APPLE (*Malus* × *domestica* 'McIntosh')
Apple scab; *Venturia inaequalis*

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Evaluation of fungicide programs for management of apple scab in a DMI-resistant orchard, 2002.

Trials were conducted in a 27-year-old orchard of McIntosh and Cortland on MM.106 rootstock in Geneva, NY. Trees were planted in alternation within rows such that individual plots consisted of two trees, one McIntosh and one Cortland. Treatments were arranged in a randomized complete block design with four replications. All treatments were applied to drip using a handgun and high-pressure pump, and cover sprays 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; 6 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 period, cumulative ascospore release. Individual leaf wetness periods were added together if separated by a drying period less than 24 hr. The events occurred: (1) 29-30 April, 20 hr, 40º F, 0.66 in., 22.5%, 22.5%; (2) 2 May, 7 hr, 46º F, 0.11 in., 16.6%, 40.3%; (3) 7 May, 5 hr, 57º F, 0.04 in., 5.8%, 47.2%; (4) 9 May, 4 hr, 52º F, 0.36 in., 12.3%, 59.7%; (5) 12-14 May, 56 hr, 44º F, 2.04 in., 31.6%, 91%; and (6) 16-18 May, 18 hr, 45º F, 0.33 in., 7.9%, 99.5%. A significant 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 on McIntosh trees only by examining all leaves on 25 clusters per tree on 3 Jun and on the first 10 fully expanded leaves (i.e., oldest leaves) on each of 10 terminal branches on 16 Aug. One hundred fruit per tree were examined for the presence or absence of scab on the same dates. Data were transformed using arcsin transformation. Transformed data were 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 except those with BAS 510 or Switch 62.5WG provided greater than 95% control of cluster leaf scab. A significant infection event occurred between bloom and petal fall. At this time, developing fruit were very susceptible to infection whereas cluster leaves were presumably resistant due to ontogenic resistance. Treatments where 2 lbs of mancozeb was applied at bloom and petal fall or, with the exception of BAS 500, a strobilurin was applied at petal fall provided the best level of control of early fruit scab. Treatments with 1 lb of mancozeb or mancozeb plus Nova 40W did poorly at protecting developing fruits; the failure of the latter treatment is attributed to DMI-resistance. All treatments provided poor control of terminal leaf and late fruit scab. It is standard practice to lengthen the interval after first cover if primary scab infections were controlled. This is based on the premise that the dispersal of conidia is confined primarily to within trees. However, even with less than 1% disease on cluster leaves and approximately 5% disease on developing fruit on 3 Jun, a nearly complete control failure can occur by harvest under a 2-week cover-spray schedule.

Material, rate/100 gal	Timing**	Foliar scab [% control] Cluster leaves Jun 3	Foliar scab [% control] Terminal Aug 16	Fruit scab [% control] Early fruit Jun 3	Fruit scab [% control] Late fruit Aug 16
Dithane RSNT 75DF 1 lb	1				
BAS 516 0.395 lb	2-7	0.2 c [99]	90.3 bc [9]	21.8 ef [77]	54.5 efg [46]
Dithane RSNT 75DF 1 lb	1				
BAS 510 2.29 oz	2-7	4.1 c [92]	92.8 ab [7]	65.8 b [29]	80.3 bc [20]
Dithane RSNT 75DF 1 lb	1				
BAS 500 4 oz	2-7	1.3 c [98]	74.0 d [26]	36.0 cde [61]	52.0 efg [48]
Syllit 65W 0.67 lb + Polyram 80DF 1 lb	1, 2				
Polyram 80DF 1 lb + Nova 40WP 1.67 oz	3, 5				
Polyram 80DF 1 lb	4				
Sovran 50WG 1 oz	6, 7	1.1 c [98]	88.3 cd [15]	10.0 fg [89]	30.8 gh [69]
Dodine 400F 0.223 qt	1, 2				
Polyram 80DF 1 lb + Nova 40WP 1.67 oz	3, 5				
Polyram 80DF 1 lb	4				
Sovran 50WG 1 oz	6, 7	0.9 c [98]	88.3 bcd [11]	8.0 g [91]	37.8 fgh [62]
Dithane RSNT 75DF 1 lb	1				
Nova 40W 0.83 oz + Dithane RSNT 75DF 1 lb	2, 3				
Dithane RSNT 75DF 1 lb	4-7	1.6 c [97]	95.0 abc [5]	42.8 cd [55]	73.5 bcde [27]
Dithane RSNT 75DF 1 lb	1-5				
Nova 40W 0.83 oz + Dithane RSNT 75DF 1 lb	6, 7	1.3 c [98]	86.5 bcd [13]	48.0 bc [48]	69.8 bcde [30]
Dithane RSNT 75DF 1 lb	1				
Nova 40W 0.83 oz + Dithane RSNT 75DF 1 lb	2, 3				
Dithane RSNT 75DF 1 lb	4, 5				
Nova 40W 0.83 oz + Dithane RSNT 75DF 1 lb	6, 7	2.9 c [95]	99.0 a [1]	37.3 cde [60]	82.3 b [18]
Dithane RSNT 75DF 1 lb	1				
Rubigan 12EC 3 fl oz + Dithane RSNT 75DF 1 lb	2, 3				
Dithane RSNT 75DF 1 lb	4, 5				
Rubigan 12EC 3 fl oz + Dithane RSNT 75DF 1 lb	6, 7	0.8 c [99]	89.0 bc [11]	28.8 de [69]	57.3 cdef [43]
Polyram 80DF 1 lb	1				
Sovran 50WG 1.33 oz	2, 3				
Polyram 80DF 2 lb+ Nova 40W 0.83 oz	4				
Polyram 80DF 2 lb	5, 6				
Sovran 50WG 1.33 oz	7	0.7 c [99]	91.3 bc [8]	5.8 g [94]	23.5 h [77]
Dithane RSNT 75DF 1 lb	1,2,4,5,7				
Flint 50WG 0.67 oz	3,6,10,11				
Captan 50WP 2 lb + Topsin M 70WSB 3 oz	8,9,12	0.9 c [98]	84.8 bcd [15]	27.6 de [70]	54.9 efd [45]
Dithane RSNT 75DF 1 lb	1				
Switch 62.5WG 4.67 oz	2, 3				
Dithane RSNT 75DF 1 lb	4-7	15.6 b [71]	94.0 ab [6]	43.3 cd [53]	76.3 bcd [24]
Dithane RSNT 75DF 1 lb	1-7	1.8 c [97]	75.5 cd [25]	57.5 bc [38]	95.8 ab [4]
Untreated check		54.3 a	99.5 a	93.1 a	100.0 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.

** Timing designations are as follows: #1= 16 Apr (1/2-inch green); #2 = 18 Apr (tight cluster); #3 = 24 Apr (pink); #4 = 1 May (extended pink), #5 = 7 May (bloom); #6 = 16 May (petal fall); and #7 = 23 May (first cover). Unless otherwise noted, five (#8-#12) additional cover sprays of Topsin M 70WSB (3 oz/100gal) plus Captan 50WP (1 lb/100gal) were applied on 7, 20 Jun; 3, 18 Jul; and 1 Aug; respectively.