a suspension of races 1, 2, and 3 of *X. c.* pv. *vesicatoria* (from S. A. Miller, OH) by using a pressurized garden sprayer. The first two inoculations were done when rain was forecasted to occur. On 20 Jul, leaves were moistened by running sprinklers for 1.5 hr before inoculating. To provide conditions favorable for disease development, a sprinkler irrigation system that delivers 0.08 in/hr was run for 1-3 hr during early evening on 20, 30 Jul; 3, 7, 8, 9, 29, 30 Aug; and 16 Sep. Plants were watered as needed based on irrometer readings using drip irrigation. Calcium nitrate (200 lb/A of 15.5-0-0) was applied through the drip on 27 Aug. For most treatments, Kocide 2000 was tank mixed with Maneb 75DF and agitated for 90 min which reportedly increases the amount of copper in solution. To assess the benefit of mixing Kocide with Maneb, Kocide was applied alone without extra agitation for one treatment. Treatments were applied with a tractor-mounted boom sprayer equipped with D3-45 hollow cone nozzles spaced 11 in. apart that delivered 100 gpa at 250 psi. A randomized complete block design with four replications was used. BS severity was assessed on 19 Aug and 2, 10, and 17 Sep as percent green leaf tissue with symptoms. Leaf death due to BS (% defoliation) was also recorded. Fruit were harvested, counted, and weighed every 8-21 days over a 68-day period (6 Aug-13 Oct). Fruit with sunscald, blossom-end rot, insect damage, or BS symptoms were considered unmarketable. Yield data were summed over three harvest periods: early (6-14 Aug), middle (24 Aug-1 Sep), late (9 Sep-13 Oct).

Symptoms of BS were first observed on leaves in the spreader row on 23 Jul and at a low level in six plots on 3 Aug. IPM scheduled sprays were started on 12 Aug after symptoms had developed in all plots. BS symptoms were first observed on fruit on 24 Aug. BS was at a low level in all plots throughout this experiment, and caused little defoliation. There were no significant differences among treatments in BS severity or defoliation. However, treated plots produced more fruit than the nontreated control plots during the late harvest period. This difference was significant for 3 treatments. BS did not have a substantial impact on yield because it did not become sufficiently severe and/or because Kocide was not sufficiently effective. Plants treated with Kocide 2000 + Maneb on a preventive schedule had lower severity of BS on foliage and lower incidence of fruit with BS compared with plants treated on an IPM schedule, however, these differences were not significant. More importantly, plants sprayed 11 times on a preventive schedule did not produce significantly more fruit than plants sprayed 7 times beginning after disease detection. Combining Maneb with Kocide 2000 did not improve efficacy. This is an important finding because harvesting is restricted by a 7-day pre-harvest interval when Maneb is used, consequently the spray interval must be more than 7 days during harvest. The cost of controlling BLS with Kocide ($98/A for 7 sprays at $7/A for Kocide and $7/A application cost) was much less than the value of the yield gain ($845/A assuming 60% of fruit are marketed at 49 fruit/box for $7.50/box and there are 9196 plants/A). Similar results were obtained in 1997 (F&N Tests 53:169). The current study did not provide conclusive evidence on the importance of continuing treatment in Sep. In the previous study, where BS was more severe, yield was improved by applications made in Sep and yield was not affected when the spray interval was lengthened under unfavorable BS conditions.

		Bacterial spot		Yield (# marketable fruit/plant)			
Treatment[2]	Schedule (application time[3])	Severity[1] 17 Sep	Incidence fruit (%)	6 Aug - 14 Aug	24 Aug -1 Sep	9 Sep - 13 Oct	Total
Nontreated Control	.....	18	4.6	3.3	3.5	3.1 c[4]	9.9
Kocide + Maneb	Preventive (1-11)	6	1.6	3.2	3.9	4.4 a	11.6
Kocide + Maneb	Start at detection (5-11)	12	4.0	3.0	3.9	4.7 a	11.6
Kocide	Start at detection (5-11)	14	5.3	3.4	3.5	4.0 ab	10.9
Kocide + Maneb	Start at detection (5-8,10) Delay when <60F at night	14	4.8	3.0	3.4	3.3 bc	9.8
Kocide + Maneb	Start at detection (5-7) End treatment in Sep	15	3.6	2.7	3.6	3.9 a-c	10.2
Kocide 4.5+ Maneb	Start at detection (5-11).....	8	4.4	3.0	4.1	3.9 bc	11.0
P-value		0.29	0.20	0.77	0.43	0.02	0.07

[1] Percent of leaf tissue in a plot with symptoms on 17 Sep.
[2] Kocide =Kocide 2000 at 2 lb/A, Maneb =Maneb 75DF at 1.5 lb/A, Kocide 4.5=Kocide 4.5 LF 2 pt/A.
[3] Application times were: 1=14 Jul, 2=21 Jul, 3=28 Jul, 4=4 Aug, 5=12 Aug, 6=20 Aug, 7=26 Aug, 8=2 Sep, 9=11 Sep, 10=19 Sep, and 11=25 Sep.
[4] Numbers in a column with a letter in common are not significantly different according to Fisher's Protected LSD (P=0.05).