

Not For Publication

FRUIT INSECT INVESTIGATIONS
IN THE HUDSON AND
CHAMPLAIN VALLEYS - 1974

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*See for note
predator kill*

Materials Tested

Bay Bue 1452	50% WP	Chemagro Corporation
Bay NTN 9306	6 EC	Chemagro Corporation
Benlate	50% WP	DuPont Company
Captan	50% WP	Stauffer Chemical Co.
Carzol	92% SP	NOR-AM Agric. Prod., Inc.
Cela W524	20 EC	FMC Corporation
CGA 18809	50% WP	Ciba-Geigy Corporation
DPX-10	50% WP	DuPont Company
DPX-12	80% WP	DuPont Company
Fundal	95% SP	NOR-AM Agric. Prod., Inc.
Guthion	50% WP	Chemagro Corporation
Imidan	1 S	Stauffer Chemical Co.
Imidan	50% WP	Stauffer Chemical Co.
Lannate	25% WP	DuPont Company
Lannate	2 EC	DuPont Company
Manzate 200	80% WP	DuPont Company
Marlate	50% WP	DuPont Company
Monitor	4 WM	Chemagro Corporation
Perthane	4 EC	Rohm & Haas Company
Petroleum Oil		Sun Oil Company
Plictran	50% WP	Dow Chemical Company
S-15126	50% WP	Gulf Res. & Dev. Co.
Thiodan	50% WP	FMC Corporation
Vendex	50% WP	Shell Chemical Company
Zolone	3 EC	Rhodia, Inc.

Growing Season Temperature and Rainfall, Highland, N.Y.

Month	<u>Temperature</u>		<u>Rainfall</u>	
	<u>10-year</u> <u>Ave. a/</u>	1974	<u>10-year</u> <u>Ave. a/</u>	1974
April	49.6	52.6	3.57	4.14
May	57.4	58.1	4.32	4.50
June	62.2	67.7	4.35	4.68
July	72.1	73.0	3.93	4.04
August	70.5	72.2	4.12	6.41
September	63.5	61.6	3.55	4.37

a/ Average for the period, 1964 - 1973.

Apple bud stages (McIntosh) Highland, N.Y. -

Half-inch green 4/8, Tight cluster 4/12, Pink 4/20, Full pink 4/29, Petal-fall 5/21.

Growing Season Temperature and Rainfall, Champlain Valley, Peru, N.Y.

Month	<u>Temperature</u>	<u>Rainfall</u>
	1974	1974
June	64.2	3.09
July	69.6	2.88
August	67.2	2.96

Apple bud stages (McIntosh) Peru, N.Y. -

Half-inch green 5/3, Tight cluster 5/7, Pink 5/14, Full pink 5/17, Petal-fall 6/3.

INTRODUCTION - Apple insect activity was monitored throughout the Hudson and Champlain Valleys during the 1974 growing season. Monitoring in the Hudson Valley was carried out at 4 Ulster county locations - the Young orchard and Hudson Valley Laboratory orchard, Highland, N.Y., the Dressel Farms reduced spray schedule orchard, New Paltz, N.Y., and the Ulster County Community College orchards, Stone Ridge, N.Y. Monitoring in Columbia county was conducted by Mr. David Ophardt, Cooperative Extension Fruit Agent, at the Love Apple Farm, West Ghent, N.Y. Champlain Valley monitoring was conducted by Mr. Frank McNicholas, Regional Extension Fruit Specialist, in the Forrence Orchards reduced spray blocks, Peru, N.Y.

METHODS - Sectar I traps baited with Pheromone attractant were used in monitoring for redbanded leafroller, codling moth, oriental fruit moth, obliquebanded leafroller, and lesser appleworm, while a 5% yeast hydrolysate + 50% ammonium acetate bait was used for apple maggot flies. The same number of traps was used for each insect, but the number of trap sites varied depending on the area of the orchard. Sampling dates varied from twice weekly for the Dressel, Young and Laboratory orchards, to weekly for the Ulster Community College and Forrence Orchards. The Columbia county orchard was checked periodically, without a firm schedule.

RESULTS - Captures of redbanded leafroller moths indicated spring brood flight started 4/8 (Table 2) in Ulster county orchards, and reached a peak 4/22, with a smaller peak occurring ca one week later (Tables 1, 2, & 5). The spring brood flight continued until the last week of May. First brood flight was first detected 6/20 (table 5) and reached a peak 7/5-7/8. A light second brood flight was detected with a peak occurring ca 8/28 (tables 1, 3, & 5). Three flights of redbanded leafroller adults were also noted on the Love Apple Farm in Columbia county (table 4).

In the Champlain Valley only two flights of redbanded leafrollers were recorded. The spring brood flight occurred over a long interval, 4/28-6/5, with a peak 5/11-5/18 (table 6). A flight of similar duration was noted for the first brood, 7/1-8/24, with a peak ca 8/13.

Codling moth adult flight was first detected in Ulster county 5/16 (table 1). An early peak was noted 5/23 (tables 1 & 2), with a second smaller spring brood peak occurring ca 6/10. Moth flight continued sporadically throughout June and early July, creating a non-distinct break between spring brood and first brood moth flight. A peak in flight activity of first brood codling moth occurred 8/5 (tables 1, 2, 3 & 5), but this was probably a result of renewing the pheromone attractant. Columbia county codling moth activity was similar to that found in Ulster county orchards, with a spring brood peak the end of May and a first brood peak in mid-August (table 4).

Traps may have been hung too late in the Champlain Valley to record the first activity of spring brood codling moths. Moth flight showed peaks 6/11 and 7/8 (table 6). Moth activity was still detected 8/24-9/14. It was difficult to distinguish whether the moths were mostly spring brood or whether a sizeable portion were first brood adults.

A rather light spring brood flight of the oriental fruit moth was detected in Ulster county orchards from 5/16 - mid-June (tables 1, 2, & 5). A larger first brood flight was noted from the last week in June until the first week in August. An equally large second brood flight was found from mid-August until traps were taken down in mid-September. Trap captures of oriental fruit moths in the Columbia county orchard were unlike those found in Ulster County. A large spring brood flight was found in mid-May while flights of the first and second broods were much lighter in comparison (table 4).

Flight activity of the obliquebanded leafroller was first detected June 10 in Ulster county orchards, with a peak of activity noted in mid-June (tables 1,2,3, & 5). Flight activity of the spring brood continued into mid-July. First brood flight was found from the first week in August until the first week in September, with an activity peak noted in mid-August. Moth activity in the Columbia county orchard paralleled that of the Ulster county orchards (table 4).

The obliquebanded leafroller flight began later in the Champlain Valley than in the Hudson Valley. First captures occurred during the week of 6/22, with a peak found during the week of 7/15 (table 6). Evidence that a first brood flight existed was detected on 9/14, when sampling was terminated.

Lesser appleworm moth flight was monitored with pheromone traps for the first time in both the Hudson and Champlain Valleys. Traps were hung in mid-May in all of the orchards monitored, but this proved too late to determine first activity or a peak of spring brood activity. Spring brood flight continued into mid-June, while first brood flight commenced the first week of July and was still noted when the traps were taken down in September (tables 1, 2,3,4, & 5).

The flight activity pattern of the lesser appleworm in the Champlain Valley differed from that in the Hudson Valley. Spring brood flight began before traps were set out and continued into the third week of July (table 6). No captures were found after this date, indicating that a first brood adult flight may not always occur in this region.

The first apple maggot fly capture in a bait trap occurred on July 8 (table 1) among the Ulster county orchards monitored. Bait trap captures reached a peak in mid-August in the Hudson Valley orchards (tables 1,2,3, & 4), with the exception of the Dressel orchard, where a reduced insecticide spray program was maintained. Traps in the Champlain Valley orchard, where a reduced spray program was also maintained, failed to record any apple maggot activity (table 6).

Plum curculio was first detected by jarring plum trees near the Highland laboratory orchard on 5/16. Populations were quite high in the laboratory orchard, as indicated by the fruit damage found in the early season control test (see following sections). Apples having fresh ovipositional and adult feeding damage were brought into the laboratory by growers as late as 7/2.

An infestation of white apple leafhopper (3/leaf) was observed in mid-August on Golden Delicious trees on a lead arsenate program. In adjacent rows of McIntosh and Red Delicious varieties on a Guthion spray program no leafhoppers were found. No other reports of large leafhopper infestations were received.

Apple samples brought into the laboratory from a Clintondale grower were found to contain European corn borer larvae. European corn borer larvae were also found in both the entomology and plant pathology test blocks at the Highland laboratory orchard.

An outbreak of the spotted tentiform leafminer was investigated in Columbia county on 8/19. Second brood larvae had damaged most of the leaves on the majority of the trees in one block of apples. Field tests are planned for next season in an attempt to learn more of the control of this pest.

APPLE MAGGOT EMERGENCE STUDIES - Ten seeding sites were prepared in the Fall of 1973 at the Young Orchard, Highland, N.Y. to monitor apple maggot fly emergence in 1974. The sites were 'seeded' with three bushels of apple maggot infested apples per site. Emergence was checked daily 6/3-9/9, with the exception of several weekends.

First emergence in the cages was recorded on 6/19. A slow emergence followed, reaching an initial peak on 7/19, with a second peak of equal magnitude occurring on 7/30 (fig. 1). This double peak may be attributed to weather conditions, specifically rainfall. Two tenths of an inch of rain fell 7/18, while another two inches of rain fell 7/29. These were the only significant amounts which fell during the peak of maggot emergence. The last fly emerged 8/28, bringing total emergence to 1305, down by ca 1000 + flies from the previous season. Female emergence was 56.09% of this total, and parasitism by *Opius* spp. amounted to 4.06%.

APPLE MAGGOT TRAPPING EXPERIMENT - Several types of traps were tested for their effectiveness in attracting and capturing the apple maggot adult flies. Efficiency in working with the traps was also considered.

Traps were evaluated under a variety of orchard conditions. Three replicates were placed in an abandoned orchard in which only fungicides were sprayed, 4 replicates were located in the laboratory orchard where early season insecticide and full season fungicide control trials were conducted, while 3 replicates were located in an unsprayed virus-infested block of apple trees.

All traps were yellow except the sticky apple trap, which was red. Only the top of the Pherocon 1 CY trap was used. The underside of this was coated with both adhesive and attractant at the factory. The gypsy moth trap contained the bait in a small plastic creamer placed at the bottom of the trap, with a 3" section of Vapona^R "No Pest Strip" hung from the top to kill flies entering the trap. The Sector 1 trap contained a 3 dram vial of dental wadding soaked with bait in the bottom. Bait in the gypsy moth and Sector traps was replaced 7/24 and 8/6.

Traps were hung ca 5' off the ground, one trap per tree, with each representative trap type hung in each replicate. Trap types were randomly assigned among the four cardinal directions within a tree row.

RESULTS - The data compares quite favorably with that of Reissig (1974): Sectar was more attractive than Pherocon, with sticky apple (unbaited) being one of the least attractive traps (Table 7). In our experiment, however, the gypsy moth trap was less attractive than either the Pherocon or Sectar traps, whereas in the Reissig test the gypsy moth trap was the most effective used. Two basic differences exist between our gypsy moth traps and those used by Reissig. His used a 30 cm strip of dimethilan impregnated paper, while we used a 3" section of Vapona^R "No-Pest Strip"; also we used 5% yeast hydrolysate whereas Reissig used 5% Soy hydrolysate in the bait.

One probable reason why the Pherocon trap may not have performed as well as the Sectar trap, was that the bait was not renewed. The Pherocon looked the best for the first evaluation, but seemed to lose its effectiveness in succeeding evaluations.

Concerning the efficiency or ease of handling, it was the consensus among those who checked the traps that the Pherocon was most efficient. The sticky surface, since it was not exposed to rain, weathered best, large amounts of small unrelated dipterans were not caught in the Pherocon trap as in the other traps, and the trap could be checked or cleaned easilier than the others. Since the bait was impregnated in the adhesive, the whole trap would have to be changed rather than just the bait vials, but this was easier done than changing the bait vials.

Table 1 - Bait Trap Captures - 1974; Laboratory Orchard, Highland, N.Y.

Sampling Date	Mean Number of Insects Per Trap ^a /					Lesser Appleworm ^b /	Apple Maggot Fly ^c
	Red-Banded Leafroller ^b	Codling Moth ^b	Oriental Moth ^b	Oblique-Banded Leafroller ^b			
4/12	d/	---	---	---		---	---
4/15	0.25	---	---	---		---	---
4/18	5.50	---	---	---		---	---
4/22	30.25	---	d/	---		---	---
4/25	8.50	0	0	---		---	---
4/29	20.75	0	0	---		---	---
5/3	3.50	0	0	---		---	---
5/6	1.0	0	0	---		---	---
5/9	0	0	0	---		---	---
5/13	0.50	0	0	---		---	---
5/16	5.25	0.75	0.25	---	d/	---	---
5/20	1.75	11.50	0.75	---	4.50	---	---
5/23	0.25	18.75	0.75	---	1.75	---	---
5/27	0	0.75	0	---	0.50	---	---
5/31	0.25	1.75	0.25	---	0.50	---	---
6/3	0	2.75	0	---	0.25	---	---
6/6	0	3.25	0	d/	0.50	---	---
6/10	0	4.50	0.25	1.25	0	---	d/
6/13	0	3.50	0	4.50	0	---	0
6/17	0	0	0	8.50	0	---	0
6/20	0	0.50	0	4.50	0	---	0
6/24	0e/f/	0.50	0e/f/	1.25	0	---	0
6/27	0	0.25	0.25	0.50	0	---	0
7/1	0	0.25	0	0.75	0	---	0
7/5	4.0	0.75	2.0	2.50	0	---	0
7/8	0.75	0.50	0.50	1.25	0	---	0.50
7/11	0.75	1.0	2.25	2.0	0	---	0
7/15	2.50	0.50	2.25	1.75	1.0	---	0.25
7/18	0.75	0.25	1.50	2.0	0.50	---	0
7/22	0.75	0	1.75	0.25	0.25	---	0
7/25	0.75	0	0	0	0	---	0
7/29	0.75	0.25	0.75	0	0	---	0

(Continued)

Table 1, Continued

Date	R. Banded	Codling <u>0.75e/f/</u>	Oriental	Oblique	Lesser <u>0e/f/</u>	Maggot <u>1.75f/</u>
8/1	1.0	0.75e/f/	1.25	0	0	1.75f/
8/5	0	8.50	1.0	0	0	1.75f/
8/8	0.25	1.75	0.25	0	1.0	1.0
8/12	0.25	4.25	0.25	0	0.75	1.25
8/15	0.75	5.0	0.50	2.0	0.50	0
8/19	0	1.25	1.25	0.75	0	0.25
8/22	1.25	1.50	1.50	0.25	1.0	1.0
8/26	2.25	0.25	1.75	0.25	0.50	0
8/29	0.75	1.0	2.50	0.25	0.25	0.25
9/5	1.0	0.50	3.0	0	0.75	0.50
9/9	0.75	0.75	2.0	0	1.0	0.50
9/12	0	0	2.50	0	0.50	0

a/ 4 Traps

b/ Phermone Attractant

c/ Yeast hydrolysate-ammonium acetate attractant, replenished every two weeks

d/ Traps Hung

e/ Traps changed

f/ Bait changed

Table 2 - Bait Trap Captures-1974: Young Orchard, Highland, N.Y.

Sampling Date	Mean Number of Insects Per Trap _a /					Lesser Appleworm _b /	Apple Maggot Fly _c /
	Red-Banded Leafroller _b /	Codling Moth _b /	Oriental Fruit Moth _b /	Oblique-Banded Leafroller _b /			
4/2	d/	---	---	---		---	---
4/4	0	---	---	---		---	---
4/8	0.33	---	---	---		---	---
4/11	0	---	---	---		---	---
4/15	7.0	---	---	---		---	---
4/18	11.0	---	---	---		---	---
4/22	31.67	d/	d/	---		---	---
4/25	7.33	0	0	---		---	---
4/29	11.33	0	0	---		---	---
5/3	2.0	0	0	---		---	---
5/6	0	0	0	---		---	---
5/9	1.0	0	0	---		---	---
5/13	0	0	0	---		---	---
5/16	3.0	0	0.33	---		d/	---
5/20	0.33	0.33	0	---		2.66	---
5/23	0.33	4.33	0	---		1.0	---
5/27	0	0.67	0	---		0.33	---
5/31	0.33	0.67	0	---		0	---
6/3	0	1.67	0	---		0.33	---
6/6	0	3.33	0	---		1.33	---
6/10	0	6.67	0	d/		0	d/
6/13	0	2.33	0	0		0	0
6/17	0	0.33	0	4.0		0	0
6/20	0	0.33	0	9.67		0	0
6/24	0	1.33	0	7.67		0	0
6/27	0	0	0	1.67		0	0
7/1	0	0	0	0		0	0
7/5	1.33	0	0	0.67		0	0
7/8	2.0	1.67	0.67	3.0		0	0
7/11	0.67	0	1.67	1.67		0	0
7/15	0	0	1.0	0.33		0	0.33
7/18	0.33	0	1.0	0.67		0.33	0.67
7/22	0.67	0	1.33	1.0		0	0
7/25	1.0	0	0.33	0.33		0	1.33
7/29	0.33	1.0	1.67	0		0	0.67
				0		0	0

(Continued)

Table 2, Continued

Date	R. Banded	Codling $\frac{0e/f}{f}$	Oriental	Oblique	Lesser $\frac{0e/f}{f}$	Maggot $\frac{2.67f}{f}$
8/1	0	2.67	2.0	0.33	1.0	2.67
8/5	0	0.67	0.67	0	0	1.33
8/8	0	1.0	0	0	0	5.0
8/12	0.33	0	0.33	0	0	5.67
8/15	0.33	0	0.67	0.67	0.33	2.67
8/19	0	0.33	0.33	0.33	0	1.33
8/22	0	0	0	0	0	1.67
8/26	0	0	0	0	0	2.33
8/29	0.33	0.33	0.67	0	0	0.67
9/5	0	0	1.0	0	0	1.67
9/9	1.0	0	0.33	0	0	0.33
9/12	0	0	1.33	0	0	0

-
- a/ 3 Traps
- b/ Phermone attractant
- c/ Yeast hydrolysate - ammonium acetate attractant, replenished every two weeks
- d/ Traps hung
- e/ Traps changed
- f/ Bait changed

Table 3 - Bait Trap Captures-1974: Ulster Community College Orchard, Stone Ridge, N.Y.

Sampling Date	Mean Number of Insects Per Trap					
	Red-Banded Leafroller ^{b/}	Codling Moth ^{d/}	Oriental Fruit Moth ^{b/}	Oblique-Banded Leafroller ^{b/}	Lesser Appleworm ^{b/}	Apple Maggot Fly ^{c/}
6/11	d/ 0.25	d/ 0.50	d/ 2.75	d/ 4.0	d/ 15.50	---
6/20	0.50	0.75	0	1.75	3.50	---
6/27	8.25	2.25	5.0	2.50	4.0	d/
7/5	4.25	1.0	0	0.50	1.50	0
7/11	1.25	0.25	0.50	0	2.0	0.25
7/18	1.50	2.0	1.0	0	1.50	0.75
7/25	1.0	2.25	1.75	0	1.0 e/f/	0.25
8/1	0.25	1.50	0	0	5.50	1.25
8/8	0.50	1.0	0	0	1.0	0.25
8/15	0	0.50	2.0	0	0.75	0
8/22	1.50	0	0	0	1.75	0.50
8/29	0.50	0	0	0.25	0.25	0.50
9/6						

- a/ 4 Traps
- b/ Phermone attractant
- c/ Yeast hydrolysate-ammonium acetate attractant, replenished every two weeks
- d/ Traps Hung
- e/ Traps changed
- f/ Bait changed

Table 5 - Bait Trap Captures - 1974; Dressel Orchard, New Paltz, N.Y.

Sampling Date	Mean Number of Insects Per Trap ^{a/}					Lesser Appleworm ^{b/}	Apple Maggot Fly ^{c/}
	Red-Banded Leafroller ^{b/}	Codling Moth ^{b/}	Oriental Fruit Moth ^{b/}	Oblique-Banded Leafroller ^{b/}			
4/12	d/	---	---	---	---	---	---
4/15	5.82	---	---	---	---	---	---
4/18	10.55	---	---	---	---	---	---
4/22	30.64	d/	d/	---	---	---	---
4/26	6.73	0	0	---	---	---	---
4/30	11.72	0	0	---	---	---	---
5/2	0.78	0	0	---	---	---	---
5/6	0.64	0	0	---	---	---	---
5/9	0.27	0	0	---	---	---	---
5/13	1.36	0	0	---	---	---	---
5/16	0.91	0	0	---	---	---	---
5/20	0.78	0.09	0.09	---	d/	---	---
5/23	0.27	0.27	0	---	1.73	---	---
5/27	0	0	0.36	---	0.82	---	---
5/31	0	0	0	---	0.27	---	---
6/3	0	0.09	0	---	0.18	---	---
6/6	0	0	0	---	0.55	---	---
6/10	0	0.18	0	d/	0.09	---	---
6/13	0	0.18	0	0.27	0.18	---	d/
6/17	0	0.09	0	6.73	0	0	0
6/20	0.09	0.36	0	7.36	0	0	0
6/24	0.18	0.18	0.09e/f/	1.55	0	0	0
6/27	0.09	0	0	0.46	0	0	0
7/1	0.82	0.18	0.09	0.09	0	0.09	0
7/5	2.91	0.55	0	0.73	0.09	0.27	0
7/8	2.18	0.09	0	1.64	0	0	0
7/11	0.78	0.09	0	0.82	0	0	0
7/15	0.64	0.09	0.09	0.18	0	0	0
7/18	0.36	0	0.09	0.18	0.09	0.09	0
7/22	0.36	0	0	0.27	0.09	0.09	0
7/25	0.36	0	0	0	0.36	0.36	0
7/29	0.18	0.18	0	0	0.09	0.09	0

(Continued)

Table 5, Continued

Date	R. Banded	Codling $\frac{0.27e}{f}$	Oriental	Oblique	Lesser $\frac{0.09e}{f}$	Maggot
8/1	0		0	0	0	0
8/5	0	0.36	0.09	0.09	0.73	0
8/8	0	0	0	0.09	1.0	0
8/12	0.27	0.27	0	0.18	0.27	0
8/15	0.09	0	0	0	0	0
8/19	0.64	0.09	0	0.27	0.18	0
8/22	0.78	0.18	0	0	0.46	0
8/26	0.46	0.09	0.18	0.27	1.27	0
8/29	1.0	0	0	0.09	0	0
9/5	1.0	0	0	0.09	0.27	0
9/9	0.78	0	0	0.09	0.09	0
9/12	0.09	0	0	0	0.27	0.09

- a/ 13 Traps
- b/ Phermone attractant
- c/ Yeast hydrolysate-ammonium acetate attractant, replenished every two weeks
- d/ Traps hung
- e/ Traps changed
- f/ Bait changed

Table 6 - Bait Trap Captures-1974: Forrence's Birchbrook Block, Peru, N.Y.

Sampling Date	Mean Number of Insects per Trap ^{a/}				
	Red-Banded Leafroller ^{b/}	Codling Moth ^{b/}	Oblique-Banded Leafroller ^{b/}	Lesser Appleworm ^{b/}	Apple Maggot Fly ^{c/}
4/18	d/	---	---	---	---
4/28	0.42	---	---	---	---
5/11	2.08	---	---	---	---
5/18	2.33	---	---	---	---
5/22	1.58	---	---	---	---
6/5	2.42	d/	d/	---	---
6/11	0.0	1.25	0.0	---	---
6/14	0.0	0.08	0.0	d/	d/
6/22	0.0	0.92	0.25	1.25	0.0
7/1	0.08	0.33	1.0	0.83	0.0
7/8	0.0	1.42	0.75	0.58	0.0
7/15	0.58	1.25	1.08	0.33	0.0
7/23	0.42	0.33	0.08	0.33	0.0
7/30	0.67	0.33	0.0	0.0	0.0
8/13	1.50	0.08	0.0	0.0	0.0
8/24	0.58	0.0	0.0	0.0	0.0
9/14	0.0	0.17	0.50	0.0	0.0

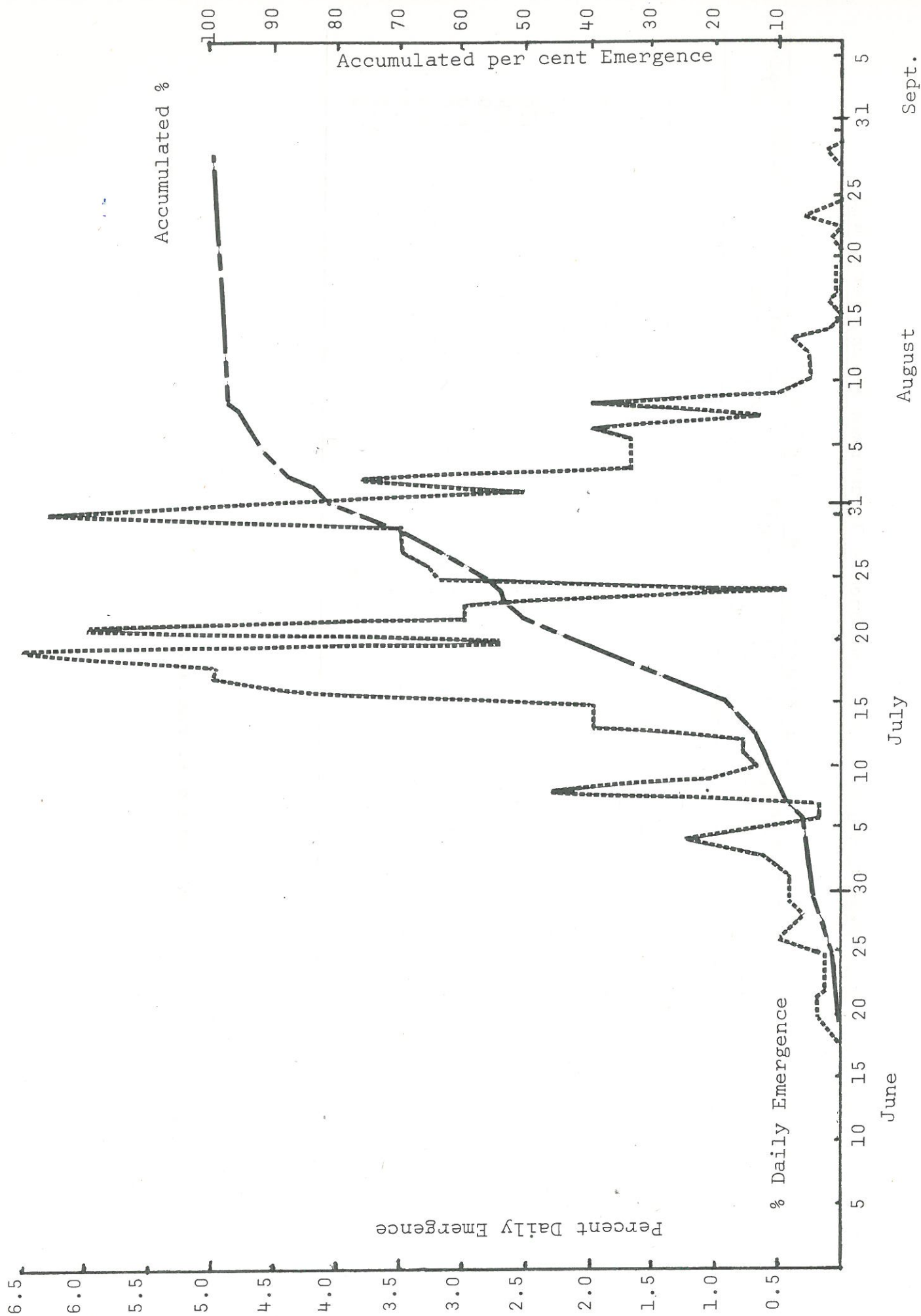
a/ 12 Traps

b/ Phermone attractant

c/ Yeast hydrolysate-ammonium acetate attractant

d/ Traps Hung

Fig. 1 • Apple Maggot Fly Emergence - 1974



APPLE INSECT CONTROL STUDIES - 1974

METHODS - An early season insect control test was conducted at the Hudson Valley Laboratory orchard near Highland, N.Y. The test was designed mainly to evaluate plum curculio control. Treatments were replicated 3 times among 8 tree plots in a randomized complete block design. Each plot contained from 5 - 7 different apple cultivars. The trees were 10 years old, on semidwarf rootstock (ca 12-15 ft. tall), and were bearing heavily.

Treatments were applied as dilute (400 gal/acre) sprays to run-off using a hand-gun at 500 psi. Treatments were applied at pink (4/29), petal-fall (5/21), and for the first two cover sprays (6/3, and 6/19). The interval between sprays averaged about 14 days, with the exception of the pink-petal-fall interval which was 22 days. The long interval between pink and petal-fall sprays was due to a very long bloom period resulting from rather cool, overcast weather during much of the period.

Fungicides were applied by airblast sprayer as dilute (400 gal/acre) sprays as follows: prebloom application of Difolatan 4F, 3 lb/100 gal (4/12), Captan 80WP, 1 lb/100 gal (4/23, 5/7, & 5/27), Polyram 80WP, 1 lb/100 gal (4/23), and Cyprex 65WP, 1 lb/100 gal (6/27 & 7/11).

Evaluations of insect injury were obtained from fruit sampled on 3 distinct occasions: 6/10-prior to June drop, 7/2 - two weeks following the last cover spray, and again in the Fall as varieties reached harvest maturity. Additionally leaves and terminals were evaluated for aphid infestations on 7/1. No phytotoxicity or fruit finish problems were found with any of the treatments used or varieties evaluated.

RESULTS - Tarnished plant bug control with all treatments was negligible (Table 1). The extended bloom period, with the resultant lack of insecticide protection toward the end of this period, was a major reason for the lack of plant bug control.

Plum curculio was very abundant this season with the checks indicating that 30% of the fruit was damaged-prior to June drop, while ca 20% of the fruit was damaged following June drop. Compounds which looked the best against plum curculio include Marlate, Guthion and CGA-18809. Lannate and Carzol did not perform quite as well as the forementioned, while Bay Bue 1452 looked almost as bad as the checks (Table 1).

Leafroller damage was chiefly contributed by the spring brood of redbanded leafroller early in the season with 2nd brood causing the damage late in the season. Guthion, CGA-18809, and Marlate gave good control of leafrollers, which was reflected in the final counts (Table 1).

Table 7. Apple maggot adult flies captured in four types of traps. Highland, N.Y. 1974^{a/}

Treatment/trap	Avg. no. flies/trap/count			Ave. no. flies/trap/ all counts
	7/24	8/6	8/20	
1. Pherocon 10Yb/ 50% HyCase 802 + 50% ammonium acetate	1.1	2.1	1.6	1.6
2. Gypsy moth trap ^{c/} 5% yeast hydrolysate + 50% ammonium acetate	0.3	1.1	0.9	0.8
3. Sectar 1d/ 5% yeast hydrolysate + 50% ammonium acetate	0.9	3.1	2.9	2.3
4. Sticky apple ^{e/} unbaited	0.2	0.8	0.0	0.3

^{a/} Trap hung 7/17, each treatment replicated 10 times, bait in treatments 2 and 3 changed 7/24 and 8/6.

^{b/} Prebaited top only, Mfg. by Zoëcon Corp. Palo Alto, Calif.

^{c/} Amer - Ecology Gypsy moth trap, Mfg. by American Can Co. Greenwich, Ct.

^{d/} Mfg. by 3M Co., Mpls. Minn.

^{e/} Wooden red sphere ca 8 cm dia coated with "Tree-Tanglefoot,"^d The Tanglefoot Co., Grand Rapids, Mich.

Several internal apple feeders were lumped together at all evaluations, these included codling moth, lesser appleworm, oriental fruit moth, and the European corn borer, (Table 1a). Most of the early damage was a result of spring brood codling moth while much of the later damage was a result of 1st brood (second generation) codling moth or European Corn borer larvae. Good early control was provided by all materials with the exceptions of Bay Bue 1452, at all evaluations, Marlata at the 7/2 evaluation, and Carzol at the 7/2 evaluation (Table 1a). Residues did not persist long enough to provide much control of the late summer generation of internal feeders, but all treatments did look better than the check at harvest.

The level of green fruitworm injury was quite low in the test orchard. Bay Bue 1452 and Carzol did not look as good as the other materials in controlling this pest (Table 1a).

Apple maggot injury was evaluated at harvest (Table 1b). Most materials showed some residual action against the fly, but the test was not designed for maggot evaluation, since the spray program was terminated 6/19, ca one month prior to peak apple maggot emergence.

Lannate, Guthion, Bay Bue 1452, and CGA-18809 all showed activity against Wooly apple aphid and/or green apple aphid (Table 1b). Marlata and Carzol showed no aphicidal activity.

In terms of overall insect control based on % clean fruit (Table 1a), Bay Bue 1452 and Carzol did not appear to give adequate commercial control. In terms of residual insecticidal activity, as indicated by % clean fruit, Guthion and CGA-18809 appeared to have the most, based on the fall fruit evaluation.

FUNGICIDES AS INSECTICIDES - Selected fungicide candidates were evaluated for insecticidal properties in the HVL screening block used by Dr. Roger Pearson for evaluating apple scab, apple rusts, and powdery mildew control programs. An application of Guthion 50WP at the 1/2#/100 gal. rate, was applied 5/28. This reduced insect pressure in the plots considerably, especially from plum curculio, which was the dominant pest noted during the season.

The Gulf S-15126 compound showed insecticidal activity against tarnished plant bug, plum curculio, leafrollers, (principally redbanded leafrollers), and codling moth, but not against apple maggot (Table 1c). The higher rate (12 oz.) gave better control of tarnished plant bug, leafrollers, and codling moth than the lower (6 oz.) rate.

Table 1. Apple Insect Control - Early Season Insecticide Applications, ab Hudson Valley Lab-
oratory Orchard, Highland, N.Y. 1974.

Material & Formulation	Oz. Formulation per 100 Gallon	Tarnished Plant Bug			Plum Curculio			Leafrollers		
		% inj.			% inj.			% inj.		
Evaluation Dates		6/10 ^c	7/2 ^d	Falle	6/10 ^c	7/2 ^d	Falle	6/10 ^c	7/2 ^d	Falle
1. Marlate 50 WP	32	3.3	4.0	5.2	1.5	4.7	7.0	2.0	2.3	7.8
2. Lannate 25 WP	32	4.2	3.0	2.9	5.2	10.7	11.3	2.2	2.0	11.3
3. Lannate 2 EC	32	4.8	3.3	4.6	9.7	14.7	14.1	4.5	1.3	10.1
4. Guthion 50 WP	8	4.3	9.7	6.3	4.0	7.0	6.0	3.0	0.0	4.4
5. Bay Bug 1452 50 WPf	16	4.3	11.3	5.5	30.8	42.0	36.1	6.0	4.0	14.6
6. Carzol 92 SP	8	4.0	9.0	5.6	13.3	13.0	11.5	5.3	1.7	10.6
7. CGA 18809 50 WP	8	3.3	4.7	8.4	4.7	10.3	6.5	4.2	0.0	6.3
8. Check		3.7	7.3	7.8	34.2	52.7	47.1	9.5	3.0	18.1

a Treatments replicated 3 times among 8 tree plots containing 7 apple varieties; dilute application, sprayed to runoff with hand-gun sprayer at 500 psi.

b Treatments applied at pink (4/29), petal-fall (5/21), and first 2 covers, (6/3, 6/19).

c Based on 50 fruits/tree, varieties McIntosh, Red Delicious, Golden Delicious, and Rhode Island Greening.

d 50 fruits per tree, McIntosh and Cortland varieties.

e 100 fruits per tree, McIntosh (9/13), Cortland (9/17), and Golden Delicious (10/1).

f Not applied at pink (4/29) application.

Table 1b. Apple Insect Control - Early Season Insecticide Applications. ^{ab} Hudson Valley Laboratory Orchard, Highland, N.Y. 1974.

Material & Formulation	Oz. Formulation Per 100 Gallon	%Punctures		
		Apple Maggot	Woolly Apple Aphid	Green Apple Aphid
		Fall ^e	7/1	7/1
1. Marlate 50 WP	32	8.7	4.1	7.3
2. Lannate 25 WP	32	7.0	0.0	1.8
3. Lannate 2 EC	32	4.3	0.0	2.5
4. Guthion 50 WP	8	4.1	0.0	1.6
5. Bay Bue 1452 50 WP ^f	16	10.7	0.1	1.8
6. Carzol 92 SP	8	5.3	3.7	6.8
7. CGA 18809 50 WP	8	4.7	0.0	3.1
8. Check		13.5	3.8	3.8

- ^a Treatments replicated 3 times among 8 tree plots containing 7 apple varieties; dilute application, sprayed to runoff with hand-gun sprayer at 500 psi.
- ^b Treatments applied at pink (4/29), petal-fall (5/21) and first 2 covers (6/3, 6/19).
- ^c Mean No. colonies per 50 terminals, 50 terminals/tree, varieties McIntosh, Red Delicious, Golden Delicious, and Rhode Island Greening.
- ^d Mean Index rating/50 terminals- No. colonies X rating value: light (1-10 aphids/colony) = 1, medium (10-100 aphids per colony) = 3, heavy (over 100 aphid/colony) = 6.
- ^e Based on 100 fruits/tree, McIntosh (9/13), Cortland (9/17), and Golden Delicious (10/1).
- ^f Not applied at pink (4/29) application.

Table 1a. Apple Insect Control - Early Season Insecticide Applications. ^{ab} Hudson Valley Laboratory Orchard, Highland, N.Y. 1974

Material & Formulation	Oz. Formulation per 100 gal.	Internal Lepidopteran Feeders % Stings			Green Fruitworm		% Clean Fruit	
		6/10 ^c	7/2 ^d	Fall	6/10 ^e	7/2 ^d	Fall ^e	6/10 ^e 7/2 ^d Fall ^e
1. Marlote 50 WP	32	0.0	2.3	16.4	0.0	0.3	0.2	93.2 85.7 59.8
2. Lannate 25 WP	32	0.2	0.7	13.3	0.2	0.0	0.0	89.2 84.3 58.8
3. Lannate 2 EC	32	0.2	0.0	12.7	0.2	0.0	0.2	81.5 80.7 59.4
4. Guthion 50 WP	8	0.0	0.0	8.4	0.0	0.0	0.3	88.7 82.7 72.3
5. Bay Bue 1452 50 WP ^f	16	2.8	8.7	20.1	0.7	1.3	0.9	60.2 38.7 34.0
6. Carsol 92 SP	8	0.8	2.0	15.4	0.2	1.0	0.8	77.8 75.3 58.6
7. CGA 18809 50 WP	8	0.0	0.0	16.8	0.0	0.0	0.3	88.3 85.0 67.4
8. Check		3.0	9.3	33.7	1.3	2.7	1.0	54.7 34.0 22.0

^a Treatments replicated 3 times among 8 tree plots containing 7 apple varieties; dilute application, sprayed to runoff with hand-gun sprayer at 500 psi.

^b Treatments applied at pink (4/29), petal-fall (5/21), and first 2 covers (6/3), (6/19).

^c Based on 50 fruits/tree, varieties McIntosh, Red Delicious, Golden Delicious, and Rhode Island Greening.

^d 50 fruits/tree, McIntosh and Cortland varieties.

^e 100 fruits/tree, McIntosh (9/13), Cortland (9/17), and Golden Delicious (10/1).

^f Not applied at pink (4/29) application.

Table 1c . Effects of seasonal fungicide programs on Apple Insects^{a/} Hudson Valley Laboratory Orchard, Highland, New York 1974

Material & Formulation ^{b/}	Rate Form. /100 gal.	Tarnished Plant Bug % inj.	Plum Curculio % inj.	Leafrollers % inj.	Codling Moth % inj.	Apple Maggot % inj.	% Clean Fruit
1. S-15126 50W	6 oz.	10.0	2.2	2.4	3.8	3.5	79.4
2. S-15126 50W	12 oz.	5.6	3.0	1.3	2.5	2.8	85.9
3. Cela W524 20EC	10 oz.	9.0	12.2	6.8	8.9	3.3	62.6
4. Captan 50W	2 lb.	10.6	7.7	7.4	8.7	2.8	66.2

^{a/} % inj. or clean fruit based on 100 fruits/tree, 1 McIntosh, 1 Cortland, and 1 Golden Delicious tree/treatment/replicate (3), evaluated 9/16, 9/17, and 10/3 respectively.

^{b/} Fungicides applied as dilute sprays using a hand-gun at 550 psi on 4/18, 4/25, 5/2, 5/16, 5/22, 5/30, 6/6, 6/13, 6/27, 7/9, and 7/29. Guthion 50WP (1/2#/100 gal.) was applied over all plots on 5/28.

REDUCED-SPRAY SCHEDULES
1974

Reduced insecticide spray programs were evaluated in the Champlain and Hudson Valleys. Evaluations were made at the Forrence Birch Brook Farm near Peru, in the Champlain Valley, and at the Fall Block of the Dressel farm at New Paltz, in the Hudson Valley.

In the Champlain Valley two blocks were used, a West block of 4.45 acre, which received alternate row treatments of Imidan, and a North block of 13.45 acres where Guthion was the principle insecticide used. The complete pesticide schedule for both blocks is presented in Table 1b.

Tarnished plant bug and green fruitworm injury was assessed for the first time in both the Hudson and Champlain Valleys. Insect injury was very difficult to evaluate at both areas because of hailstorms in early June in the Hudson Valley and hailstorms in early August in the Champlain Valley.

In the Champlain Valley overall insect injury in 1974 was greater than the previous year, less than in 1972, but greater than in 1971 (Table 1). The principle cause of the injury was due to tarnished plant bug.

The Imidan block contained slightly more insect injury overall. This was contributed mainly by the tarnished plant bug, however, while the Guthion block had more apple maggot, plum curculio, leafroller, and codling moth injury than did the Imidan block (Table 1). One possible reason for the greater tarnished plant bug injury in the Imidan block could be due to the fact that Imidan was not applied until petal fall, while Guthion went on first at pink.

Insect pressure, as indicated by adult pheromone and bait trap captures, was slightly less at the Champlain Valley site during the 1974 season as compared with the 1973 season, but greater when compared with the 1972 season, with the exception of apple maggot pressure, which was greatest in 1972 (Table 3). Further details of the seasonal insect monitoring program conducted in the Champlain Valley are discussed in the Apple Insect Monitoring section.

In the Hudson Valley a ca 20 acre block of mature McIntosh, Red Delicious, and Cortland cultivars was sprayed on an alternate side schedule starting at the third cover spray. Guthion was the principle insecticide used. The complete pesticide spray schedule for this block is presented in Table 2b.

Overall insect injury was greater this season than for the three previous seasons (Table 2). The principle cause of injury was about equally divided between fruittree leafroller and tarnished plant bug. Plum curculio injury was down slightly from previous seasons, while for the first time considerable redbanded leafroller

injury and a slight amount of green fruitworm injury were found.

The increase in injury at the Hudson Valley site can in large part be attributed to the failure to have an insecticide in the pink spray, with the resultant protection it would have provided through the long bloom period which ensued.

Insect pressure, as indicated by the trap captures at the Hudson Valley site, was less than in previous seasons for codling moth, and oriental fruit moth, but greater for redbanded leafroller and obliquebanded leafroller (Table 3). Lesser appleworm adults were also caught for the first time this season. Further details of the seasonal insect monitoring program conducted in the Hudson Valley are discussed in the Apple Insect Monitoring section.

Table 1. Reduced Insecticide Program: Champlain Valley, Forrence Orchard - 1971 - 1974.

Schedule	Year	% Clean Fruit	Apple Maggot % inj.	Plum Curculio % inj.	Red-banded Leafroller % inj.	Fruit Tree Leafroller % inj.	Codling Moth % inj.	Tarnished Plant Bug % inj.	Green Fruitworm % inj.
Alternate Side	1971	99.0	0.1	0.8	0.0	0.0	0.1	--	--
	1972	97.3	0.5	2.0	0.0	0.2	0.0	--	--
	1973	99.1	Tr ^a	0.6	0.0	0.3	0.0	--	--
Guthion	1974 ^b	97.9	0.1	0.2	0.5	Tr	0.1	1.2	Tr
	1974	98.2	0.1	0.3	0.6	0.1	0.1	0.8	Tr
Imidan	1974	97.7	Tr	0.1	0.5	0.0	Tr	1.5	0.1

a/ Trace - Less than 0.05%

b/ Based on 6000 McIntosh apples (300 per tree) evaluated 9/23, 9/24, and 3600 Cortland apples (300 per tree) evaluated 10/8.

Table 1b. Reduced Insecticide Program^a: Forrence Orchard - 1974

Alternate Side Schedule

Application	Date	North Block		West Block	
		Red Side	White Side	Red Side	White Side
HIG	4/26	Captan 50WP 4#/acre ^b	Captan 50WP 4#/acre ^b	Captan 50WP 4#/acre ^b	Captan 50WP 4#/acre ^b
	4/30	Ferbam 76WP 1 1/2#	Ferbam 76WP 1 1/2#	Ferbam 76WP 1 1/2#	Ferbam 76WP 1 1/2#
	5/2	Ferbam 76WP 1 1/2#	Ferbam 76WP 1 1/2#		
	5/3			Phygon 3% dust	Phygon 3% dust
	5/6	Ferbam 76WP 1 1/2#		Ferbam 1 1/2#	
	5/9		Ferbam 76WP 1 1/2#		Ferbam 76WP 1 1/2#
Pink	5/11	Oil, 60 sec 1 gal. Guthion 50WP 1/3# Ferbam 76WP 1 1/2#	Oil, 60 sec 1 gal. Guthion 50WP 1/3# Ferbam 76WP 1 1/2#		
	5/13			Phygon 3% dust	Phygon 3% dust
	5/17	Ferbam 76WP 1 1/2#	Ferbam 76WP 1 1/2#	Phygon 2% dust	Phygon 3% dust
	5/23	Captan 50WP 2#	Captan 50WP 2#	Phygon 2% dust	Phygon 2% dust
Petal-fall	5/29	Ferbam 76WP 1 2/3#	Ferbam 76WP 1 2/3#	Ferbam 76WP 1 2/3#	Ferbam 76WP 1 2/3#
	6/3	Guthion 50WP 1/2#	Guthion 50WP 1/2#	Imidan 50WP 1 1/2#	Imidan 50WP 1 1/2#
1st cover	6/14	Guthion 50WP 1/2#		Imidan 50WP 1 1/2#	
2nd cover	7/2		Guthion 50WP 1/2#		Imidan 50WP 1 1/2#
3rd cover	7/17	Guthion 50WP 1/2#		Imidan 50WP 1 1/2#	
4th cover	8/3	Plictran 50WP 1/4# Captan 80WP 2/3#	Guthion 50WP 1/2# Plictran 50WP 1/4# Captan 80WP 2/3#	Plictran 50WP 1/4# Captan 80WP 2/3#	Imidan 50WP 1 1/2# Plictran 50WP 1/4# Captan 80WP 2/3#

^a Rates given as amount material per 100 gal. dilute. Applied with air blast sprayer at 6X.

^b Aerial application.

Table 2. Reduced Insecticide Program: Hudson Valley, Dressel Farms - 1974

Schedule	Year	% Clean	Apple Maggot % inj.	Plum Curculio % inj.	Red-banded Leafroller % inj.	Fruit Tree Leafroller % inj.	Codling Moth % inj.	Tarnished Plant Bug % inj.	Green Fruitworm % inj.
Alternate Side	1971	97.3	0.1	2.4	0.0	0.2	0.0	-	-
	1972	98.4	Tr ^a / ₂	1.5	0.0	0.1	0.0	-	-
	1973	99.1	0.0	0.8	0.0	0.1	0.0	-	-
	1974 ^b	95.9	Tr	0.4	0.7	1.8	0.2	1.4	0.3
Mac	1974	96.7	0.1	0.2	0.5	1.2	0.2	1.1	Tr
Mac Drops	1974	93.3	0.0	0.5	1.0	3.4	0.1	1.0	0.7
Red Del.	1974	95.9	0.0	0.4	0.5	0.9	0.4	2.1	0.3

a/ Trace - Less than 0.05%.

b/ Based on 1000 McIntosh apple drops (100/tree) evaluated 9/17, 3000 McIntosh apples (300/tree) evaluated 9/19, and 1500 Red Delicious apples (300/tree) evaluated 10/4).

Table 2b. Reduced Insecticide Program^{a/} Hudson Valley, Dressel Farms. 1974

Application	Date	Alternate Side Schedule	
		Red Side	White Side
Pink	4/27	Glyodex 37-22WP-2/5# Oil, 60 sec. -1 1/2 gal.	Glyodex 37-22WP-2/5# Oil, 60 sec. -1 1/2 gal.
	5/3	Glyodex 37-22WP-2/5# Thylate 65WP-1#	Glyodex 37-22WP-2/5# Thylate 65WP-1#
	5/9	Glyodex 37-22WP-2/5# Thylate 65WP-1#	Glyodex 37-22WP-2/5# Thylate 65WP-1#
	5/21	Guthion 50WP-1/2# Systox 6EC-1/4 pt. Captan 80WP-1/2# Thylate 65WP-1# Captan 80WP-1/2# Thylate 65WP-1#	Guthion 50WP-1/2# Systox 6EC-1/4# Captan 80WP-1/2# Thylate 65WP-1# Captan 80WP-1/2# Thylate 65WP-1#
	5/28		
	6/4	Guthion 50WP-1/2# Captan 80WP-1/2# Thylate 65WP-1#	Guthion 50WP-1/2# Captan 80WP-1/2# Thylate 65WP-1#
First Cover	6/17	Guthion 50WP-1/2# Captan 80WP-1#	Guthion 50WP-1/2# Captan 80WP-1#
Second Cover	7/8	Guthion 50WP-1/2# Captan 80WP-1# Boron -1/2#	Guthion 50WP-1/2# Captan 80WP-1# Boron -1/2#
Third Cover	7/22	Guthion 50WP-1/2# Plictran 50WP-5 oz. Captan 80WP-1#	Guthion 50WP-1/2# Plictran 50WP-5 oz. Captan 80WP-1#
Fourth Cover	8/3		
Fifth Cover			

^{a/} Rates given as amount material per 100 gal. dilute. Applied with air blast sprayer at 2X.

Table 3. Reduced Spray Program Orchards^{a/}, Pheromone and Bait Trap Captures - 1971-1974.

Year	Orchard	Mean Number of Insects/Trap/Season							Lesser Apple Worm	Apple Maggot Fly
		Red-banded Leafroller	Codling Moth	Oriental Fruit Moth	Oblique-banded Leafroller					
1971	Dressel Forrence	39.9 ---	0.7 ---	4.8 ---	0.79 ---			---	---	0.1 _{b/} ---
1972	Dressel Forrence	34.6 6.4	7.3 6.0	---	7.8 2.0			---	---	0.5 _{c/} 1.9 _{c/}
1973	Dressel Forrence	62.8 50.5	6.8 9.7	3.5 7.7	5.8 8.7			---	---	0.0 _{c/} 0.2 _{d/}
1974	Dressel Forrence	71.0 12.7	3.5 6.2	0.9 ---	18.2 3.2			8.08 3.33		0.1 _{c/} 0.0 _{c/}

a/ Dressel Farms, New Paltz, N.Y.
Forrence Orchards, Peru, N.Y.

b/ Red Balls coated with Tanglefoot used as traps
c/ Yellow sector traps with liquid ammonia-base attractant
d/ Yellow sector traps with tablet ammonia-base attractant

ORCHARD MITE CONTROL STUDIES-CHAMPLAIN VALLEY-1974

A mite control test was conducted in the Champlain Valley at the Fran and Patrick Sullivan Orchard, Peru, N.Y. Observations and counts were also made at the Robert Rulfs Orchard, Peru, N.Y. The studies were conducted in cooperation with Mr. Frank McNicholas, Regional Cooperative Extension Fruit Specialist. Objectives of the studies were to 1) assess the performance of new miticide materials and 2) assess the potential for utilizing mite predators in an integrated mite control program.

METHODS - Oil, 60 sec., was applied at HIG (5/3) at the 2% rate, and at pink (5/16) at the 1% rate. Vendex 50WP, Carzol 92SP, and Plictran 50WP, were all applied at the 6 oz. rate at petal fall (6/6). The miticides were applied to areas treated with 1% oil and equal areas which had not received oil treatments.

Mite counts were made with a mite brushing machine immediately after sampling. Samples consisted on 25 leaves/tree, four trees sampled per program from the two middle rows of each four row plot. Details of the insecticide and fungicide spray programs in the test are presented in Table 1.

RESULTS - The European red mite (ERM) and twospotted spider mite (TSM) populations increased to peaks of 36.2 ERM mites and 31.1 ERM eggs per leaf, and 1.4 TSM mites and 1.1 TSM eggs per leaf on 7/11 in the check program (no. 9, Tables 1 and 1b). As visible bronzing was occurring, a low rate (3 oz.) of Plictran was applied to the check and 1% oil programs on 7/16. This application along with predator mites kept pest mite levels very low throughout the rest of the season in this program (Table 1).

The only mite predator found in this study was a predaceous phytoseiid mite (PPM) species, which appeared similar to specimens of Amblyseius fallacis observed earlier by this writer. Specimens were collected, preserved and given to Drs. Chandrashek M. Watve and S.E. Lienk, whom identified them as Amblyseius fallacis.

PPM populations were not found prior to the 8/13 count, even though substantial pest mite populations had build up. One major reason for this was attributed to the insecticide spray program used (Table 1), which relied heavily on Sevin^R (Carbaryl). The carbaryl residues on the leaves, reported as highly toxic to PPM populations, may have prevented PPM movement from the ground cover into the trees until the residues dissipated. Carbaryl, in addition to the miticides used, may also have contributed to the elimination of the apple rust mite, Aculus schlechtendali, which was not found in any of the programs sampled.

The 1% oil treatment (5/16) reduced initial ERM populations from 50-90% (5/30, Table 1). Effects of the 1% oil treatment on both ERM and TSM counts could still be detected in most programs as

late as 7/30. Both 1% and 2% oil sprays may have affected the PPM populations, as such populations were generally lower in oil-treated than non oil-treated programs. This may be due, however, to initially lower prey numbers in such programs, and consequently slower predator build-up in those plots.

The 2% oil program (no. 1) provided satisfactory ERM and TSM control until 7/30, at which time a low rate (3.5 oz.) of Vendex was applied. An increase in ERM numbers on 8/13 indicated less than adequate control occurring, thus Plictran (2 oz.) was applied (8/19) which reduced pest mite populations adequately.

Plictran applied at pink (programs 4 and 5) resulted in season long control of pest mite species (Table 1 and 1B). Late in the season (8/27, 9/23) PPM populations were observed in the Plictran plots actively feeding on ERM and TSM populations which were present. Carzol (programs 6 and 7) looked as good as Plictran up to 8/13, except where it was used alone without a prior oil treatment, (program 7). Consequently an application of Carzol (6 oz.) was applied on 8/19. This application controlled both ERM and TSM populations throughout the rest of the season. The summer (8/19) Carzol application did not prevent PPM populations from building up later in the season.

Vendex (programs 2 and 3) began to lose its effectiveness on 7/11 and by 7/30 it was necessary to re-treat (Table 1). A low rate (3.5 oz.) of Vendex was applied on 8/6, but since an increase in both ERM and TSM counts were noted on the subsequent 8/13 count, it was decided to spray Vendex plots with a low rate (2 oz.) of Plictran. This Plictran application reduced pest mite numbers while not greatly affecting PPM populations.

Observations and counts in a nearby orchard, Robert Rulfs, Peru, N.Y., indicated the presence of high apple rust mite, and PPM populations, but virtually no ERM or TSM populations. A small area (10-12 trees) near the grower's machinery sheds was the site of a localized outbreak of ERM, which was treated with Plictran and controlled. This grower's spray program consisted of early oil, Captan®, and Imidan®; pesticides which did not appear to upset a balance between PPM and apple rust mite populations.

DISCUSSION - The forementioned studies indicate a good potential for integrated mite control in the Champlain Valley through careful management of the predaceous phytoseiid mite and presently used miticides and insecticides. Several other observed factors might be briefly mentioned which also increase the potential for integrated control. These include apple variety composition, fungicidal usage, and ground cover considerations.

The predominant apple variety in the Champlain Valley is McIntosh, which has been reported to have a medium potential for developing pest mite infestations, as compared to Red Delicious with a high potential and wealthy with a low potential. This moderate potential might allow 1) a grower more time to react to pest mite

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buildup and 2) the PPM population more time to increase.

Fungicides usage in the Champlain Valley has been concerned chiefly with scab and rust control. There has been no appreciable amount of fungicide usage for powdery mildew control. Because the fungicides used in scab and rust control are considerably less toxic to pest and predator mite alike, than those used for powdery mildew control; one would not have to contend with the complicating factor of working with fungicides which are also miticides.

Lastly the presence of vetch, Vicia sativa, in most orchard ground covers observed should be an advantage. Vetch supports TSM populations initially thus providing prey for PPM buildup. If managed properly, the vetch can provide a high predator population which can migrate to the apple foliage in response to pest mite build-up.

ORCHARD MITE CONTROL STUDIES - HUDSON VALLEY - 1974 - Mite control studies were conducted in the Hudson Valley at the Harry Evans Orchard, Marlboro, N.Y. and the Paul Minard Orchard, Clintondale, N.Y. Tests were conducted in cooperation with Mr. Warren Smith, Ulster County Cooperative Extension Fruit specialist.

EVANS ORCHARD - At the Evans orchard Carzol was compared in back to back applications of 4 oz. (program 4, 7, 8, and 9) with Carzol in a single 6 oz. petal fall application (programs 2 and 5) and an early oil (2%) application (programs 1 and 3) (Table 2). Several different cultivars were compared and all treatments were applied by the grower at 2X.

The Carzol 6 oz. single application (programs 2 and 5), the 2% oil application on McIntosh (program 1) and the Carzol back to back 4 oz. applications on the Golden Delicious (program 7) began to lose their effectiveness on both ERM and TSM populations by 7/15. Plictran 5 oz. was applied over the 2% oil programs (1 and 3) on 7/19, this application providing season long control (Table 2). On 7/26 Carzol at 4 oz. rate (programs 2 and 5) was compared with Plictran at the 5 oz. rate (programs 6 and 7) by splitting program 5, ar Red Delicious plot, in half. Control with the Plictran looked better than that with the Carzol on 8/2 count.

Pest mite populations were observed (8/12) to be increasing in the 7/26 Carzol treated plots (programs 2 and 5), the Carzol 4 oz. back to back application on Red Delicious (program 4), and in the 7/26 Plictran treated Red Delicious program (#6). As a result those and also program #7 were sprayed with Plictran (8/20) at the 5 oz. rate.

Pest mite populations did not build up significantly on the Carzol 4 oz. back to back applications on Rome Beauty (program 8), nor was any significant buildup noted on the Pipens. Predator mites were not found in any of the programs on any of the counts, but it should be pointed out that both Benlate, used for powdery mildew control, and Trithion, used as an aphicide, were included in the

spray program (Table 2) until the end of June. Both materials have been reported as having adverse effects on some mite predators.

MINARD ORCHARD - Studies at the Paul Minard orchard were limited to McIntosh and Red Delicious cultivars. The entire orchard received 2% petroleum oil at ca green tip. ERM populations began to build up in the orchard on 6/11 and Plictran at the 3 oz. rate was sprayed on all blocks except the Carzol test plot. The plictran application (6/18) gave season long control of both ERM and TSM populations (programs 1 and 3) (Table 3).

The Carzol application was delayed until ERM averaged one mite/leaf (7/10). The Carzol was applied in a block of large McIntosh trees with smaller Red Delicious trees interplanted between the McIntosh (programs 2 and 4). The Carzol application reduced mite populations and held them in check until mid-August (8/12). The 8/12 count indicated ERM populations of ca two mites and two eggs/leaf, with TSM populations also increasing. As no predators were found during this count the grower decided to treat the block with Plictran at the 6 oz. rate.

Counts were discontinued too soon for definite conclusions to be drawn concerning mite predator presence in the Hudson Valley orchards studied. Factors which contributed to the lack of predator presence include: 1) pest mite populations were maintained at very low levels in these studies 2) no rust mites or alternative hosts were present and 3) several of the materials used in both grower's spray programs have been reported as having lethal or adverse effects on mite predators.

INSECTICIDES AS MITICIDES - The early season insecticide test block at the Hudson Valley Laboratory Orchard was sampled for mites and mite predators to assess the effects the insecticides might have on their populations. Sampling was not initiated until one month after the insecticide spray schedule had been terminated.

Pest mite populations, both ERM and TSM, were very low at each count. Marlate and the two Lannate treatments had the highest ERM counts on the first sampling 7/17, while Marlate and Bay Bue 1452 had the highest counts on the 8/7 date, and Bay Bue 1452 had the highest counts on the final 9/13 count, (Table 4). TSM populations were similar in most respects to those of the ERM, with the exceptions being that highest counts were found on Marlate and the two Lannate treatments rather than the Bay Bue 1452, (Table 5).

The most abundant mite species was the predatory stigmatid, Zetzellia mali (Ewing). Specimens of this mite had been previously identified by Prof. E.W. Baker, from material collected in the laboratory orchard in August of 1969. If one considers the majority of the predatory mites found on 7/17 to be Z. mali then there is good evidence that Lannate, Bay Bue 1452 and Carzol were all toxic to this predator, while CGA-18809, Guthion and, to a lesser extent, Marlate, were not toxic.

Predatory Phytoseiid mites, some of which were recently determined to be Amblyseius fallacis by Dr. C. Watve, were found during the 7/17 evaluation. They were not tallied apart from Z. mali until the 8/7 and 9/13 counts, however, PPM populations were found in all treatments, except Guthion and the Lannate 25WP plots, on at least one of two late season counts (Table 4). Their presence or absence in these late counts was probably influenced more by the absence or presence of prey species than by chemical residues which may have been present. The higher pest mite counts in the Lannate and Bay Bue 1452 treatments may have been due to earlier toxic effects on predator mite populations, which allowed for the pest mites to build up.

FUNGICIDES AS MITICIDES - Several registered and experimental fungicides were evaluated for their miticidal activity against both pest and predator mites. The study was conducted in cooperation with Dr. Roger Pearson, Plant Pathologist at the Hudson Valley Laboratory. The fungicides were evaluated in the HVL screening block used by Dr. Pearson for evaluating apple scab, apple rusts, and powdery mildew control programs.

The Gulf compound, S-15126, demonstrated excellent miticidal activity against all mite forms (Table 6). The Cela W524, DPX-10 + Oil, and the Benlate + Oil also provided good mite suppression. PPM populations were found in the S-15126 and DPX-10 + Oil treatments on the 8/20 count, three weeks following the last spray application, while both PPM and Z. mali populations were found in the Cela W524 and the Benlate + Oil treatments on this count. Pest mite populations fluctuated in the DPX-10, DPX-112, Captan, Manzate 200 and untreated check plots, in relationship to predator mite numbers. In general high predator mite populations resulted in low pest mite populations.

Table 1. Effects of Orchard Mite Control Programs on European Red Mite (ERM) and Predaceous Phytoseiid Mites (PPM) in the Champlain Valley, Sullivan Orchards, Peru, New York 1974^{a/}

Program No.	b/ 5/3	5/16	5/30 ERM	6/6	6/13 ERM	ERM Eggs	6/26 ERM	ERM Eggs	7/11 ERM	ERM Eggs	7/16	7/30 ERM	ERM Eggs
1	Oil 2 gal.		2.5 ^{c/}		.5	2.0	.3	.0	10.0	15.0		58.3	124.0
2		Oil 1 gal.	3.3	Vendex 6 oz.	2.3	12.0	3.5	1.0	9.0	8.8		11.0	47.3
3			38.5	Vendex 6 oz.	20.0	62.3	4.5	7.5	27.8	88.3		81.8	158.3
4		Oil 1 gal.	16.8	Plictran 6 oz.	7.5	6.5	.0	.8	.8	4.3		2.8	9.3
5			38.3	Plictran 6 oz.	16.8	40.8	.8	15.3	1.0	5.0		9.0	13.8
6		Oil 1 gal.	18.5	Carzol 6 oz.	4.0	9.6	1.5	2.3	.8	.5		10.8	27.0
7			54.0	Carzol 6 oz.	31.5	38.0	1.5	7.0	5.3	2.8		16.3	27.5
8		Oil 1 gal.	12.8		8.3	61.5	60.8	21.8	157.5	255.5	Plictran 3 oz.	12.0	45.5
9			85.8		52.8	281.3	275.8	79.3	904.3	777.0	Plictran 3 oz.	4.5	41.8

	8/6	8/13	ERM Eggs	PPM	8/19	8/27 ERM	ERM Eggs	PPM	9/23 ERM	ERM Eggs	PPM	PPM Eggs
1	Vendex 3.5 oz.	81.8	336.3	.8	Plictran 2 oz.	32.5	117.8	1.8	1.0	21.8	.8	.5
2	Vendex 3.5	21.0	135.5	2.5	Plictran 2 oz.	4.8	20.8	1.5	.0	15.0	1.0	.0
3	Vendex 3.5 oz.	87.3	444.0	5.0	Plictran 2 oz.	7.5	38.8	3.3	.5	12.0	1.0	.0
4		27.8	74.8	.0		63.3	51.5	1.8	62.0	22.0	6.5	1.5
5		21.8	80.0	.0		76.0	66.8	5.3	69.5	11.0	14.3	.3
6		19.0	44.3	.0	Carzol 6 oz.	12.5	14.3	.8	2.3	1.5	.3	.0
7		59.3	254.0	.0	Carzol 6 oz.	25.3	25.8	1.5	2.5	7.3	2.3	.3
8		22.3	168.3	.5		126.3	99.8	4.5	45.0	15.3	6.0	.0
9		7.3	46.3	1.5		16.8	38.5	5.5	5.2	13.3	14.3	1.3

^{a/} Mite treatments (Oil 60 sec., Vendex 50 WP, Plictran 50 WP, Carzol 92 S) shown with amount material per 100 gal. dilute, applied with air blast sprayer at 3X.

^{b/} Each program encompasses a 1.33 acre plot of mature McIntosh trees spaced 40' X 40'.

^{c/} Data given as average No. mites or eggs/25 leaves based on 25 leaves per tree, 4 trees per program sampled at each date.

The following fungicides and insecticides were applied as full cover sprays (F) or as alternate row sprays (A) over the entire block on the dates indicated - Captan 50 WP 1#/100 gal. = C, Cyprex 65 WP 1/4#/100 gal. = Cy, Sevin 50 WP 1#/100 gal. = S, Malathion 25 WP 1 1/3#/100gal. = M, Guthion 50 WP 1/4#/100 gal. = G, Imidan 50 WP 1#/100 gal. = I, amounts given as lbs. material per 100 gal., sprays applied with air blast sprayer at 6X: F - 4/29 - Cy; F - 5/3 - Cy (3X); F - 5/9 - Cy, I 2/3# (3X); A - 5/17 - Cy; F - 5/29 - Cy; A - 6/4 - G,C; F - 6/11 - C,S; A - 6/17 - C, M; A - 6/25 - C,S; A - 7/2 - C,S; A - 7/11 - C,S; A - 7/23 - C,S; A - 8/1 - C,S; A - 8/9 - C,S.

Table 1b. Effects of Orchard Mite Control Programs on Two spotted Spider Mite (TSM) in the Champlain Valley, Sullivan Orchard, Peru, N.Y. 1974^{a/}

Program No.	5/3	5/16	6/6	7/11 TSM	TSM Eggs	7/16	7/30 TSM	TSM Eggs
1	Oil 2 Gal.			2.3 ^{c/}	3.0		3.3	7.3
2		Oil 1 Gal.	Vendex 6 oz.	.5	.5		6.3	7.8
3			Vendex 6 oz.	9.3	4.8		8.8	14.5
4		Oil 1 Gal.	Plictran 6 oz.	.0	.0		.5	.8
5			Plictran 6 oz.	.0	.0		1.8	.8
6		Oil 1 Gal.	Carzol 6 oz.	.0	.0		1.0	2.0
7			Carzol 6 oz.	.5	1.5		1.0	.8
8		Oil 1 Gal.		18.0	8.5	Plictran 3 oz.	1.0	3.0
9				37.3	27.5	Plictran 3 oz.	5.3	2.0
	8/6	8/13 TSM	TSM Eggs	8/19	8/27 TSM	TSM Eggs	9/23 TSM	TSM Eggs
1	Vendex 3.5 oz.	9.3	22.0	Plictran 2 oz.	1.8	.0	.8	.3
2	Vendex 3.5 oz.	2.8	3.5	Plictran 2 oz.	1.0	.0	.5	.0
3	Vendex 3.5 oz.	10.0	30.3	Plictran 2 oz.	.0	.0	.3	.0
4		8.3	9.8		8.0	1.3	6.0	1.0
5		4.8	9.3		6.8	3.3	5.5	.5
6		7.3	5.8	Carzol 6 oz.	.0	.0	.3	.0
7		7.3	16.3	Carzol 6 oz.	.8	.0	.3	.3
8		5.3	2.0		10.5	5.8	4.3	.5
9		2.8	1.3		.5	.3	1.5	.3

^{a/} Mite treatments (Oil 60 sec., Vendex 50 WP, Plictran 50 WP, Carzol 92 S) shown with amount material per 100 gal. dilute, applied with air blast sprayer at 3 X.

^{b/} Each program encompasses a 1.33 acre plot of mature McIntosh trees spaced 40' X 40'.

^{c/} Data given as average no. mites or eggs/25 leaves based on 25 leaves per tree, 4 trees per program sampled at each date.

Table 2. Effects of Orchard Mite Control Programs on European Red Mite (ERM) and Twospotted Spider Mite (TSM) populations in the Hudson Valley, Evans Orchard, Marlboro, New York.^{a/}

Program/Variety	4/24	5/14	5/16	5/20	5/24 ERM	ERM Eggs	6/18 ERM	ERM Eggs	7/15 ERM	ERM Eggs	TSM	TSM Eggs
1. McIntosh	Oil 2 gal	0.5 ^{b/}			1.5	0.3	0.0	0.0	13.8	112.8	3.5	5.5
2. McIntosh		0.5		Carzol 6 oz.	0.3	0.0	0.0	0.3	12.0	93.5	3.0	10.5
3. Red Delicious	Oil 2 gal	1.8			0.5	0.0	0.0	0.3	0.5	10.8	0.0	0.3
4. Red Delicious		1.8	Carzol 4 oz.	Carzol 4 oz.	0.0	0.0	0.3	0.5	2.0	21.0	2.0	11.0
5. Red Delicious		2.0		Carzol 6 oz.	3.0	0.5	1.0	1.0	21.3	297.5	2.3	23.8
6. Red Delicious												
7. Golden Delicious		0.5	Carzol 4 oz.	Carzol 4 oz.	0.5	0.0	0.3	4.3	5.0	87.0	1.0	6.0
8. Rome Beauty		0.0	Carzol 4 oz.	Carzol 4 oz.	0.3	0.0	0.0	0.0	0.3	3.0	0.5	0.3
9. Pipens		0.0	Carzol 4 oz.	Carzol 4 oz.	0.0	0.0	0.0	0.0	0.5	5.0	1.0	6.0

Program/Variety	7/19	7/26	8/2 ERM	ERM Eggs	TSM	TSM Eggs	8/12 ERM	ERM Eggs	TSM	TSM Eggs	8/20
1. McIntosh	Plictran 5 oz.		0.0	1.5	0.3	0.5	0.3	6.8	0.0	1.3	
2. McIntosh		Carzol 4 oz.	20.8	45.5	3.3	13.0	129.0	391.3	27.5	33.8	Plictran 5 oz.
3. Red Delicious	Plictran 5 oz.		0.0	1.5	0.0	0.0	0.0	1.0	0.3	0.5	
4. Red Delicious			4.3	21.0	7.5	17.8	36.8	81.3	9.5	59.8	Plictran 5 oz.
5. Red Delicious		Carzol 4 oz.	3.0	116.5	1.5	28.5	43.8	147.5	8.5	61.0	Plictran 5 oz.
6. Red Delicious		Plictran 5 oz.	0.0	39.5	0.3	6.8	47.7	55.0	0.8	4.5	Plictran 5 oz.
7. Golden Delicious		Plictran 5 oz.	0.8	21.3	0.8	2.5	0.8	32.8	0.0	4.0	Plictran 5 oz.
8. Rome Beauty			0.8	5.3	0.5	0.5	1.0	7.8	1.3	1.8	
9. Pipens											

^{a/} Mite treatments (oil 60 sec., Carzol 92SP, Plictran 50WP) shown with amount material per 100 gal. dilute; all material applied with air blast sprayer at 2X.

^{b/} Data presented as average no. mites or eggs/25 leaves; based on 25 leaves per tree, 4 trees per program sampled at each date.

The following fungicides and insecticides were applied in full cover sprays on the dates indicated-
 4/24-Thylate 65WP, 1#, Benlate 50WP 2 oz., 5/5-Thylate 1#, Benlate 2 oz., 5/16-Thylate 1#, Benlate 2 oz., Guthion 50WP 1/2#, 5/23-Thylate 1#, Benlate 2 oz., Guthion 1/2#, 6/3-Thylate 1#, Benlate 2 oz., Guthion 1/2#, 6/18-Thylate 1#, Benlate 2 oz., Guthion 1/2#, 6/13-Thylate 1#, Benlate 2 oz., Trithion 25 WP 1#, Imidan 50WP 1#, 6/23-Thylate 1#, Benlate 2 oz., Trithion 1#, Imidan 1#, 7/12-Thylate 1 1/2#, Imidan 1#, 7/26-Thylate 1 1/2#, Guthion 1/2#.

Table 3. Effects of Orchard Mite Control Programs on European Red Mite (ERM), and Twospotted Spider Mite (TSM) Populations in the Hudson Valley, Paul Minard Orchard, Clintondale, N.Y.^{a/}

Program/Variety	4/17	5/22 ERM	ERM Eggs	6/3 ERM	ERM Eggs	6/11 ERM	ERM Eggs	TSM	6/18
1. McIntosh	Oil 2 gal			0.3	6.3				Plictran 3 oz.
2. McIntosh	Oil 2 gal	3.3 ^{b/}	22.3	0.0	1.0	7.3	7.0	4.0	
3. Red Delicious	Oil 2 gal			0.0	16.5				Plictran 3 oz.
4. Red Delicious	Oil 2 gal	2.3	19.5	0.3	30.3	7.8	14.3	2.8	

Program/Variety	6/20 ERM	ERM Eggs	7/3 ERM	ERM EGGS	7/10 ERM	ERM Eggs	7/11	7/19 ERM	ERM Eggs	TSM	TSM Eggs
1. McIntosh	0.0	4.8			0.5	4.0		0.3	3.0	0.8	0.3
2. McIntosh	5.0	29.8	28.0	10.5	20.8	53.8	Carzol 6 oz.	9.8	11.0	3.0	0.0
3. Red Delicious	0.0	0.5			0.0	1.0		0.0	0.0	0.0	0.0
4. Red Delicious	5.0	59.3	22.5	14.0	29.3	114.3	Carzol 6 oz.	4.8	22.5	1.5	0.0

Program/Variety	8/6 ERM	ERM Eggs	TSM	TSM Eggs	8/12 ERM	ERM Eggs	TSM	TSM Eggs	8/14
1. McIntosh	1.3	11.8	0.3	0.3	4.8	6.3	0.5	0.3	
2. McIntosh	8.8	61.5	0.5	0.5	48.0	35.0	3.0	0.5	Plictran 6 oz.
3. Red Delicious	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	
4. Red Delicious	5.8	65.8	0.0	1.8	48.3	63.5	2.5	2.0	Plictran 6 oz.

^{a/} Mite treatments (Oil 60 sec., Carzol 92SP, Plictran 50WP) shown with amount material per 100 gal. dilute; all materials applied with air blast sprayer at 2X.

^{b/} Data presented as average no. mites or eggs/25 leaves; based on 25 leaves per tree, 4 trees per program sampled at each date.

The following fungicides and insecticides were applied in full cover sprays on the dates indicated -
 4/8-Thylate 65WP 2#, 4/16-Cyprex 65WP 1/4#, 4/22 - Thylate 2#, 4/28-Thylate 2#, Methoxychlor 50WP 2#,
 5/6-Captan 50WP 1 1/2#, Thylate 1 1/2#, 5/14-Captan 1 1/2#. Thylate 1 1/2#, 5/19-Captan 1/2#,
 Thylate 1 1/2#, Karathane 25WP 1/4#, Guthion 50WP 1/2#, Phosphamidon 8EC 1/4 pt. 5/27 Captan 1 1/2#,
 Thylate 1 1/2#, Karathane 1/4#, 6/4 Captan 1 1/2#, Thylate 1 1/2#, Karathane 1/4#, Guthion 1/2#,
 6/18 Captan 3/4#, Thylate 3/4#, Zolone 3 EC 1 pt., 7/1-Captan 1 1/2#, Guthion 1/2#, 7/17-Captan
 1 1/2#, Guthion 1/2#, 8/14-Captan 1 1/2#, Guthion 1/2#.

Table 4. Effect of early season insecticide applications^{ab} on the European red mite (ERM), and predaceous phytoseiid mites (PPM). Hudson Valley Laboratory Orchard, Highland, N.Y. 1974.

Material & Formulation	Oz. Formulation per 100 Gallon	Sampling Date			ERM			PPM		
		7/17	8/7	9/13	Eggs	Eggs	Eggs	Eggs	Eggs	Eggs
1. Marlato 50 WP	32	12.7	21.7	6.3	24.7	1.0	0.0	1.7	0.3	
2. Lannate 25 WP	32	2.3	2.7	0.3	0.0	0.0	0.3	0.0	0.0	
3. Lannate 2 EC	32	10.7	5.3	0.0	0.0	0.3	0.3	0.0	0.7	
4. Guthion 50 WP	8	0.3	3.0	0.3	0.0	0.0	0.0	0.0	0.0	
5. Bay Bue 1452 50 WP ^d	16	0.0	0.3	1.3	2.0	0.3	2.0	3.0	1.7	
6. Carzol 92 SP	8	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	
7. CGA 18809 50 WP	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	
8. Check		0.3	3.3	0.0	0.0	0.0	0.0	0.3	1.0	

^a Treatments applied at pink (4/29), petal-fall (5/21), and first 2 covers, (6/3, 6/19).

^b All treatments applied to 8 tree plots containing 7 apple varieties, plots replicated 3 times. Dilute application sprayed to runoff with hand-gun sprayer at 500 psi.

^c Counts presented as average no. mites or eggs/25 leaves, based on sampling 25 leaves/red delicious tree/plot.

^d Not applied at pink (4/29) application.

Table 5. Effect of early season insecticide applications^{ab} on the two spotted spider mite (TSM) and the predaceous mite, Zetzellia mali (Ewing). Hudson Valley Laboratory Orchard Highland, New York 1974.

Material & Formulation	Oz. Formulation per 100 gal.	Sampling Date	TSM	TSM EGGS	Total Pred. Mites ^c	TSM Eggs	TSM Eggs	8/7		9/13	
								Zetzellia Mali	Zetzellia Mali	TSM Eggs	TSM Eggs
1. Marlate 50 WP	32	7/17	3.0 ^d	1.0	15.0	2.7	2.7	18.7	22.0	2.0	0.7
2. Lannate 25 WP	32		6.0	0.3	3.0	1.7	2.3	16.7	24.0	0.0	0.0
3. Lannate 2 EC	32		8.7	0.3	1.0	5.7	1.0	3.0	7.7	1.7	0.0
4. Guthion 50 WP	8		0.3	0.3	26.3	0.0	0.0	33.7	31.0	0.0	0.0
5. Bay Bue 1452 50 WP ^e	16		0.0	0.0	0.3	0.7	0.0	0.0	0.0	0.3	0.3
6. Carzol 92 SP	8		0.0	0.0	2.0	0.0	0.0	5.3	4.3	0.0	0.0
7. CGA 18809 50 WP	8		0.0	0.0	31.3	0.0	0.0	41.3	31.7	0.0	0.0
8. Check			0.3	1.0	20.7	0.0	0.0	21.7	5.3	0.0	0.0

^a Treatments applied at pink (4/29), petal-fall (5/21), and first 2 covers (6/3, 6/19).

^b All treatments applied to 8 tree plots containing 7 apple varieties, plots replicated 3 times. Dilute application sprayed to runoff with hand-gun sprayer at 500 psi.

^c Includes both Zetzellia mali and predatory phytoseiids.

^d Counts presented as average no. mites or eggs/25 leaves, based on sampling 25 leaves/Red Delicious tree/plot.

^e Not applied at pink (4/29) application.

Table 6. Effects of seasonal fungicide programs against the European Red Mite, ERM, Twospotted Spider Mite, TSM, Predaceous Phytosiid Mite, PPM, and Predaceous Stigmaeid Mite, Zetzellia mali. Hudson Valley Laboratory Orchard, Highland, N.Y. 1974

Material & Form. <u>a/</u>	Rate form. /100 gal	ERM 7/16	ERM Eggs	TSM Eggs	Total Pred.	ERM 8/20	ERM Eggs	TSM Eggs	PPM	Z. mal		
1. DPX-10 50W	4.0 oz.	23.7 ^{b/}	30.7	0.7	2.0	0.0	8.3	23.3	1.3	3.0	0.3	0.3
2. DPX-10 50W + 70 sec. Oil	2.0 oz. 1.0 qt.	0.0	0.0	1.7	0.0	0.7	0.3	4.3	3.0	1.0	0.3	0.0
3. DPX-112 80W	1.0 lb.	3.3	1.3	1.0	2.0	0.3	3.7	3.7	8.0	2.7	0.0	0.7
4. S-15126 50W	6.0 oz.	0.7	0.0	0.0	0.0	0.0	0.3	4.7	0.0	0.0	2.3	0.0
5. S-15126 50W	12.0 oz	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
6. Cela W524 20EC	10.0 oz.	0.0	0.0	0.3	0.0	1.3	0.0	0.3	0.3	0.3	0.7	20.3
7. Captan 50W	2.0 lb.	21.3	17.7	2.7	2.0	15.7	0.0	2.3	0.0	0.3	0.0	29.7
8. Manzate 200 80W	2.0 lb.	4.3	1.7	8.7	12.3	3.0	2.7	3.0	0.3	0.3	0.0	1.7
9. Benlate 50W + 70 sec. Oil	2.0 oz. 1.0 qt.	0.0	0.0	0.0	0.0	0.3	1.0	6.3	0.7	1.7	0.3	3.7
10. Untreated		0.0	0.3	3.0	0.0	29.3	1.7	0.3	0.7	1.3	4.3	29.7

^{a/} Fungicides applied as dilute sprays using a hand-gun at 550 psi on 4/18, 4/25, 5/2, 5/11, 5/16, 5/22 5/30, 6/6, 6/13, 6/27, 7/9, and 7/29. Guthion 50WP (1/2#/100 gal.) was applied over all plots on 5/28.

^{b/} Counts expressed as # mites or eggs/25 Red Delicious leaves, based on three single tree reps/treatment

Pear Psylla Control Experiments - 1974

General Observations - Active overwintering pear psylla adults were first observed on 3/18 on pear trees located near Milton, N.Y. This was five days later than the previous season but eleven days earlier than in 1972. First eggs were found on 4/8 with first hatch observed on 4/20. Nymphs were in the hardshell stage by 5/17 and first brood adults were found laying eggs by 5/30.

Buildup of second brood nymphs was large in some orchards where the populations were sprayed with materials the psylla were resistant to. Late in the season, after the pears had been harvested (last week in September) high populations of pear psylla, in all stages of development, were observed in several orchards throughout the Hudson Valley.

Screening Trial for New Compounds - Several experimental and newer compounds were evaluated for their performance against pear psylla. The test was conducted in the Plant Pathology pear planting at the Hudson Valley Laboratory, Highland, N.Y. Five single tree replicates were used for each treatment. Each replicate consisted of a different cultivar, those being Old Home, Bartlett, Bosc, Gorham, and Clapp.

Treatments were applied dilute (400 gal/acre) to runoff with a hand-gun sprayer at 450 psi on 7/10 and 8/15. Pre and post treatment counts were made of both nymphs and eggs on 5 spurs per tree.

In the first evaluation the Bay Bue 1452 (16 oz.), the Fundal (8 oz.), the Imidan 50WP (16 oz.), and the CGA 18809 (16 oz.) all looked promising in terms of nymphal reductions (Table 1). The population was a declining one at this point as both nymph and egg counts were lower in the post treatment check counts (Table 1 and 2). This may have been responsible for the erratic nature of the egg reductions noted in this first test (Table 2).

A rapidly expanding population composed of nymphs, adults, and eggs was encountered on the final test. Reductions in nymphal counts were noticed with only the Fundal, Imidan and CGA 18809 (16 oz.) treatments (Table 1). In many cases considerable increases in both nymphs and eggs were found (Table 1 and 2). No reductions in egg counts were observed, indicating a lack of ovicidal or adult activity by the materials used.

Seasonal Control Programs - Six seasonal programs and a check were evaluated at the J.R. Clarke Orchard, Milton, N.Y. Treatments were replicated 3 times in ca 1 acre plots. Materials were applied with an air-blast sprayer at 1.5X. Adult pear psylla were counted on 10 spurs, nymphs and eggs on 5 spurs per tree. Two Bartlett and 2 Bosc trees were sampled per plot.

The early oil (2%) or split oil (1%) programs (1 and 3) provided good psylla control up to petal fall (Table 3). Early insecticide applications were not as effective against psylla. Back to back

applications of Fundal, Guthion, Perthane, Thiodan, and Carzol, initiated at 1st egg second brood (5/30), resulted in a lack of psylla control with Guthion and Carzol (programs 2 and 5), and good nymphal but poor adult control with Thiodan and Fundal programs (4 and 6). Programs in which oil had been used earlier looked the best, except that Perthane (program 3) provided a greater measure of adult control than Fundal (program 1).

As a test of the 3 best preforming materials, Zolone, Fundal, and Perthane were applied in programs 2,5, and 7, respectively. Zolone and Fundal provided good nymphal control, while Perthane provided the best control, against all forms of psylla (Table 3).

The results of these tests suggest that early oil sprays should be encouraged for adult pear psylla control, while insecticide usage, with the possible exception of perthane, should be directed at nymph control, preferrably before the nymphs are in the hard-shell stage.

Table 1. Pear Psylla control - screening trial for new compounds. Station Orchard, Highland, New York - 1974^a

Material and Formulation	oz. form per 100 gal.	7/9	Pear Psylla nymphs per 5 spurs ^b / %Red.		
			7/17	8/13	8/22
1. Bay Bue 1452 50WP	8	6.2	5.0	19	22.2
2. Bay Bue 1452 50WP	16	9.0	3.0	67	34.0
3. Bay NTN 9306 6EC	3	6.8	10.6	-	26.4
4. Bay NTN 9306 6EC	6	7.0	5.6	20	16.4
5. Monitor 4WM	8	5.2	4.0	23	68.6
6. Monitor 4WM	16	0.8	7.8	-	64.8
7. Fundal SP	8	5.2	0.0	100	1.6
8. Imidan 1S	64	7.6	4.4	42	0.8
9. Imidan 50WP	16	5.6	0.8	86	4.8
10. CGA 18809 50WP	8	0.8	0.8	-	7.0
11. CGA 18809 50WP	16	1.6	0.0	100	5.0
12. Check -	-	9.7	9.3	4	37.9

^a/ Treatments applied 7/10, and 8/15. Sprays applied dilute to runoff with hand-gun sprayer at 450 psi.

^b/ Data are average of 5 single tree replicates, each replicates being a different variety. Varieties-Old Home, Barlett, Bosc, Gorham, Clapp.

Table 2. Pear Psylla control - screening trail for new compounds. Station Orchard, Highland, N.Y. 1974a/

Materials and Formulation	oz. form. per 100 gal	7/9	Pear Psylla eggs per 5 spursb/			
			7/17	8/13	8/22	%Red.
1. Bay Bue 1452	50WP	8	12.0	3.0	4.6	18.0
2. Bay Bue 1452	50WP	16	5.0	3.8	11.4	23.0
3. Bay NTN 9306	6EC	3	8.2	5.0	3.2	11.0
4. Bay NTN 9306	6EC	6	6.6	5.2	1.2	17.0
5. Monitor	4WM	8	4.0	6.2	13.0	19.8
6. Monitor	4WM	16	0.2	6.4	20.2	38.4
7. Fundal	SP	8	3.6	1.8	2.0	11.6
8. Imidan	1S	64	8.8	2.6	5.2	12.8
9. Imidan	50WP	16	5.6	3.2	11.2	35.2
10. CGA 18809	50WP	8	4.4	7.2	7.0	11.6
11. CGA 18809	50WP	16	7.4	3.4	2.2	12.4
12. Check	-	-	6.5	4.4	6.2	32.9

a/ Treatments applied 7/10, and 8/15. Sprays applied dilute to runoff with hand-gun sprayer at 450 psi.

b/ Data are average of 5 single tree replicates, each replicate being a different variety. Varieties - Old Home, Barlett, Bosc, Gorham, Clapp.

Table 3. Seasonal Control Programs for Pear Psylla in the Hudson Valley. Clarke Orchard, Milton, N.Y. 1974^{a/b/c/d/}

Program No.	4/8 Adt.	4/8	4/11 Adt.	4/15	4/24	4/26 Adt.	Nym.	5/13 Nym.	5/15	5/20 Nym.	5/29 Adt.	Nym.	5/30
1	0.7	Oil 2%	0.3		Fundal	0.1	1.7	1.8	Zolone	0.5	2.0	0.4	Fundal
2					Guthion	0.3	9.2	23.9	"	14.6	19.8	9.7	Guthion
3	1.3	Oil 1%	0.7	Oil 1%		0.1	6.9	8.7	"	2.9	5.8	1.4	Perthane
4					Thiodan	0.1	3.7	19.6	"	5.7	7.5	4.9	Thiodan
5					Carzol	0.3	3.8	39.0	"	15.5	16.4	7.9	Carzol
6					Fundal	1.3	5.4	13.8	"	6.2	7.5	4.9	Fundal
7	1.6		3.9			1.9	14.6	42.4		42.2	29.4	55.3	

	6/4 Adt.	Nym.	6/6	6/12 Adt.	Nym.	Eggs	6/24 Adt.	Nym.	Eggs	6/27	7/2 Adt.	Nym.	Eggs
1	1.7	0.1	Fundal	0.8	1.3	25.7					3.0	7.9	3.8
2	33.5	6.4	Guthion	18.9	16.7	231.5	13.3	246.5	172.5	Zolone	1.4	7.7	24.1
3	0.4	0.2	Perthane	0.1	0.4	1.2					1.8	5.4	4.2
4	7.7	1.5	Thiodan	3.8	6.4	54.3					9.8	103.4	40.3
5	11.7	5.4	Carzol	6.2	14.9	115.5	11.6	78.4	130.1	Fundal	3.9	4.8	33.8
6	10.9	0.9	Fundal	6.5	5.8	78.0					5.9	82.4	12.0
7	31.0	50.7		31.2	67.7	161.3	11.0	118.3	100.3	Perthane	0.3	2.3	1.7

	7/12	7/25 Nym.	Eggs	8/7 Nym.	Eggs
1	Zolone	1.5	1.3	2.5	7.9
2	"	2.8	6.4	8.8	15.1
3	"	0.3	1.8	1.0	0.8
4	"	3.6	8.3	9.4	12.7
5	"	6.5	33.5	13.4	5.3
6	"	1.0	1.6	1.2	0.4
7	"	0.4	1.1	0.6	1.0

^{a/} Treatments replicated 3 times on ca. 1-acre plots; treatments applied with air-blast sprayer at 1.5X.

^{b/} Formulations used and rates per 100 gallons dilute- Oil 2%, 70 sec. 2 gal; Oil 1%, 70 sec 1.0 gal; Fundal, 95 SP, 0.5 lb; Guthion, 50 WP, 0.5 lb; Thiodan, 50 WP, 1.5 lb; Carzol, 22 SP, 0.5 lb; Zolone, 3 EC, 1.0 qt; Perthane, 4 EC, 1.0 qt.

^{c/} Counts expressed as Adults/10 spurs, Nymphs/5 spurs, and Eggs/5 spurs; based on the average from 4 trees/plot, 2 Bartlett and 2 Bosc.

^{d/} Pear psylla development- 1st egg-4/3; petal fall-5/15; 1st egr, second brood-5/30

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PEACH INSECT INVESTIGATIONS - 1974

Several peach orchards were surveyed for several of the causative agents contributing to the decline of peach growing in the Hudson Valley. The surveys were conducted with Dr. Roger Pearson, plant pathologist, and Mr. M. Wayne McKee, pomologist. In the survey each tree was examined for the agents associated with peach tree decline. One peach tree borer, either the lesser peachtree borer, Synanthedon pictipes (Grote & Robinson), or the peachtree borer, Sanninoidea exitiosa (Say), found in a major scaffold limb or the trunk resulted in that tree's being labeled as infested. Severity, i.e. numbers of borers infesting a tree, was noted but not included in the results of this survey.

RESULTS - Peach tree borers were found to infest a considerable (35%) number of the peach trees checked in the survey (Table 1). The percentage of trees infested ranged from 3-90% depending on the orchard surveyed. In general, orchards which had a high percentage borer infestation had not received the proper scaffold sprays with a handgun, or there was a tendency to rely on sprays applied with an airblast sprayer to control borers.

PHEROMONE TRAPPING - Pherocon 1CP traps were set out containing peachtree borer pheromone caps prepared by Dr. Ring Carde. The traps were placed in 3 grower's orchards ranging in age from 1-4 years and ca 2-5 acres in size. All growers had followed the recommended spray schedule and included the recommended trunk applications for borer control. Traps were also placed in a small (1/4 acre) ten year old peach planting located on the Highland laboratory station.

RESULTS - The traps were placed in the orchards too late to determine first activity of the moths. The traps indicated that a peak of moth activity occurred around 7/22, and that moth activity continued as late as 9/12, when the traps were taken down (Table 2).

Table 1. Peach orchard surveys in the Hudson Valley, 1973 - 1974.

Peach Orchard Surveyed	Year	Total No. Trees	% Vacant Sites ^{a/}	% Replants	% Suspected "X" Disease	% Valsa Canker	% Rodent Damage	% Peach Tree Borers ^{b/}	% Unknown
A	1973	161 ^{c/}	17	1	0	14	--	--	8
	1974	195	16	0	5	13	4	9	13
B	1973	218	23	5	0	23	--	--	1
	1974	125 ^{d/}	3	8	2	29	2	69	0
C	1973	233 ^{c/}	9	0	4	39	--	--	11
	1974	350	14	47	31	35	4	51	0
C ₁	1974	801	6	14	4	11	4	36	0
C ₂	1974	143	10	16	4	33	8	41	0
	1974	74	8	18	7	19	0	80	0
D	1973	63	26	6	0	54	--	--	0
	1973	110	3	2	0	1	--	--	0
	1974	113	0	1	1	2	0	3	3
E	1973	307	33	0	6	17	--	--	11
	1974	300	34	0	7	31	0	47	5
E ₁	1974	399	6	0	1	3	0	13	1
F	1974	77	63	7	40	83	4	92	0
	1974	39	45	5	33	51	0	90	0
Ge/	1974	180	4	5	5	3	1	0	2
	1973	1092	23	2	3	26	--	--	7
All Orchards	1974	2796	16	12	9	19	3	35	2

a/ Percent tree sites vacant calculated from the total number of original tree sites, all other percents calculated from the total number of trees present at the time of survey.

b/ Includes both lesser peachtree borer, Synanthedon pictipes (Grote & Robinson) and peachtree borer, Sanninoidea exitiosa (Say).

c/ Total orchard was not surveyed this year.

d/ 154 trees were removed from this orchard.

e/ Nectarine orchard.

Table 2 - Peach Tree Borer Captures - 1974^{a/}
Mean Number of Adults per Trap

Sampling Date	Gene Coy Orchard ^{b/}	Bob Coy Orchard ^{c/}	Dressel Orchard ^{d/}	Laboratory Orchard ^{e/}	Combined Locations
7/17	3.50	5.0	6.33	----	4.94
7/18	2.67	6.17	5.20	8.0	5.51
7/22	5.33	9.50	13.40	8.67	9.23
7/25	1.50	6.17	3.00	2.33	3.25
7/29	5.17	4.17	5.20	3.0	4.39
8/1	1.83	3.67	4.40	4.33	3.56
8/5	3.17	5.0	2.60	5.33	4.03
8/8	2.83	3.33	1.20	3.33	2.67
8/12	5.17	2.83	0.80	3.67	3.12
8/15	0.67	2.17	0.60	3.33	1.67
8/19	1.50	2.67	0.80	2.0	1.74
8/22	1.50 ^{f/}	1.17 ^{f/}	0.20 ^{f/}	0 ^{f/}	0.72
8/26	0.50	2.67	0.40	1.67	1.31
8/29	0.50	0.67	0.20	0.67	0.51
9/3	1.67	1.50	1.60	2.33	1.78
9/5	0.33	0.17	0	0	0.10
9/9	0.50	0.50	0.40	0.67	0.64
9/12	0.50	0	0.20	2.00	0.68

^{a/} Phermone Bait

^{b/} Ardonia, N.Y.-6 traps

^{c/} Ardonia, N.Y.-6 traps

^{d/} New Paltz, N.Y.-5 traps

^{e/} Highland, N.Y.-3 traps

^{f/} Traps changed