

APPLE (*Malus × domestica*, 'Cortland')
Apple scab; *Venturia inaequalis*
Powdery Mildew; *Podosphaera leucotricha*

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Strobilurin-based programs for management of apple scab and powdery mildew in a DMI-resistant orchard, 2002.

This trial was designed to: (1) evaluate the utility of adding mancozeb as a mixing partner with the strobilurin fungicides; and (2) evaluate the efficacy of early-season applications of wettable and liquid lime sulfur for managing powdery mildew. The experiment was conducted in a 27-year-old 'Cortland' orchard planted on MM.106 rootstock in Geneva, NY. DMI-resistant isolates of *Venturia inaequalis* are prevalent in this orchard. Single-tree plots were arranged in a randomized complete block design with four replications. All treatments were applied to drip using a handgun and high-pressure pump. Cover sprays of Captan and Topsin M were applied with an airblast sprayer at 3X concentration. Ascospore release was monitored from 15 Apr through 25 May with a Burkard spore trap to estimate disease pressure. Ascospore counts were summarized in daily increments; six major release events were identified. For each of these six events the following information is given: date of event, hours of leaf wetness and the average temperature during that period, amount of precipitation, percent of the total seasonal ascospore released for that event, and cumulative ascospore release. Individual leaf wetness periods were summed if separated by a drying period of less than 24 hr. The events occurred: (1) 29-30 April, 20 hr, 40° F, 0.66 in., 22.5%, 22.5%; (2) 2 May, 7 hr, 46° F, 0.11 in., 16.6%, 40.3%; (3) 7 May, 5 hr, 57° F, 0.04 in., 5.8%, 47.2%; (4) 9 May, 4 hr, 52° F, 0.36 in., 12.3%, 59.7%; (5) 12-14 May, 56 hr, 44° F, 2.04 in., 31.6%, 91%; and (6) 16-18 May, 18 hr, 45° F, 0.33 in., 7.9%, 99.5%. A significant ascospore release/infection event may have occurred on 13 Apr (just prior to green tip for that orchard), however, the Burkard trap was not in place at the time. Apple scab incidence (presence/absence) was evaluated by examining all leaves on 25 clusters per tree on 4 Jun; the 10 oldest fully expanded leaves on each of 10 terminal branches on 16 Aug; and 100 fruit per tree on 16 Aug. Powdery mildew incidence was evaluated by examining the oldest 10 fully expanded leaves on each of 10 terminal branches on 19 Aug. Data were transformed using arcsin transformation and were then analyzed using ANOVA. Treatment means were separated using Fisher's Protected LSD test.

Disease pressure was higher than normal during primary scab season due to frequent rain events. Moreover, the period between pink and petal fall lasted nearly 3 weeks due to unusually cool temperatures. All treatments started at tight cluster with an application of Dithane RSNT or wettable sulfur. Management programs built around strobilurin fungicides provided good to excellent season-long control of scab. As expected for this DMI-resistant orchard, four applications of Nova 40W mixed with Dithane RSNT did not provide significantly better control than Dithane RSNT used alone. Programs that included Sovran 50WG provided slightly but consistently better control of fruit scab than programs built around Flint 50WG. Conversely, programs built around Flint 50WG provided slightly but consistently better control of foliar scab than programs built around Sovran 50WG. Although the treatments did not separate statistically, it is interesting to note that the combination of the low rate of Sovran 50WG plus Dithane RSNT provided better control of fruit scab than the high rate of Sovran 50WG used alone, which provided better control of fruit scab than the low rate of Sovran 50WG; the same trend was evident with the use of Flint 50WG on foliar scab. Results suggest that it might be worth considering using Flint 50WG to manage cluster scab and then switching over to Sovran 50WG later in the season to manage fruit scab. Including wettable and liquid lime sulfur in spray programs with Dithane RSNT early in the season did not improve mildew control better than Dithane RSNT alone.

Material, rate/100 gal	Timing**	Apple Scab*				Powdery Mildew
		% Foliar scab [% control]		% Fruit scab [% control]		% Foliar mildew
		Cluster	Terminal	4 Jun	16 Aug	Terminal (19 Aug)
Dithane RSNT 75DF 1 lb	1, 3, 5					
Flint 50WG 0.67 oz	2, 4, 6, 7	1.9 cdef [96]	15.2 def [81]	0.3 b [98]	5.0 e [95]	16.7 cd [73]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Flint 50WG 1 oz	2, 4, 6, 7	1.0 def [98]	16.0 def [80]	0.3 b [98]	3.7 ef [96]	15.7 d [74]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Flint 50WG 0.67 oz + Dithane RSNT 75DF 1 lb.....	2, 4, 6, 7	0.2 f [99]	22.5 de [71]	0.0 b [100]	6.2 de [93]	24.0 bcd [61]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Sovran 50WG 1.33 oz	2, 4, 6, 7	3.8 cd [92]	18.5 def [76]	1.0 b [93]	3.7 ef [96]	19.5 bcd [68]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Sovran 50WG 2.1 oz	2, 4, 6, 7	1.4 cdef [97]	16.5 def [79]	0.3 b [98]	2.0 ef [97]	13.2 d [79]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Sovran 50WG 1.33 oz + Dithane RSNT 75DF 1 lb..	2, 4, 6, 7	0.9 ef [98]	14.7 ef [81]	0.3 b [98]	0.5 f [99]	8.0 d [87]
Dithane RSNT 75DF 1 lb	1-7	3.6 cde [92]	42.7 b [46]	0.0 b [100]	17.7 c [81]	10.2 d [83]
Penncozeb 75DF 1 lb	1-7	3.1 cde [93]	37.5 bc [52]	1.5 b [90]	15.7 cd [83]	40.2 abc [35]
Dithane RSNT 75DF 1 lb	1, 3, 5					
Nova 40WP 1.5 oz + Dithane RSNT 75DF 1 lb.....	2, 4, 6, 7	2.5 cdef [95]	26.7 cd [66]	0.3 b [98]	21.8 c [77]	16.0 cd [74]
Microthiol Special 80DF 6.67 lb	1					
Miller Lime Sulfur Solution 2 gal.....	2					
Sovran 50WG 2.1 oz	3, 4, 6, 7					
Dithane RSNT 75DF 1 lb	5	0.7 f [99]	10.7 f [86]	0.3 b [98]	3.0 ef [97]	15.7 cd [74]
Microthiol Special 80DF 6.67 lb	1					
Miller Lime Sulfur Solution 2 gal.....	2					
Dithane RSNT 75DF 1 lb	3-7	5.4 bc [88]	22.7 de [71]	0.0 b [100]	6.7 de [93]	30.5 bcd [50]
Microthiol Special 80DF 6.67 lb	1					
Miller Lime Sulfur Solution 2 gal.....	2					
NO SPRAY	3-7	9.3 b [80]	45.2 b [42]	11.4 a [23]	84.3 b [9]	46.0 ab [26]
Untreated check.....		46.4 a	78.5 a	14.7 a	92.9 a	61.5 a

* Mean disease incidence values from four replicate plots per treatment are shown. Means within a column not followed by a common letter are significantly different from each other according to Fisher's Protected LSD ($P < 0.05$). Bracketed values denote percent control relative to the untreated check.

** Spray timing designations are as follows: #1 = 18 Apr (tight cluster); #2 = 24 Apr (pink); #3 = 1 May (extended pink); #4 = 8 May (bloom); #5 = 15 May (late bloom-early petal fall); #6 = 21 May (petal fall), #7 = 29 May (first cover). Unless otherwise noted, Captan 50W 1 lb/100gal + Topsin M 70WSB 3 oz/100 gal was used in cover sprays 8 thru 12 and was applied on 13, 26 Jun; 11, 25 Jul; and 7 Aug; respectively.