

Evaluation of fungicides for the control of clubroot of broccoli, 2006.

The experiment was conducted at the Ohio Agricultural Research and Development Center's Muck Crops Agricultural Research Station in Celeryville, OH on Linwood muck soil, pH 5.4. Fertilizer (N-P-K 18-17-17, 500 lbs/A) was incorporated into the test field on 1 May. 'Everest' and 'Green Magic' broccoli seeds were sown on 15 May into 200-cell plug trays containing Scott's Metro seedling mix. Plots were disked, leveled, rolled, and beds prepared on 7 Jun. Broccoli seedlings were transplanted on 13 Jun. Plots were arranged in a randomized complete block design with four replications. Each plot consisted of two rows (one row of each variety) on a 20 ft long bed with a plant-to-plant spacing of 0.5 ft. Beds were spaced 6 ft apart on center. Immediately after transplanting, Omega 500F, Ranman 400SC, and ProPhyt 4L were applied by pouring 3.4 fl oz (100 ml) of fungicide solution at the base of each transplant. For the untreated control transplants, water was applied at the same rate. Plots were irrigated with 1 in. water according to their timing of application using a portable water tank with a motor-driven pump. Treatments with irrigation timings of 2-4 hours, 1 day or 3 days after fungicide application were irrigated on 13 Jun, 14 Jun, and 16 Jun, respectively. ProPhyt 4L was applied at the rate of 6 pt/A on 20 Jun as a foliar spray using a tractor mounted 3.0 hitch (hydraulic attach) motor-driven sprayer (95 psi, 52.2 gal/A, 2 mph). Sevin XLR Plus (1 qt/A) was applied on 28 Jun, and Ambush 25W (12.8 oz/A) on 7 Jul for insect pest management. On 7 Aug, ten plants from each variety per treatment were dug from the middle of each row and evaluated for clubroot severity. The vigor, height, and total fresh and dry top weight of five plants randomly selected among the 10 plant sampled were recorded. Average maximum temperatures for 13-30 Jun, Jul, and 1-7 Aug were 80.8, 83.3, and 88.7°F; average minimum temperatures were 56.7, 63.1, and 67.1°F; and rainfall amounts were 3.67, 4.31, and 0.07 in., respectively. Data were analyzed by ANOVA using SAS statistical software. Means were separated using Fisher's protected least significant difference test.

Clubroot pressure was severe in this trial, with 100% of plants showing clubroot symptoms. Variety × treatment interactions were not significant for any of the measured parameters, so data from the two varieties were combined for analysis. There were no significant differences among treatments and the untreated control in fresh or dried top weight. However, plants from plots treated with Omega 500F (irrigated 1 or 3 days after treatment), Ranman 400SC, or ProPhyt 4L were significantly taller than untreated control plants. Clubroot severity was significantly lower in all treated plots than in the untreated control. Ranman 400SC was significantly more effective in reducing clubroot severity than the other treatments. All of the treatments significantly increased plant vigor compared to the untreated control.

| Treatment (application timing) | Fresh top ^z weight (lb) | Dry top ^z weight (lb) | Plant height ^z (in.) | Clubroot ^{zy} severity | Total ^{xw} vigor |
|--|--|--|------------------------------------|------------------------------------|------------------------------|
| Untreated control- irrigated with 1" water 2-4 hours after application | 2.0 a ^v | 0.3 a | 17.5 b | 84.6 a | 3.9 a |
| Omega 500F 6.4 fl oz /100 gal irrigated with 1" water 2-4 hours after application..... | 3.7 a | 0.6 a | 20.4 ab | 50.5 b | 2.2 b |
| Omega 500F 6.4 fl oz /100 gal irrigated with 1" water 1 day after application..... | 3.9 a | 0.6 a | 20.7 a | 43.9 bc | 2.1 b |
| Omega 500F 6.4 fl oz /100 gal irrigated with 1" water 3 days after application..... | 3.5 a | 0.5 a | 22.0 a | 40.9 bc | 2.4 b |
| Ranman 400SC 17.1 fl oz/100 gal irrigated with 1" water 2-4 hours after application | 4.2 a | 0.6 a | 22.4 a | 31.6 c | 1.9 b |
| ProPhyt 4L 4 pt/100 gal seedling drench at transplanting + 6 pt/A 1 week after transplanting (foliar) ^u | 3.6 a | 0.6 a | 21.3 a | 56.3 b | 2.5 b |
| <i>P</i> value | 0.1815 | 0.1438 | 0.0525 | 0.0002 | 0.0148 |

^zValues based on ten plants.

^ySeverity of clubroot was assessed on a 1-5 scale where 1 (healthy) = 0% disease; 2= 1-25 % disease; 3= 26-50% disease; 4= 51-75% disease; and 5= 76-100% disease. Severity = [Σ(category midpoint*number of plants in category)]/n, where n = total number of plants harvested.

^wValues based on five plants.

^xPlant vigor was rated according to the following scale: 5=severe stunting, few small sized leaves, chlorosis; 4=stunting, few small-medium sized leaves, chlorosis 3=moderate stunting, medium-large leaves, reduced leaf number, chlorosis; 2=slight stunting, slight reduction in leaf number, mild chlorosis, mainly larger leaves; 1=healthy plant, large leaves, no chlorosis. Vigor = [Σ(category value*number of plants in category)]/n, where n = total number of plants harvested.

^vValues are the means of four replicate plots of two varieties; treatments followed by the same letter within a column are not significantly different at *P*≤0.05. Means were separated using Fisher's protected least significant difference test.

^uFoliar application made on 20 Jun.

