Stretton Mtn Report

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1980
Results of Fungicide Evaluations for Control of Apple and Pear Diseases

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1980 Apple Scab and Cedar Apple Rust
Infection Periods and Fungicide Application Dates
Hudson Valley Laboratory, Highland, NY

Spray dates		McIntosh growth stage	Cumm. % scab spores discharged	Wetting periods				Infection periods		
Protectant	Post-infection			Date	Hours wet	Avg. temp.	Inches rain	Scab 1°	Scab 2°	Cedar apple-rust
April 15		GT-QIG	5%	April 14-15	29	48	0.56	M		No
April 24		TC; 3-4 term. lvs.								
	April 29 (52 hrs)			April 27-30	65	47	2.58	H		Yes
May 2		Pink								
		Bloom		May 5-6	12	59	0.02	L*		Yes
				May 7-8	12	54	0.12	L*		Yes
May 9	May 9 (60 hrs)	7-9 term. lvs.		May 9	6	43	0.01	-		-
				May 11	3	58	0.04	-		-
		PF	24%	May 12	13	56	0.34	L	M	Yes
				May 13	7	64	0.02	-	L	Yes*
				May 13-14	10	59	0.24	L*	M	Yes
May 16		10-11 term. lvs.		May 19-20	6	58	0.01	-	-	-
	May 22	12-13 term. lvs.	24%	May 21-22	28	55	0.20	H	H	Yes
May 28	(26 hrs)			May 31-6/1	11	62	0.07	L	M	Yes
				June 2	9	59	0.10	-*	M	Yes
				June 2	1	76	0.02	-	-	-
				June 3	10	65	0.08	L*	M	Yes
June 5	June 5 (102 or 29)		65%							
				June 7	9	57	0.56	-	L	Yes
				June 8	10	60	0.05	L	M	Yes
			85%	June 9-10	11	50	Trace	-	L	Yes
		Term. bud set		June 15-16	9	61	0.33	L*	M	Yes
				June 20	7	59	0.02	-	-	-
				June 28-30	37	62	1.88		H	
				June 30	4	70	0.04		-	
July 2	July 2 (84 hrs)			July 2	5	70	0.20		-	
				July 3	6	64	Trace		-	
				July 4	6	64	Trace		-	
				July 5-6	10	67	1.09		M	
				July 8	2	69	0.04		-	
				July 11-12	11	63	0.06		M	
				July 17	3	73	0.03		-	

Spray dates		McIntosh growth stage	Cumm. % scab spores discharged	Wetting periods				Infection periods		
Protectant	Post-infection			Date	Hours wet	Avg. temp.	Inches rain	Scab 1°	Scab 2°	Cedar apple-rust
July 21				July 21-22	12	69	1.57		M	
	July 24 (60 hrs)			July 22-23	12	70	0.22		H	
				July 29	6	71	0.23		-	
				July 29-30	13	68	0.01		M	
August 18	August 18									

* = borderline infection period.

APPLE (*Malus sylvestris*)

Apple scab: *Venturia inaequalis*
Cedar apple rust; *Gymnosporangium juniperi-virginianae*

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EVALUATION OF APPLE FUNGICIDES ON PROTECTANT AND POSTINFECTION SPRAY SCHEDULES, 1980. Fungicides were evaluated on a block of 16-yr-old trees on EM II rootstock. Treatments were replicated three times with six cultivars in each plot. Fungicides were sprayed to runoff (ca. 3740 L/ha or 400 gal/A) with a handgun at 2758 kPa (400 psi). McIntosh growth stages and spray dates for plots treated on a protectant schedule were Apr 15 (green tip), 24 (tight cluster), May 2 (pink), 9 (early petal fall), 16, 28, June 5, Jul 2, 21, and Aug 18. Postinfection treatments were applied Apr 29, May 9, 22, Jun 5, and Jul 2 at 52, 60, 26, 102, and 84 hours, respectively, after the start of infection periods. Postinfection plots were sprayed again Jul 24 and Aug 18 to allow for comparisons of summer disease control across both protectant and postinfection plots. Other sprays applied to all plots were Sevin 50W 2.4 g/L May 17, Guthion 50W 0.6 g/L July 14, and Plictran 50W 0.3 g/L Jun 19. Small wire baskets were attached to poles ca. 1 m above the Rome tree in each plot and rust galls from cedar trees were added to each basket on Apr 23, May 2 and 14. Despite 10 primary infection periods and 14 cedar apple rust infection periods, disease pressure was very light. Eight of the 10 primary scab infection periods were light according to the Mill's Table and 5 were borderline infection periods. Longer infection periods occurred Apr 27-30 and May 21-22, but ascospore maturity was delayed and 75% of the ascospores were released after May 30 during short wetting periods. The months of June, July, and August were unusually dry. Data were collected from 20 clusters per tree Jun 18, from 20 terminals per tree Aug 5-13, and from 100 fruit per tree in mid-summer except for Golden Delicious which were rated Oct 2. Mite counts were made Jun 18 and Aug 12 by using a mite brushing machine to brush 25 leaves from the Delicious tree in each replicate.

A 65 hr wetting period with mean temperature of 48 F provided moderate disease pressure for the first postinfection spray and accounted for most of the cluster leaf scab. Cluster-leaf ratings showed Dikar was surprisingly effective on the post-infection schedule. However, most of the rain (and presumably most of the spore discharge) occurred toward the end of the first infection period and within 24 hours of the first postinfection spray. Disase control in postinfection treatments after the first spray is at least partially attributable to redistribution of fungicide residues. All materials tested gave good control of apple scab although the high rate of DPX-6961 was significantly better than the low rate on cluster leaf scab. BFN 8206 provided no control of cedar apple rust, and DPX-6961 was similar to Captan for rust control. Fruit finish was evaluated on Cortland, Empire, and Golden Delicious. All treatments resulted in good fruit finish except that SLJ-0312 caused severe russetting on 47% of the Empire fruit, and both SLJ-0312 and BFN 8206 resulted in a slightly rougher finish in Golden Delicious. Percent fruit with apple scab in the unsprayed check plots was 37, 18, 20, 33 and 15 for McIntosh, Cortland, Empire, Rome, and Golden Delicious, respectively. Fruit scab infections were less than 1% in all sprayed plots (except 1.3% for the Dikar postinfection treatment on Cortlands) and there were no significant differences between fungicide treatments. No cedar apple rust, flyspeck, or sooty blotch was observed on any fruit, and powdery mildew was not observed in this orchard. Mite counts showed that Dikar on the protectant program and SLJ-0312 provided the most effective mite control. Mite counts in the unsprayed check were low due to predation by *Amblyseius fallacis*.

1980 Apple Scab and Cedar Apple Rust Control
Hudson Valley Laboratory, Highland, NY

Treatment and rate/100 gallons[1]	% Leaves with apple scab			% Terminal leaves with cedar apple rust[4]	
	McIntosh clusters[2]	Terminals[3] McIntosh	Cortland	Golden Del.	Rome
Protectant schedule					
1. Check	23.1 d	53.8 c	33.0 b	10.6 c	14.9 e
2. Captan 50W 2 lb	0.1 ab	0.6 ab	0.2 a	2.9 b	3.5 cd
3. Benlate 50W 2 oz + Manzate 200 80W 12 oz	0 a	0.4 ab	Tr a	0.7 ab	0.3 ab
4. Dikar 77W 2 lb (1.5 lb after May 28)	0 a	1.3 ab	0.3 a	Tr a	0.1 ab
5. DPX-6961 50W 4 oz	1.3 b	0.5 ab	0.1 a	2.6 b	4.5 d
6. DPX-6961 50W 8 oz	0 a	0.4 ab	0 a	1.3 ab	2.7 cd
7. SLJ-0312 50W 8 oz	0.6 ab	Tr a	Tr a	0.3 ab	0.2 ab
8. Baycor 50W 4 oz (2 oz after May 28)	0 a	0 a	0.1 a	0 a	0 a
Post-infection schedule					
9. Baycor 50W 4 oz	0 a	0.8 ab	0.2 a	0 a	0 a
10. CGA-64251 10W 2.5 oz	0 a	0.9 ab	Tr a	0 a	0.2 ab
11. BFN 8206 50W 4 oz	0.2 ab	0.1 ab	0 a	9.3 c	15.3 e
12. Dikar 77W 2 lb (1.5 lb after May 28)	4.6 c	2.2 b	0.2 a	0.7 ab	1.1 bc

Numbers within columns followed by the same letter are not significantly different (Waller -Duncan's exact Bayesian K-ratio LSD rule, $P \leq 0.05$).

[1]Treatments on the protectant schedule were applied April 15, 24, May 2, 9, 16, 28, June 5, 19, July 2, 21, and August 18. Post infection treatments were applied April 29, May 9, 22, June 5, July 2, 24, and August 18. Other sprays applied to all treatments were Sevin 50W 2 lb May 17, Plictran 50W 4 oz June 19, and Guthion 50W 8 oz July 14.

[2]Data taken from 20 cluster/replicate (3 single-tree reps) on June 18, 1980.

[3]Data taken from 20 terminals/replicate on August 13 (McIntosh & Cortland).

[4]Data taken from 20 terminals/replicate on August 5-8. Cedar apple rust galls were placed in baskets above Rome trees on April 23, May 2 and 14.

Treatment and rate per 100 L (100 gal)	% fruit infected with apple scab					G. Delicious fruit finish rating[1]
	McIntosh	Cortland	Empire	Rome Beauty	Golden Delicious	
Protectant Schedule						
Check -	37.0 b	18.0 b	20.3 b	33.3 b	15.0 b	1.7 a
Captan 50W 240 g (2 lbs)	0 a	0 a	0 a	0 a	0 a	1.9 a
Benlate 50W + 15 g (2 oz) Manzate 200 80W 90 g (12 oz)	0 a	0 a	0 a	0 a	0 a	2.0 a
Dikar 77W 240 g (2 lbs) after May 28 180 g (1.5 lbs)	0 a	.3 a	0 a	0 a	0 a	1.3 a
DPX-6961 50W 30 g (4 oz)	0 a	.7 a	0 a	0 a	0 a	1.9 a
DPX-6961 50W 60 g (8 oz)	0 a	0 a	0 a	0 a	0 a	1.9 a
SLJ-0312 50W 60 g (8 oz)	.3 a	0 a	0 a	0 a	0 a	2.2 a
Baycor 50W 30 g (4 oz) after May 28 15 g (2 oz)	0 a	0 a	0 a	0 a	0 a	1.7 a
Post-Infection Schedule						
Baycor 50W 30 g (4 oz)	0 a	0 a	0 a	0 a	0 a	1.6 a
CGA-64251 10W 19 g (2.5 oz)	.3 a	.3 a	0 a	0 a	0 a	1.8 a
BFN 8206 50W 30 g (4 oz)	0 a	.3 a	0 a	.7 a	0 a	2.6 a
Dikar 77W 240 g (2 lbs) after May 28 180 g (1.5 lbs)	.3 a	1.3 a	0 a	0 a	0 a	1.7 a

Numbers within columns followed by the same letter are not signiciantly different (Waller-Duncan's Exact Bayesian K-ratio LSD rule, $P \leq 0.05$).

[1] 0 = good finish; 1 = enlarged lenticels; 2 = russetting at stem end; 3-5 = increasing degrees of fruit russet.

APPLE (*Malus sylvestris* 'Golden Delicious')

Cedar apple rust; *Gymnosporangium juniperi-virginianae*
Blossom end rot; *Botrytis cinerea*; *Physalospora obtusa*

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EFFECTS OF SPRAY TIMING ON CEDAR APPLE RUST FRUIT INFECTIONS, 1980. Sprays of Dithane M-45 80W 681 g/378 litres (1.5 lb/100 gal) were applied to mature Golden Delicious trees on seedling rootstock. Treatments were replicated five times using single-tree plots and consisted of an unsprayed check, a seasonal program of five Dithane M-45 sprays, and five schedules with various sprays omitted. Spray dates were Apr 25 - tight cluster (TC), May 6 - pink (P), May 13 - bloom (B), May 20 - petal fall (PF), and May 29 - first cover (1C). Sprays were applied with a high pressure handgun at 3447 kPa (500 psi). The number of cedar apple rust infection periods as determined according to Aldwinckle *et al.* (Infection periods of *Gymnosporangium juniperi-virginianae*. Phytopathology 70:[In Press]) occurring between spray dates were as follows: Apr 25-May 6: 2; May 6-13: 3; May 13-20: 1; May 20-29: 1; after May 29: 7. All of the infection periods were of 7-13 hrs duration except for two: Apr 27-30 (65 hrs) and May 21-22 (28 hrs). Data were collected from 20 clusters/tree Jun 23, 20 terminals/tree July 18, and 100 fruit/tree Aug 4. The locations of infections on each fruit were noted.

The development of terminal leaf infections on all treatments verified that rust infection did occur throughout the season. Some of the terminal leaf infections occurred as late as mid-June, two weeks after the last spray, and these late season infections account for about half of the 9.1% infected leaves in the treatment with five sprays. Most of the fruit rust infections occurred during the period between TC and P sprays: fruit infection in treatments from which the TC spray was omitted were not significantly different from the check treatment. The proportion of infected fruit with calyx end lesions did not differ significantly among treatments, but the proportion of infected fruit with lesions on the stem end or side of the fruit was significantly greater in the unsprayed trees and lower in the full-season schedule than in other treatments. Although no significant differences occurred in the incidence of blossom-end rot in spray treatments, the incidence was greatest in treatments receiving the lowest numbers of sprays.

Treatment and spray timing	% leaves infected		% fruit infected	% of infections affecting			
	cluters	terminals		Calyx end	Side and stem	Entire fruit	Blossom end rot
Check	92.6 b	79.3 d	40.5 c	76.8 a	21.8 c	.4 a	13.5 b
Dithane M-45 Timing							
TC, P, B, PF, IC	4.2 a	9.1 a	3.5 a	98.5 a	0 a	1.5 a	1.0 a
P, B, PF, IC	94.9 b	26.1 b	31.8 c	75.0 a	5.1 b	15.1 b	3.8 a
B, PF, IC	91.9 b	50.6 c	35.0 c	91.0 a	5.6 b	2.6 ab	4.6 a
TC, P	10.1 a	47.6 c	12.2 b	93.7 a	5.6 b	0.2 a	4.9 a
TC, P, B	6.0 a	28.5 b	2.4 a	82.1 a	1.5 ab	0 a	1.5 a
P, B, PF	90.4 b	31.5 b	29.3 c	92.0 a	1.8 ab	3.6 ab	2.6 a

Numbers within columns followed by the same letter are not significantly different (Waller-Duncan's Exact Bayesian K-ratio LSD Rule P≤ 0.05).

APPLE (Malus sylvestris, 'McIntosh')

Blue mold postharvest decay; Penicillium expansum

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NEW FUNGICIDES FOR CONTROL OF PENICILLIUM BLUE MOLD OF APPLES DURING CONTROLLED ATMOSPHERE STORAGE, 1979-80. The efficacy of postharvest fungicide dips for control of blue mold decay of apples was tested using apples stored at 16C and at 3C in controlled atmosphere (CA) storage. Healthy McIntosh apples harvested Sept 17 were punctured 2-3 mm deep at three locations on one face using three 6 d finishing nails mounted in a large cork. The wounded fruit were placed in field crates and dipped in postharvest treatments for 30 seconds. Fruit from each treatment were divided into 8 replicates of 25 fruit each and were arranged on tray packs with the wounded face up. Tray packs were arranged in a randomized, complete-block design and were misted with a spore suspension of a benomyl-sensitive isolate of P. expansum applied with a paint sprayer. The trays of inoculated fruit were placed in cartons and half of the replicates were stored at 16C and half were kept in CA storage until Apr 18, 1980. Fruit stored at 16C was observed for decay after 12 and 20 days and fruit from CA storage was observed the day it was removed from storage and 7 days later.

Benlate, Benlate + Captan, and the high rate of CGA-64251 provided excellent control of blue mold during CA storage and during the 7-day period after apples were removed from storage. CGA-64251 also performed well at 16C but Benlate did not. The high rate of Rovral provided good protection during CA storage, but was no better than Captan 7 days after CA storage. The low rate of CGA-64251 did not provide adequate protection during CA storage. Sisthane, Ronilan and Rovral showed no significant or meaningful rate responses under the conditions of this test. The clorox treatment increased the severity of decay compared to the water check. Most of the uninoculated checks remained uninfected indicating that few infections in this trial could be attributed to natural inoculum on the surface of harvested fruit.

Treatment and rate of formulated material per 100 litres (100 gal)	Following incubation at 16C		Following 221 days CA storage	
	12 days	20 days	Day of removal	7 days out of storage
Water check -	22.9 fg	31.9 ef	56.1 f	60.1 c
Benlate 50W 60 g (8 oz) + Captan 50W 120 g (1 lb)	9.5 de	12.3 cd	1.0 a	2.3 a
Captan 50W 120 g (1 lb)	16.4 ef	18.5 de	21.7 de	22.5 b
Benlate 50W 60 g (8 oz)	7.1 cde	12.7 cd	4.0 ab	4.9 a
Sisthane 2EC 250 ml (1 qt)	0.5 ab	5.6 bc	33.3 e	39.5 bc
Sisthane 2EC 500 ml (2 qt)	2.0 abc	2.5 ab	26.2 de	34.6 bc
CGA-64251 10W 23 g (3 oz)	1.0 ab	1.5 ab	11.6 bcd	22.7 b
CGA-64251 10W 45 g (6 oz)	0.3 a	1.0 a	0.8 a	4.7 a
Rovral 50W 120 g (1 lb)	0 a	0 a	15.8 bcde	24.9 b
Rovral 50W 240 g (2 lb)	0 a	1.5 ab	4.4 abc	25.9 b
Ronilan 50W 180 g (1.5 lb)	0.3 a	11.2 cd	16.3 cde	23.6 b
Ronilan 50W 240 g (2 lb)	5.1 bcd	10.5 cd	17.6 de	22.4 b
Clorox 10 l (10 gal)	34.9 g	43.0 f	83.3 g	85.5 d
Uninoculated check -	0.5 ab	0.5 a	0 a	0 a

Numbers followed by the same letter within columns do not differ significantly (Waller-Duncan's Exact Bayesian K-ratio LSD rule, $P \leq 0.05$). The arcsin transformation was used for statistical analysis.

Disease Incidence in Experimental Planting of Disease Resistant Varieties

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Cultivar	% cluster leaves infected[1]		% terminal leaves infected[2]	
	Apple scab	Cedar apple rust	Apple scab	Cedar apple rust
Coop 5	0 a	12.2 de	0.4 b	53.1 ef
Priscilla	0 a	1.0 ab	0 a	11.8 c
55158-2	0 a	12.1 de	0 a	58.5 f
Cortland	59.8 b	1.8 bc	98.8 d	8.9 c
McIntosh	66.3 c	0 a	99.8 e	2.5 ab
58553-1	0 a	0 a	0 a	4.7 bc
Golden Delicious	65.3 bc	5.7 cd	92.2 c	39.8 de
18491	0 a	1.6 abc	0 a	40.1 de
55166-23	0 a	9.4 de	0 a	38.6 d
Prima	0 a	16.8 e	0 a	57.6 f
Liberty	0 a	0 a	0 a	0 a
61345-2	-[3]	-	0 a	0.2 a
Nova Easy Gro	-	-	0 a	8.6 c

Small letters indicate groupings that do not differ significantly ($P \leq 0.05$) according to Waller-Duncan's Exact Bayesian K-ratio LSD rule.

[1]Cluster leaf data was taken on 10 clusters/tree on July 7, 1980.

[2]Terminal leaf data was taken on all leaves of 10 terminals/tree on Aug. 22, 21, 22, 25.

[3]Trees grafted spring of 1979 there were no clusters to rate.