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Testing Wetness-Hour Models to Predict Need for Summer Fungicide in New England

Thomas Clark, Ezekiel Goodband, and Kathleen Leahy

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Objectives and Procedures

The primary objective of this project was to test two reduced fungicide programs to see if they would adequately control the "summer diseases" (primarily sooty blotch and flyspeck) of apples in New England conditions. In the two cooperating orchards, the test blocks were divided into three ½ acre plots, and each plot was treated according to one of three programs: the 'standard' program of a fungicide application every three weeks throughout the mid- and late-summer months; the 'New York' program of waiting until 150 hours of wetness had accumulated since the most recent fungicide application; and the 'North Carolina' model of waiting until 200-250 hours of wetness had accumulated since the primary infection period for these diseases, which is thought to occur about 10 days after petal fall.

A hygrothermograph unit, modified to measure leaf wetness (by the addition of a string sensor), was used to determine these thresholds. In addition, a Davis Instruments electronic 'GroWeather' unit was used at each orchard to measure leaf wetness. We had hoped to test the two units against one another, but because of difficulty calibrating the wetness sensor on the hygrothermograph at one location (the unit is very old and is no longer supported by the manufacturer), and lightning/power surge problems with the Davis units at both locations, we were not able to do this in a satisfactory manner.

The weather units were set out prior to blossom in both orchards, and the final layout of the test plots was done shortly after petal fall (because of the crop loss which bedeviled most of central New England in 1998, we had to change the test block location at both orchards). The time of petal fall was noted (May 10 at Clarkdale Orchards; May 11 at Alyson's Apple Orchard) and wetness-hours were accumulated beginning 10 days after petal fall (May 20 and May 21, respectively). Trees in both blocks are on M7 rootstock; the Clarkdale block consisted of Golden Delicious and McIntosh, about 15 years old, with rows running east-west, and the Alyson's block was McIntosh and Empire, about 12 years old, with rows running north-south.

This was an unusually wet year in the Northeast; in a more typical year we would not reach the 'North Carolina' threshold until early August, but in 1998 we reached this threshold by early July. Over 100 hours of wetness were received during a single week in June. The specific threshold dates were: at Clarkdale Orchards, the New York threshold of 150 hours from the last apple scab fungicide was reached on June 22 and the North Carolina threshold of 200 hours was reached on July 3. At Alyson's Apple Orchard, the New York threshold was reached on June 24 and the North Carolina threshold on July 2. Because the New York threshold at Clark's was reached at the same time he was planning a 'standard' spray, both the 'standard' and 'New York' plots were treated the same date.

Fungicide Programs

The first summer fungicide applications were made on the following dates at each orchard:

	<u>Standard program</u>	<u>NY program</u>	<u>NC program</u>
Clarkdale	June 22	June 22	July 9
Alyson's	June 24	July 2	July 16

At Alyson's, Mr. Goodband decided to test a yet more radical approach than what we had originally intended. The June 24 'standard' date actually coincides with the NY threshold, and the July 2 date is when the 200-hour NC threshold was reached. The application on July 16 was actually at 336 wetness-hours from 10 days after petal fall, and 262 wetness-hours from the previous fungicide.

The full summer fungicide programs for both orchards are as follows:

	<u>Date:</u>	<u>Material:</u>	<u>Rate/A:</u>	<u>Plots treated:</u>
Clarkdale	6/9	Captan 50 WP	2#	All
	6/22	Captan 50 WP	2#	Standard and NY
	7/9	Captan 50 WP Benlate	1# 3 oz	All
	7/26	Captan 50	1#	All
Alyson's	6/9	Captan 80	2.5#	All
	6/24	Captan 80 Topsin	2.5# 5.3 oz	Standard
	7/2	Captan 80 Topsin	2.5# 5.3 oz	NY
	7/16	Captan 80 Topsin	1.25 # 5.3 oz	All
	8/17	Captan Topsin	2.25# 5.3 oz	All

The cost for the fungicide program in each plot in each orchard was: Clarkdale, standard, 4 applications, \$22.70; NY, 4 applications, \$22.70; NC, 3 applications, \$16.32. Alyson's, standard, 4 applications, \$43.04; NY 4 applications, \$43.04; NC 3 applications, \$36.73.

Summer disease control

Because of the early accumulation of the threshold level of leaf wetness hours, sampling began in mid-July instead of early August as planned, but no symptoms were seen even in check trees until mid-August. When flyspeck symptoms did begin to appear (virtually all the summer disease seen this year was flyspeck), they appeared first in the most lightly-sprayed plots. Despite the early wetness, there was not a significant level of flyspeck except in the check trees until mid-September.

As can be seen from Table 1, there were few significant differences in summer disease occurrence except between the treated and check trees, but there was a trend toward somewhat higher disease in the 'radical' plot at Alyson's. When the McIntosh were harvested in this plot, a random survey of fruit showed over 40% with flyspeck, which is not commercially acceptable. It was clear that the 'radical' option did not provide acceptable control of flyspeck. Because of the advanced season and the dry conditions in August, the fruit in the other two plots was harvested before a proper survey could be done, but it was evident that control was satisfactory in these two plots.

At Clarkdale, there was very little difference between treated plots (the intended check trees were sprayed so the data were not included), and a harvest survey of 100 McIntosh per plot showed no significant difference nor any trend between treatments. There was some premature drop in this block owing to waiting till a harvest survey had been taken.

Table 1.
Weekly Sampling Results prior to McIntosh Harvest (50 fruit/sample) % with flyspeck

Clarkdale				Alyson's				Check					
Standard	NY	NC		Standard	NY	NC		Standard	NY	NC			
0	a	0	a	0	a	0	a	0	a	0	a	0	a
0	a	0	a	0	a	0	a	0	a	0	a	0	a
0	a	0	a	0	a	0	a	0	a	0	a	0	a
0	a	0	a	4	a	0	a	0	a	2	a	2	a
2	ab	0	b	8	a	0	a	0	a	2	a	18	a
6	a	6	a	14	a	2	a	2	a	8	a	20	c
10	a	0	a	14	a	10	a	2	a	8	a	22	c

100-fruit sample taken at McIntosh harvest, 9/11/98 & with flyspeck

15	a	10	a	13	a	43	x	--	--	--	--
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Once the McIntosh had been harvested, it became evident that there were differences in flyspeck occurrence between varieties in both orchards. This effect had been masked by the random zigzag pattern through the plot adopted when sampling fruit in the regular weekly sessions. At Alyson's, the Empires had much less flyspeck than the McIntosh, whereas at

Clarkdale, the Golden Delicious had much more flyspeck than the McIntosh. These differences were presumably not owing to varietal susceptibility, since the literature indicates that apple varieties are essentially identical in their susceptibility to flyspeck. I believe that the differences were owing to the more open growth habit of Empires vs. Macs at Alyson's, generating a less favorable (lower humidity) environment for the organism, whereas at Clarkdale the strikingly high level of flyspeck throughout all three treatments seems to me to indicate that this entire row did not receive a fungicide application - perhaps the last 'scab' fungicide on June 9. Also, it may be that fungicide spraying was discontinued too early and there should have been another fungicide in August.

Table 2.

Weekly Sampling Results from McIntosh Harvest through early October % with flyspeck

Clarkdale				Alyson's						Check		
<u>Standard</u>	<u>NY</u>	<u>NC</u>		<u>Standard</u>	<u>NY</u>	<u>NC</u>						
10	a	6	a	28	a	6	a	6	a	10	b	34b
56	a	46	a	52	a	4	a	6	a	10	b	26b
58	a	62	ab	62	a	10	a	18	a	10	a	30b
68	a	72	a	72	a	--		--		--		--

Mite sampling in the test plots did not show any difference in either pest or predator mite numbers; this was as we expected, since the first year of reducing fungicide is unlikely to produce a dramatic effect in the mite population.

Discussion

In general both the New York and North Carolina methods of timing fungicide applications seemed to work very well, under unusually challenging conditions for this region. It is clear, though, that extending the number of wetness-hours beyond the 250 hours recommended by the North Carolina model poses an unacceptable risk to the crop. The economic savings from reduced sprays overall were less than \$10 per acre, but even this amount could be significant, given the slim profit margins in apple-growing at this time. The major benefit of adopting a reduced summer fungicide program, however, is more likely to be increased flexibility in time management and the ability to incorporate summer oils into the spray program without risking phytotoxicity from fungicide/oil interactions. In addition, we hope that this practice would be helpful for beneficial organisms in the orchard.

This information was reported to tree fruit researchers at the New York/New England/Canadian Fruit Pest Management Workshop in Burlington, VT in October 1998, and the present report will be adapted as an article to be presented in Fruit Notes, a journal produced for fruit growers and research workers by the University of Massachusetts at Amherst.