



PLANT SCIENCES

ENTOMOLOGY (GENEVA)

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Evaluation of pesticides against the European red mite, apple rust mite, and two mite predators in 1976-1977

S. E. Lienk, J. Minns, and B. H. Labanowska

Of the six mite species reported to feed on apple and other tree fruits in New York, only the European red mite, *Panonychus ulmi* (Koch) is now of general economic concern in commercial orchards. Infestations occur annually and in all areas of the State. Consequently, many growers incorporate an acaricide as a preventive measure in their pest control schedule. In recent years, the implementation of integrated pest management programs on apple has had some success in curtailing European red mite activity. This was made possible through the development of tolerant strains of our two major mite predators, *Amblyseius fallacis* (Garman) and *Typhlodromus pyri* Scheuten, to most of our commonly used orchard pesticides. Pest controls now favor materials which are effective against target species but relatively non-toxic to the parasite-predator complex. Chemicals, however, still are and will for the foreseeable future remain the mainstay of our pest control endeavors. Consequently, the search for more efficient and less ecologically disruptive materials continues.

During the 1976-1977 season, extensive field screening programs were conducted to evaluate currently recommended and experimental acaricides against the European red mite. In addition, some trials were included against the apple rust mite, *Aculus schlechtendali* (Nalepa), in 1976.

We continue to believe that the European red mite can best be controlled by preventive or early season treatments, and therefore such programs were emphasized in field trials.

In the laboratory, studies were undertaken to measure the responses of our two predatory mite species, *A. fallacis* and *T. pyri* to a series of experimental compounds.

EUROPEAN RED MITE AND APPLE RUST MITE TRIALS

Procedure.—All field evaluations were conducted on apple. Treatments were applied with either a Myers airblast sprayer or a truck-mounted hydraulic orchard sprayer. The latter was operated at 500 psi, and the trees were sprayed to run-off using a handgun from the ground. In applying test sprays, both the inside surface and outside canopy were thoroughly covered. The Myers airblast sprayer was calibrated to deliver 33 gallons of spray per minute per side at dilute or 1X concentration. Tractor speed varied from 2 to 2 $\frac{1}{2}$ mph and sprays were applied dilute, 3X, or 4X. Applications were made only at times when wind conditions were such that thorough coverage could be achieved.

For determining the performance of the early season and seasonal programs, 7 to 10 mite population counts were made at approximately weekly intervals beginning in mid-June. A sample consisted of 100 carefully selected leaves picked at chest height (25 leaves from each of 4 trees or replicates). The leaves were placed in pint ice cream containers, fumigated with ethylene dichloride, and placed under refrigeration in the laboratory. The mites were removed by brushing within 48 hours, using a Henderson-McBurnie mite brushing machine, and counts made immediately thereafter.

In the case of summer trials, records were taken directly in the orchard. A minimum of three (most often 4) observers using stereoscopic microscopes made counts of all mite stages present, except eggs, on independently selected sub-samples of 10 leaves.

RESULTS AND DISCUSSION

Early Season Tests.—All of the early season trials were conducted in mature apple plantings. Airblast sprayed plots consisted of unreplicated blocks ranging from 1 to 2 1/2

acres in size. The four-count trees were selected prior to the initiation of the test on the basis of the uniform overwintering red mite egg population present and were usually located near the center of the plot. The handgun treated plots consisted of a minimum of three but usually four single tree replicates. Pertinent information regarding the early season trials is given in Tables 1-13.

Test 1.—F. Cottrell Farm, 1976. Preliminary field and laboratory tests in 1975 strongly suggested that PP 199, a new diphenylamine acaricide of moderately high mammalian toxicity, possessed strong ovicidal activity against winter eggs of the European red mite. To determine if this actually was the case, treatments of PP 199 were applied at two concentrations in the green tip and tight cluster period. Details of the test and results are presented in Table 1. Winter eggs of the red mite begin hatching at the tight cluster stage of bud development. It was clearly evident in

this test that the green tip spray applied some 12 days prior to the initiation of egg hatch was only slightly ovicidal even at the higher concentration. When, however, applied at the tight cluster stage, results were excellent and similar to the 1 per cent petroleum oil treatment.

Test 2.—C. Fox Orchard, 1976. In this test PP 199 either alone or in combination with the fungicide difolatan was applied in the green tip period. Plots were 1/4 acre in size and the sprays were applied with an airblast sprayer. Results of the test are given in Table 2. It was again demonstrated that the material is ineffective against the winter eggs.

Test 3.—F. Cottrell Farm, 1977. Results of the tests conducted here are presented in Table 3. Initial screening in 1975 of PP 199 indicated that it possessed ovicidal properties. In these trials, the technical material was used in the laboratory while a 50 per cent dispersible grain formulation was evaluated in the field. In 1976, the product was for-

Table 1.—Efficiency of acaricidal sprays applied during the pre-bloom period against the European red mite. Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation ^a	Oz. form./100 gals.	Spray date ^b	Avg no. hatched mites/leaf					
			6/09	6/15	6/23	6/29	7/06	7/20
PP 199 (4# gal)	2	4/07	1.1	10.4	8.3	28.5	59.8	84.0
PP 199 (4# gal) + Difolatan (4# gal)	96	4/07	1.1	9.8	10.3	15.9	26.4	92.3
PP 199 (4# gal)	4	4/07	4.1	17.6	20.2	24.6	72.4	83.1
PP 199 (4# gal)	2	4/19	0.2	1.4	4.1	9.9	13.6	104.6
PP 199 (4# gal)	4	4/19	0.1	0.6	1.7	3.5	7.5	41.6
P. oil (70 sec. vis.)	128	4/19	0	0.2	0.2	1.6	4.6	21.6
Baam (1-1/2#/gal)	20	4/22	0.3	0.5	1.0	2.1	5.3	13.1
Controls:			4.2	53.3	31.2	35.9	68.8	96.7

^a/Treatments applied to four single tree replicates with a truck-mounted hydraulic orchard sprayer using a hand gun.

^b/Bud stages on treatment dates: 4/07 - green tip; 4/19 - tight cluster; 4/22 - pink.

Table 2.—Efficiency of various early season applied acaricides against the European red mite. Host: Apple. Sodus, NY, 1976.

Material and amount form./100 gals. ^a	Spray date ^b	Avg no. hatched mites/leaf								
		6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10
<u>Red Delicious</u>										
PP 199 (4# gal) - 4 oz	4/08	0.6	2.6	2.7	12.9	17.8	27.5	49.8	73.2	119.4
PP 199 (4# gal) - 4 oz + Difolatan - 3 qt	4/08	1.6	0.7	4.7	2.9	4.8	14.7	37.6	78.1	195.8
OII - Ethion - 1%	4/19	0.3	2.5	2.3	4.7	4.2	15.1	11.8	28.1	66.9
Zardex (40% wp) - 24 oz	4/21	0.4	0.7	0.3	1.1	4.5	13.5	11.1	33.4	56.5
Controls:		4.2	3.9	2.5	14.8	26.4	31.5	76.5	173.2	181.7
<u>Golden Delicious</u>										
PP 199 (4# gal) - 4 oz	4/08	0.3	1.6	1.5	1.3	7.9	35.5	34.3	46.9	61.6
OII - Ethion - 1%	4/19	tr	0.1	0.3	tr	3.1	4.0	3.1	12.2	40.1
Zardex (40% wp) - 24 oz	4/21	0.9	0.3	1.0	1.5	2.0	8.9	9.8	34.6	11.2
Controls:		2.2	3.2	2.5	4.6	15.3	37.6	55.4	70.7	82.9

^a/Treatments applied to 1/4 acre plots with a Myers airblast sprayer at dilute or 1X concentration.

^b/Bud stages on treatment dates: 4/08 - green tip; 4/19 - tight cluster; 4/21 - early pink.

Table 3.—Efficiency of experimental acaricides applied at various stages of bud development against the European red mite. Host: Rome apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Avg no. hatched mites/leaf			
	6/15	6/28	7/11	7/18
<u>Dormant Series - 3/30</u>				
PP 199 (4#/gal) - 3.2 oz	23.3	2.1	29.2	38.8
PP 199 (2#/gal) - 6.4 oz	9.9	8.3	42.8	20.5
<u>Green Tip Series - 4/07</u>				
PP 199 (4#/gal) - 3.2 oz	3.4	4.1	26.8	67.1
PP 199 (2#/gal) - 6.4 oz	1.4	3.2	12.9	22.1
PP 199 (Tech) - 1.6 oz	5.7	4.8	34.5	19.9
<u>Half-inch Green Series - 4/14</u>				
PP 199 (4#/gal) - 3.2 oz	1.7	2.9	12.1	29.8
PP 199 (2#/gal) - 6.4 oz	4.2	3.8	30.1	37.9
PP 199 (Tech) - 1.6 oz	2.3	1.8	14.4	26.7
P. oil (70 sec) - 2%	0.1	0.1	1.4	2.0
<u>Tight Cluster Series - 4/18</u>				
PP 199 (4#/gal) - 3.2 oz	18.8	4.6	84.8	20.7
PP 199 (2#/gal) - 6.4 oz	2.5	3.4	29.8	27.7
PP 199 (Tech) - 1.6 oz	8.5	1.6	13.4	14.6
P. oil (70 sec) - 1%	0.1	0.2	1.1	9.3
XE 333 (2.7#/gal) - 9 oz	0.5	0.1	7.7	1.9
<u>Pink Series - 4/21</u>				
XE 333 (2.7#/gal) - 6 oz	2.4	1.1	23.4	26.2
XE 333 (2.7#/gal) - 9 oz	1.2	0.5	3.9	13.1
RH 6564 (3.37#/gal) - 7.5 oz	1.4	0.1	1.5	2.1
RH 6564 (3.37#/gal) - 15 oz	1.3	0.1	0.2	1.1
PP 199 (4#/gal) - 3.2 oz	0.6	0.2	0.1	3.3
PP 199 (2#/gal) - 6.4 oz	1.1	0.1	0.8	4.2
Controls:	18.9	18.0	90.3	52.3

^a/Treatments applied to 3 single tree replicates with a truck-mounted hydraulic orchard sprayer using a hand gun.

Table 4.—Efficiency of PP 199 applied 5/20/77 (petal fall) against the European red mite. Host: Northern Spy apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Avg no. hatched mites/leaf						
	6/15	6/20	6/28	7/11	7/18	7/25	8/01
<u>PP 199 (4 lb/gal) -</u>							
3.2 oz	-	0.1	0.1	0.4	0.9	2.3	4.2
<u>PP 199 (2 lb/gal) -</u>							
6.4 oz	-	0.1	0.1	0.4	0.1	0.9	0.3
Controls:	24.5	-	56.6	57.4	10.5	11.4	4.1
							3.6

^a/Treatments applied with an airblast sprayer at dilute or 1X concentration.

mulated as a 4#/gal. colloidal suspension. As noted in Tables 1 and 2, little if any ovicidal action was noted with the new formulation. For the 1977 season, the manufacturer developed a 2#/gal. colloidal suspension. To determine if any of the formulations including the technical material were ovicidal, the present test was initiated. Treatments were applied on five occasions, the first in the dormant period on March 30 and the last on April 21 when buds were in the pink stage of development. Red mite control was only achieved with the pink application indicating that PP 199 has no value against the winter eggs of this species.

Table 5.—Efficiency of RE 20966 applied during the pre-bloom period against the European red mite. Host: Rome apple. Sodus, NY, 1976.

Material and formulation ^a	Oz form./ 100 gals.	Spray date(s) ^b	Avg no. hatched mites/leaf				
			6/09	6/15	6/23	6/29	7/06
RE 20966 (50% wp)	32	4/19	0.3	3.1	3.4	4.7	12.5
RE 20966 (50% wp)	16	4/19 & 4/22	0.3	4.9	15.3	12.7	22.3
RE 20966 (50% wp)	16	4/22	1.4	2.9	9.9	3.8	39.4
Controls:			3.4	6.3	11.3	13.6	37.1
							60.7

^a/Material applied with a hand gun to two single tree replicates using a truck-mounted hydraulic orchard sprayer.

^b/Bud stages on treatment dates: 4/19 - tight cluster; 4/22 - pink.

Table 6.—Efficiency of soil applications of Temik (15% granular) + a 1% petroleum oil spray against the European red mite. Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation ^a	Application rate ^b	Avg no. hatched mites/leaf					
		6/09	6/15	6/23	6/29	7/06	7/20
Temik (15% granular)	2-1/2# AI/A	3.4	10.8	14.1	20.1	30.5	120.6
Temik (15% granular)	5# AI/A	1.3	3.7	7.7	12.1	14.1	27.9
Temik (15% granular)	10# AI/A	1.1	6.6	12.6	21.7	5.1	16.9
P. oil (70 sec. vis)	1%	0	0.2	0.2	1.6	4.6	21.6
Controls:		4.2	53.3	31.2	35.9	68.8	96.7

^a/Treatments consisted of 4 single tree replicates. Temik distributed into three inch deep furrows under the drip line of the tree.

^b/All treatments applied on 4/19/76 when apple buds were in the tight cluster stage.

Test 4.—F. Cottrell Farm, 1977. Results of this test are given in Table 4. Two concentrations of PP 199 were evaluated against a moderate infestation of the European red mite on Northern Spy apple. Plots were approximately half acre in size, and applications were made with an air-blast sprayer at petal fall. As was the case with the pink application in Test 3, excellent control was obtained with a petal fall spray.

Test 5.—F. Cottrell Farm, 1976. Results are given in Table 5. RE 20966, an organotin compound, had shown promise in earlier tests against summer mite infestations. No significant control, however, was evidenced with pre-bloom applications.

Test 6.—F. Cottrell Farm, 1976. Results are presented in Table 6. Soil application of Temik, a systemic pesticide, was made in a 12-year-old Red Delicious block. The Temik was placed in a 3-inch deep furrow which had been dug by hand under the drip line of each test tree. A 1 per cent tight cluster petroleum oil spray was included in the test for comparison purposes. Although some mortality was detected, particularly with the higher rate of Temik, it could only be classed as having had only a thinning effect.

Test 7.—F. Cottrell Farm, 1977. Results are given in Table 7. The experimental product XE 333 in laboratory trials was quite effective against winter eggs of the European red mite. However, as shown by the data, the field results were not as encouraging.

Test 8.—F. Cottrell Farm, 1977. Results are presented in Table 8. Nine acaricides, six of which were experimental compounds, were applied against the hatched forms of the European red mite as pink or petal fall, or in one instance, as dual treatments. As noted in the control or check plots, the mite pressure was heavy and "peaked" in early July. With the exception of the UC 21865 plots and the low rate of RH 6564, all other treatments held the mites in check until July 18.

Table 7.—Efficiency of various pre-bloom acaricides against the European red mite. Host: Rome apple. F. Cottrell Farm, Sodus, NY, 1977.

Material and amount formulation/100 gals. ^a	Avg no. hatched mites/leaf			
	6/15	6/28	7/11	7/18
<u>Tight cluster series - 4/18/77</u>				
XE 333 (2.7#/gal) - 9 oz	0.5	0.1	7.7	-
P. oil (70 sec. vis.) - 1%	tr	0.2	1.1	9.3
<u>Pink series - 4/21/77</u>				
XE 333 (2.7#/gal) - 6 oz	2.4	1.1	23.4	26.2
XE 333 (2.7#/gal) - 9 oz	1.1	0.5	3.9	13.1
Plictran (50% wp) - 6 oz	0.4	0.2	10.4	7.0
<u>Controls:</u>	18.8	12.4	90.3	52.3

^a/Plictran applied with an air-blast sprayer to a block of 37 trees at 1X concentration. All other treatments applied to 3 single tree replicates by hand gun using a truck-mounted hydraulic orchard sprayer.

Test 9.—J. Minns Farm, 1976. Results are given in Table 9. For the evaluation of various early season applied acaricides, a 22-year-old Rome planting was selected as the test site. Treatments were applied dilute with an airblast sprayer to acre size plots. All treatments with the exception of Fundal gave seasonal control. Fundal had failed in this planting in a previous year's test. It is assumed that the red mite population in this orchard has developed a tolerance to this material. It is interesting to note that BAAM, a close chemically related compound, gave excellent control either as a pink or petal fall spray. The two organotin materials, Plictran and R 28627, were also highly effective.

Test 10.—C. Fox Orchard, 1977. Results are given in Table 10. Petal fall treatments of Plictran and BAAM were compared in a mixed Red and Golden Delicious block. Sprays were applied dilute with an airblast sprayer. The mite population on the untreated Red Delicious trees exceeded 300 hatched forms on August 1. Even under this

Table 8.—Efficiency of various pesticides applied early in the season against the European red mite. Host: Rome apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Spray date(s) ^b	Avg no. hatched mites/leaf						
		6/15	6/28	7/11	7/18	7/25	8/01	8/08
DPX 3792 (2 EC) - 16 oz	4/21	1.2	0.5	4.8	5.7	7.3	15.9	13.4
DPX 3792 (2 EC) - 32 oz	4/21	1.4	0.6	2.2	3.1	18.4	5.2	2.5
UC 21865 (75% wp) - 21 oz	4/21	5.9	3.6	20.2	21.1	7.5	5.1	2.3
UC 21865 (75% wp) - 42 oz	4/21	8.6	5.6	24.7	33.1	47.5	18.3	4.2
UC 55304 (4#/gal) - 16 oz	4/21	0.3	0.8	6.2	3.7	8.2	11.1	10.6
Morestan (25% wp) - 16 oz	4/21	1.0	0.9	7.6	7.3	61.7	46.7	40.1
Malonoben (50% wp) - 16 oz	4/21	2.1	1.8	8.4	8.1	7.9	9.9	4.8
Malonoben (50% wp) - 16 oz	4/21 & 5/23	0.6	0.8	1.6	1.8	5.8	2.6	6.2
Malonoben (50% wp) - 16 oz	5/23	0.6	0.5	5.6	8.1	9.6	6.7	5.1
Malonoben (50% wp) - 8 oz	5/23	0.6	0.3	1.1	1.7	4.5	11.8	2.5
Plictran (50% wp) - 6 oz	5/23	0.2	0.1	2.1	1.2	2.5	1.7	1.0
DPX 3792 (2 EC) - 8 oz	5/23	1.5	0.6	5.2	3.9	6.8	8.3	4.1
DPX 3792 (2 EC) - 16 oz	5/23	0.9	0.7	3.4	3.6	13.6	12.2	6.8
RH 6564 (3.37#/gal) - 7.5 oz	5/23	1.2	0.9	3.9	12.5	45.9	13.2	9.9
RH 6564 (3.37#/gal) - 15 oz	5/23	0.2	0.8	3.9	9.6	7.1	3.2	3.6
<u>Controls:</u>		36.2	39.1	96.9	56.6	51.6	17.1	6.3
								7.6

^a/Treatments applied to 4 single tree replicates by hand gun using a truck-mounted hydraulic orchard sprayer.

^b/4/21 - pink; 5/23 - petal fall.

Table 9.—Efficiency of various early season applied acaricides against the European red mite. Host: Rome apple. Sodus, NY, 1976.

Material & formulation	Oz form./ 100 gals. ^a	Spray date(s) ^b	Avg no. hatched mites/leaf								
			6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10
OII - Ethion	1%	4/19	0	tr	tr	0	0	tr	0.4	0.4	0.3
Fundal (97% sp)	4 oz	4/21	0.3	0.3	0.9	2.4	6.3	15.7	52.6	16.9	59.4
Baam (50% wp)	20 oz	4/21	0.1	0	0.2	tr	tr	0.3	0.8	0.6	1.1
Baam (50% wp)	20 oz	4/21 & 5/21	0	tr	tr	tr	tr	0.1	0.1	0.1	0.1
Baam (50% wp)	20 oz	5/21	tr	0	tr	0	0	0.2	0.9	0.5	0.7
R 28627 (40% wp)	7.5 oz	5/21	tr	tr	tr	tr	0.1	0.4	1.1	0.9	1.7
Plictran (50% wp)	6 oz	5/21	0.1	tr	0	tr	tr	tr	0.3	0.6	0.7
Controls:			4.9	1.0	9.6	4.6	8.9	18.4	35.2	51.1	90.0
											41.8

^a/Treatments applied with a Myers air-blast sprayer at dilute or 1X concentration. Plots approximately acre size.

^b/Bud stages on treatment dates: 4/19 - tight cluster; 4/21 - early pink; 5/21 - petal fall.

Table 10.—Efficiency of Plictran and Baam applied as a single spray on 5/20/77 (petal fall) against the European red mite. Host: Apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Avg no. hatched mites/leaf					
	6/20	7/11	7/18	8/01	8/08	8/15
<u>Red Delicious</u>						
Plictran (50% wp)						
6 oz	0.2	0.1	0.1	0.4	0.9	1.1
Baam (1-1/2 lb/gal)						
20 oz	0.5	0.1	0.1	0.7	0.2	3.7
Controls:	1.1	43.1	60.7	204.1	165.0	38.6
<u>Golden Delicious</u>						
Plictran (50% wp)						
6 oz	0.3	0.1	0.1	0.4	0.2	0.6
Baam (1-1/2 lb/gal)						
20 oz	0.1	0.1	0.2	0.3	0.5	1.7
Controls:	0.9	2.8	12.9	60.5	75.1	29.2

^a/Treatments applied to 1/3 acre plots with a Myers airblast sprayer at dilute or 1X concentration.

heavy pressure, both materials, at the rates tested, gave good seasonal commercial control.

Test 11.—F. Cottrell Orchard, 1976. Test results are given in Table 11. Excellent seasonal suppression of the red mite has been achieved in our 1975 experimental trials using low rates of Vendex in a multiple spray program. Applications were made at petal fall, first and second cover. The present test was designed to determine if other acaricides used at low rates in a similar schedule would give comparable results. Of the four materials evaluated, only the Omite treatment failed to hold the mite population in check. Excellent seasonal control was obtained with the Vendex, Plictran, and Zardex sprays.

Test 12.—J. Minns Orchard, 1976. Results are given in Table 12. Wettable powder formulation of Omite, Vendex, and Zardex were applied at low rates at petal fall, first and second cover to 5-acre size plots of 22-year-old Rome apple trees. Treatments were applied with an airblast sprayer at 4X concentration. Mites were controlled in all plots through July after which time there was a "buildup" in the Omite and Zardex treatments necessitating retreatment

Table 11.—Efficiency of four acaricides applied at reduced rates in three post-bloom sprays against the European red mite. Host: Rome apple. Sodus, NY, 1976.

Material, formulation and amount/100 gals. ^a	Avg no. mites/leaf								
	6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10
Vendex (50% wp) - 2 oz	tr	0.2	0.2	tr	0.3	0.2	0.2	0.4	0.4
Plictran (50% wp) - 2 oz	0	0.1	0.1	0.4	0.2	0	0.2	0.4	0.5
Zardex (40% wp) - 16 oz	0	0.3	0.7	0.3	0.1	0.3	0.2	0.4	0.2
Omite (6 E) - 3 oz ^b	0.1	0.5	0.3	0.7	0.2	2.9	20.1	2.7	16.3
Controls:	1.3	5.7	10.8	3.9	8.7	25.6	78.2	109.2	40.5

^a/Treatment dates: 5/21 - petal fall; 6/02 - 1st cover; 6/17 - 2nd cover. Plots consisted of unreplicated blocks containing a minimum of 28 trees. Treatments applied with a Myers airblast sprayer at dilute or 1X concentration.

^b/Treated on 8/17 with Kelthane (30 w) - 20 ozs./100 gals.

with Plictran in late August. The Vendex plot remained relatively mite-free for the entire season.

Test 13.—F. Cottrell Orchard, 1977. Results are presented in Table 13. A series of labeled acaricides was applied either as pre-bloom or multiple early season sprays to solid blocks of Rome apple. Morestan, a combination miticide/fungicide, is recommended in the pre-bloom period for powdery mildew control. To determine its acaricidal efficiency, applications were made at pink by handgun and with an airblast sprayer at 1X and 3X concentrations. Both airblast sprayer plots held the mites in check until the final count in mid-August. In previous tests, Omite, either as a liquid or wettable powder formulation, when used at reduced rates in a 3-spray program (petal fall, first and second cover) did not give seasonal control of the European red mite. In the present test, Omite was again tested in a similar program but with an added pink spray. When used in this manner, control was comparable to the 3-spray Vendex plot.

Seasonal Programs.—Two apple orchards served both in 1976 and 1977 for the evaluation of seasonal or multiple

spray programs. The results of these tests are presented in Tables 14-17.

Test 14.—J. Minns Orchard, 1976. Test results are presented in Table 14. A mixed 4.5 acre planting of McIn-tosh, Cortland, and Red Delicious was made available in 1973 for evaluating various seasonal control programs. This rectangular block was divided into three equal sized plots, two of which were separated by an untreated check row. Prior to the initiation of the three programs listed in the Table, the entire block for the fourth season was treated with difolatan for apple scab control. For rosy apple aphid control, demeton was used in plots 1 and 3 and Pirimor in plot 2. European red mite pressure was heavy on all cultivars (over 150 hatched forms/leaf in mid-August). It is interesting to note that the oil-Benlate program (plot 1) even under this severe pressure held the mites in check until September. Mite control in the plot was attributable to eight 1 -quart oil applications. Under a similar program (plot 2) in which no oil was included, an acaricide had to be applied in August. In plot 3, the mites were contained through September by three low rates (3 oz) of Vendex

Table 12.—Efficiency of various acaricides applied in three post-bloom sprays (petal fall, first and second covers) against the European red mite. Host: Rome apple. Sodus, NY, 1976.

Material, formulation and amount/100 gals. ^a	Avg no. hatched mites/leaf										
	6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10	8/17	9/07
Omite (30 w) - 3 oz ^b	tr	tr	tr	0.1	tr	0.5	1.8	7.3	1.0	39.4	-
Vendex (50% wp) - 4 oz	tr	0	tr	0	tr	tr	0.2	0.1	0.1	0	0
Zardex (40% wp) - 8 oz ^b	tr	tr	0.1	tr	0.2	0.2	1.8	0.7	66.0	59.3	-
Controls:	4.9	1.0	9.6	4.6	8.9	18.4	35.2	51.1	90.0	41.8	-

^aTreatment dates: 5/22 - petal fall; 6/02 - 1st cover; 6/17 - 2nd cover. Sprays applied with a Myers airblast sprayer at 4X concentration. Delivery rate 2 gal/tree.

^bTreated with 6 oz of Plictran (50% wp)/100 gals on 8/19/76.

Table 13.—Efficiency of various acaricide treatments applied against the European red mite. Host: Rome apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Spray Conc.	date(s) ^c	Avg no. hatched mites/leaf							
			6/15	6/28	7/11	7/18	7/25	8/01	8/08	8/15
Oil-ethion - 2%	1X	4/14	0.3	0.2	0.1	0.3	0.4	0.1	0.1	0.1
Morestan (25% wp) - 1 lb	Gun ^b	4/21	1.0	0.9	7.6	7.3	61.7	46.7	40.1	18.8
Morestan (25% wp) - 1 lb	1X	4/21	0.6	0.4	0.3	0.1	0.4	0.3	0.5	0.4
Morestan (25% wp) - 1 lb	3X	4/26	0.4	0.1	0.2	0.2	0.1	0.3	0.2	0.2
Omite (30 W) - 4 oz	1X	- ^d	0.6	0.4	0.2	0.1	0.4	0.3	0.5	0.4
Omite (6 E) - 2 oz	1X	- ^d	0.2	0.5	0.3	1.8	2.5	0.8	0.4	1.6
Vendex (50% wp) - 3 oz	1X	- ^e	1.1	0.1	0.6	0.1	0.2	0.1	0.1	0.1
Controls:			36.2	39.1	96.9	56.6	51.6	17.1	6.3	7.6

^aAll treatments with exception of Morestan (gun) applied with a Myers airblast sprayer. Minimum of 50 trees/plot.

^bApplied by handgun using hydraulic orchard sprayer. Plot consisted of 6 trees.

^cTreatment dates: 4/14 - half-inch green; 4/21-26 - pink.

^dFour sprays: Pink - 4/22; P. fall - 5/20; 1-2 covers - 6/02 & 6/16.

^eThree sprays: P. fall - 5/20; 1-2 covers - 6/02 & 6/16.

Table 14.—Efficiency of various apple pesticide programs against the European red mite. Sodus, NY, 1976.

Treatment schedule ^a		Materials & amts./ /100 gals.	Cultivars	Avg no. mites/leaf									
Dates				6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10	9/07
<u>Plot 1</u>													
4/06	Difolatan, 3 qt												
4/15	Systox (6E), 4 oz												
4/23, 4/29	Oil, 1 qt Benlate, 2 oz	McIntosh Cortland R. Delicious		tr 0.2 0.4	tr tr tr	0 tr tr	tr 0.2 0.5	0.1 0.2 0.5	tr 0.2 0.1	1.2 0.5 0.2	1.4 0.1 0.3	0.1 0.4 1.7	- - -
5/06, 5/13	Benlate, 4 oz												
5/20, 6/02, 6/17 7/02, 7/17, 8/04	Oil, 1 qt Benlate, 2 oz Guthion, 8 oz												
<u>Plot 2</u>													
4/06	Difolatan, 3 qt PP 199, 4 oz												
4/15	Pirimor, 4 oz												
4/23, 4/29 5/06, 5/13	Captan, 16 oz Benlate, 2 oz	McIntosh Cortland R. Delicious		0.6 0.4 2.1	0.6 0.2 1.7	0.9 0.5 4.5	0.3 0.7 2.7	6.8 3.6 11.1	15.6 11.1 15.6	21.4 23.3 43.1	22.4 19.2 213.4	4.4 14.0 61.1	- - -
5/20, 6/02, 6/17 7/02, 7/17 8/04	Captan, 16 oz Benlate, 2 oz Guthion, 8 oz												
8/04	Kethane, 20 oz												
8/17	Galecron, 8 oz												
<u>Plot 3</u>													
4/06	Difolatan, 3 qt												
4/15	Systox, 4 oz												
4/23, 4/29 5/06, 5/13	Captan, 16 oz Benlate, 2 oz												
5/20, 6/02 6/17	Captan, 16 oz Benlate, 2 oz Guthion, 8 oz Vendex, 3 oz	McIntosh Cortland R. Delicious		tr 0.2 0.3	tr tr 0.2	0.2 0.5 tr	tr 0.3 0.2	0 0.4 0.7	0.7 1.2 0.2	0.6 1.2 1.1	1.1 1.8 3.4	1.3 1.8 0.9	tr 0.8
7/02, 7/17 8/04	Captan, 16 oz Benlate, 2 oz Guthion, 8 oz												
Controls:		McIntosh Cortland R. Delicious		1.8 1.5 13.1	3.4 2.5 9.7	3.5 6.7 17.1	5.1 4.8 5.1	12.6 12.4 62.6	26.5 35.0 105.6	45.7 64.4 21.7	103.1 74.1 36.2	166.1 152.4 176.0	- - -

^aAll treatments applied with a Myers airblast sprayer at 3X concentration.

(petal fall, first and second cover). Apple scab and mildew control was excellent in all plots, and no phytotoxicity or fruit spotting observed. Oil-Benlate (plot 1) gave a dull fruit finish.

Test 15.—J. Minns Orchard, 1977. Results are presented in Table 15. This is the fifth year that this planting has been used as a test site and the fifth time that the same 1.5 acres have been treated with the identical oil-Benlate program. No evidence of apple scab resistance was detected at harvest. The European red mite attained high levels on the untreated trees early in the season, and under this type of pressure, the oil-Benlate in both plots 1 and 2 failed to give commercial control. Consequently, both plots plus the control trees were treated with Plictran on July 26. On the other hand, the 3-spray Vendex program again gave seasonal control.

Test 16.—F. Cottrell Orchard, 1976. Test results are given in Table 16. For additional data on the acaricidal efficiency of two oil fungicide schedules, a 3.5 acre, 30-year-

old Wealthy orchard was used in both this and the following 1977 test. All sprays were applied dilute with an airblast sprayer. In general, mite control was excellent in both the Benlate-oil and Topsin M-oil seasonal programs.

Test 17.—F. Cottrell Orchard, 1977. Results of this test are given in Table 17. The fungicide Benlate remains one of the better chemicals for powdery mildew control. It is also effective against scab. Because of the threat of apple scab resistance to Benlate, plant pathologists now recommend the inclusion of an additional fungicide at a reduced rate when Benlate is used even if oil is incorporated in the program. The acaricidal value of such a schedule was evaluated in this test. For comparison, a 3-spray (petal fall, first and second cover) reduced rate Plictran and Vendex program was also included. Excellent commercial mite control was apparent in all three plots.

Summer Evaluation.—Tests 18-24.—Results of these tests are given in Tables 18-24. Each year, in addition to

Table 15.—Efficiency of various apple pesticide programs against the European red mite. Host: Apple. Sodus, NY, 1977.

Treatment dates	Treatment schedule ^a		Cultivars	Avg no. hatched mites/leaf ^b							
	/100 gals.			6/20	6/28	7/11	7/18	7/25	8/01	8/08	8/15
<u>Plot 1</u>											
4/19, 4/25	Dil, 1 qt Benlate, 4 oz		McIntosh	0.1	0.5	4.5	3.4	32.7			
5/02, 5/11	Benlate, 4 oz		Cortland	0.2	0.2	0.7	0.6	6.9			
5/17, 5/31	Dil, 1 qt		R. Delicious	0.4	0.4	6.7	2.3	6.3			
6/14, 6/30	Benlate, 2 oz										
7/14, 7/29	Guthion, 8 oz										
<u>Plot 2</u>											
4/19, 4/25	Dil, 1 qt Benlate, 2 oz Manzate, 12 oz		McIntosh	0.2	0.5	0.6	0.3	3.3			
5/02, 5/11	Benlate, 2 oz Manzate, 12 oz		Cortland	0.4	0.2	2.0	2.7	56.5			
5/17, 5/31	Dil, 1 qt		R. Delicious	0.1	0.2	2.9	1.8	9.7			
6/14, 6/30	Benlate, 2 oz										
7/14, 7/29	Manzate, 12 oz Guthion, 8 oz										
<u>Plot 3</u>											
4/19, 4/25	Benlate, 2 oz		McIntosh	0.1	0.3	0.3	0.1	0	tr	tr	tr
5/02, 5/11	Polyram, 1 lb		Cortland	0.2	0.1	0.6	0.2	0.1	tr	tr	tr
5/17, 5/31	Benlate, 2 oz		R. Delicious	tr	0.2	0.3	0	tr	0	tr	0
6/14	Polyram, 1 lb Vendex, 3 oz Penncap M, 1 pt										
6/30, 7/14	Benlate, 2 oz Polyram, 1 lb Penncap M, 1 pt										
<hr/>											
<u>Controls:</u>			McIntosh	22.6	25.8	92.3	37.2	43.3			
			Cortland	7.3	6.6	67.2	34.6	63.1			
			R. Delicious	26.0	24.3	67.5	40.0	35.4			

^aAll treatments applied at 3X with a Myers airblast sprayer at 3X concentration. Entire planting treated 4/12 with Difolatan 3 qts./100 & 4/16 with demeton 4 ozs./100.

^b/Plots 1, 2 and controls sprayed with Plictran 6 ozs./100 on 7/26.

Table 16.—Efficiency of various seasonal pesticide programs against the European red mite. Host: Wealthy apple. Sodus, NY, 1976.

Treatment and amount/100 gals. ^a	Avg no. mites/leaf								
	6/15	6/23	6/29	7/06	7/14	7/20	7/27	8/03	8/10
Benlate - 2 oz; P. oil - 1 qt ^b	tr	tr	0.3	0.9	2.6	0.3	0.5	0.3	0.5
Topsin - 2 oz.; P. oil - 1 qt ^c	0	0.1	0.9	tr	0.5	tr	0.1	1.8	1.0
Benlate - 2 oz; Polyram - 1 lb ^d	4.1	3.6	8.1	10.7	13.2	5.4	-	11.2	2.6
<u>Controls:</u>	8.9	15.1	27.5	24.9	61.1	42.7	26.9	56.6	74.5

^a/Treatment dates: 4/24 - pink; 4/29 - full pink; 5/26 - bloom; 5/13 - 25% bloom fallen; 5/21 - petal fall; 6/02, 6/17, 7/02, 7/17, 8/04 - cover sprays. Plots consisted of solid blocks containing a minimum of 42 trees - approximately 1 acre. All treatments applied at dilute or 1X concentration using a Myers air blast sprayer. Delivery rate 7 gal./tree.

^b/1 lb. Imidan included in petal fall and all covers.

^c/1 lb. Imidan in petal fall, 1 pt. Penncap M in all covers.

^d/1 pt. Penncap M included in petal fall and all covers; Vendex (50% w.p.) - 8 ozs. included in 4th cover (7/17).

reviewing the efficacy of recommended acaricides, a host of new experimental compounds are screened against established European red mite populations. All summer evaluations for 1976 and 1977 were conducted on apple. Treatments were applied with a conventional truck

mounted hydraulic orchard sprayer using a hand gun from the ground. Trees were sprayed to run-off, and to insure complete coverage, approximately twice the commercial gallonage was used.

Along with the heavy uniform European red mite popula-

Table 17.—Efficiency of three seasonal pesticide programs against the European red mite. Host: Wealthy apple. Sodus, NY, 1977.

Material and amount form./100 gals. ^a	Avg no. hatched mites/leaf						
	6/20	6/28	7/11	7/18	8/01	8/08	8/15
Benlate 2 oz; P. oil 1 qt; + Manzate 12 oz (all sprays) Imidan 1 lb (P. fall + covers)	0.1	0.1	1.4	0.1	0.6	1.1	2.8
Benlate 2 oz; Polyram 1 lb (all sprays); Penncap M 1 pt P. fall + covers); Plictran 3 oz (P. fall, 1+2 covers)	0.1	0.0	0.3	0	0.1	0.1	0.3
Benlate 2 oz; Polyram 1 lb (all sprays); Penncap M 1 pt (P. fall + covers); Vendex 3 oz (P. fall, 1+2 covers)	0.1	0.7	0.1	0.1	0.1	0.2	0.1
<u>Controls:</u>	0.9	0.6	10.1	2.8	9.8	54.2	31.8

^a/Treatment dates: 4/19 - early pink; 4/25 - pink; 5/03 - 50% bloom; 5/11 - 50% petals fallen; 5/17 - petal fall; 5/31, 6/13, 6/29, 7/14, 7/29 - cover sprays. Plots consisted of solid blocks containing a minimum of 42 trees - approximately 1 acre. All treatments applied at dilute or 1X concentration using an airblast sprayer. Delivery rate 7 gal./tree.

tion in the 1976 Red Delicious test orchard, the apple rust mite was also present. It was therefore possible to obtain records on both species. European red mite counts as previously mentioned are taken directly in the orchard both 2 and 9-10 days after application using stereoscopic microscopes. The 2-day count gives an accurate measure of the products efficacy against hatched forms of the mites and, to a limited extent, indicating if the material has ovicidal value. The 9- or 10-day count provides a measure

of ovicidal action which can be determined by the presence of unhatched eggs. If the eggs have hatched, a measure of the residual action, if any, is obtained. Rust mite counts, however, are made by collecting a sample of 25 leaves from each of the test trees and brushing the mites onto a sticky glass plate in the laboratory using a Henderson-McBurnie mite brushing machine.

Results shown in the tables are, in the main, self evident. It is interesting to note that in western New York, there was no indication of a decrease in the efficiency of our recommended acaricides. Plictran, Kelthane, Omite, and Carzol. Many new experimental compounds, some in several years' tests, have demonstrated excellent activity and warrant further evaluation.

An attempt (Table 18) was made to enhance Plictran's efficacy and possibly reduce its application rate by incorporating a sticker-extender (Exhalt 800) into the spray mix. Although there was an increase in the acaricide residue (unpublished data) for a period of 2-3 weeks after application, there was little change in Plictran's efficacy against the European red mite or apple rust mite.

PREDATORY MITE TRIALS

Procedure.—Both contact and residual toxicities of a series of pesticides were evaluated against two predatory mite species, *A. fallacis* and *T. pyri*.

For the contact determinations, a slide-dip method was employed. In this procedure, some 10 to 20 female adult mites are transferred by means of a camel's hair brush to

Table 18.—Efficiency of recommended and experimental acaricides applied as a single spray against the European red mite. Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation	Oz form./ 100 gals.	Percent reduction in population	
		days after 7/6/76 treatment	9
Plictran (50% wp)	2	49.1	96.2
Plictran (50% wp) + Exhalt 800	2 16	76.3	92.9
Plictran (50% wp)	6	83.5	99.3
Plictran (50% wp) + Exhalt 800	6 16	87.4	98.5
Exhalt 800	16	84.9	78.4
Baam (50% wp)	8	96.9	98.2
Baam (1.5 EC)	20	99.4	99.5
Zardex (40% wp)	16	27.4	92.1
Vydate (2 EC)	32	91.3	79.4
Penncap M (2 EC)	16	33.4	14.1
DPX 3792 (2 EC)	16	98.9	99.1
DPX 3792 (2 EC)	32	99.9	99.3
PP 199 (40% cs)	1	99.9	99.4
PP 199 (40% cs)	2	99.9	99.8
PP 199 (40% cs)	4	100	100
R 28627 (40% wp)	8	91.3	94.6
<u>Controls:</u>		Avg no. hatched mites/leaf	105
	93		

Table 19.—Efficiency of recommended + experimental acaricides applied as a single spray against the European red mite. Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation	Oz form./ 100 gals.	Percent reduction in population	
		2	9
Galecron (95% sp)	4	93.2	93.6
Kelthane (30 w)	20	99.8	99.8
Carzol (97% sp)	4	96.2	96.1
Vendex (50% wp)	6	94.2	93.9
Vendex (4 WDS)	6	95.3	95.1
FMC 33297 (3.2 EC)	4	71.7	58.5
Ambush (2 EC)	4	41.1	51.2
UC 21865 (75% wp)	11	95.8	94.6
Vydate (2 EC)	64	97.1	95.0
Exhalt 800	16	82.5	90.5
Omite (30 w)	20	94.3	99.1
Omite (6 E)	8	98.9	99.7
Controls:		<u>Avg no. hatched mites/leaf</u>	
		151	144

Table 20.—Efficiency of various acaricides applied as a single spray against the apple rust mite, *Aculus schlechtendali* (Nalepa). Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation	Oz form./ 100 gals.	8 days after 7/06/76 treatment	
		mites/leaf	% reduction
Plictran (50% wp)	2	122	75.9
Plictran (50% wp) + Exhalt 800	2 16	205	59.4
Plictran (50% wp)	6	123	75.7
Plictran (50% wp) + Exhalt 800	6 16	122	75.9
Exhalt 800	16	210	58.5
Bam (50% wp)	8	28	94.5
Bam (1.5 EC)	20	43	91.5
Zardex (40% wp)	16	90	82.2
Vydate (2 EC)	32	60	88.1
Penncap M (2 EC)	16	62	87.8
DPX 3792 (2 EC)	16	113	77.7
DPX 3792 (2 EC)	32	93	81.6
PP 199 (40% cs)	1	22	95.6
PP 199 (40% cs)	2	81	83.9
PP 199 (40% cs)	4	58	88.5
R 28627 (40% wp)	8	48	90.5
Controls:		506	

Table 21.—Efficiency of various acaricides applied as a single spray against the apple rust mite, *Aculus schlechtendali* (Nalepa). Host: Red Delicious apple. Sodus, NY, 1976.

Material and formulation	Oz form./ 100 gals.	4 days after 7/19/76 treatment	
		mites/leaf	% reduction
Galecron (95% sp)	4	52	90.3
Kelthane (30 w)	20	72	86.6
Carzol (97% sp)	4	57	89.4
Vendex (50% wp)	6	70	86.9
Vendex (4 WDS)	6	54	89.9
FMC 33297 (3.2 EC)	4	228	57.6
Ambush (2 EC)	4	168	68.7
UC 21865 (75% wp)	11	41	92.4
Vydate (2 EC)	64	102	81.0
Exhalt 800	16	241	55.2
Omite (30 w)	20	58	89.2
Omite (6 E)	8	165	69.3
Lannate (1.8 EC)	24	100	81.4
Sevin (50% wp)	32	146	72.8
Guthion (50% wp)	8	120	77.7
Thiodan (50% wp)	24	215	60.1
Controls:		538	

the sticky surface of a microscope slide. The mites are positioned on their backs. The *A. fallacis* females were taken from a stock laboratory colony while the *T. pyri* were collected as needed from a commercial Idared apple planting in Sodus, NY. In use, the mite bearing slides were dipped for 5 seconds into the solution or suspension of the test chemical. A minimum of five replicates/concentration was employed. Mortality counts were taken 24 hours later.

For assessing residual toxicities, leaves were taken from apple trees treated with test chemicals in the field. Sprayed foliage was brought to the laboratory at various intervals, and one 0.75-inch diameter leaf disc was punched from each of four or five leaves. The discs were placed, lower surface upward, on 1.5-inch diameter circles of filter paper which in turn were placed on 1.75-inch diameter polyurethane sponge discs and put afloat in water held in

Table 22.—Efficiency of various acaricides applied as a single spray against the European red mite. Host: Rome apple. Sodus, NY, 1977.

Material and formulation	Oz form./ 100 gals.	% reduction in population	
		days after 7/6/77 treatment	2 9
RH 6564 (3.37#/gal)	7.6	93.2	99.8
RH 6564 (3.37#/gal)	15.2	93.8	99.9
XE 333 (2.7#/gal)	5.9	90.6	99.7
XE 333 (2.7#/gal)	8.9	96.7	99.9
XE 567 (50% wp)	4	97.5	99.7
XE 567 (50% wp)	6	98.9	99.9
XE 626 (50% wp)	4	95.6	99.1
XE 626 (50% wp)	6	97.4	99.4
Plictran (50% wp)	4	92.1	99.8
Plictran (50% wp)	6	96.3	100
DPX 3792 (2 EC)	4	94.3	99.9
DPX 3792 (2 EC)	8	100	99.9
DPX 3792 (2 EC)	16	99.9	99.9
PP 199 (4#/gal)	3.2	98.3	100
PP 199 (2#/gal)	6.4	98.3	99.9
Kelthane (30 W)	20	99.0	99.4
Controls:		Avg no. hatched mites/leaf	
		131	73

Table 23.—Efficiency of various acaricides applied as a single spray against the European red mite. Host: Rome apple. Sodus, NY, 1977.

Material and formulation	Oz form./ 100 gals.	% reduction in population	
		days after 7/12/77 treatment	2 9
Malonoben (50% wp)	4	98.3	99.9
Malonoben (50% wp)	8	99.6	99.6
Malonoben (50% wh)	4	99.0	99.5
Malonoben (50% wh)	8	99.7	99.9
Malonoben (2 EC)	8	99.6	100
Malonoben (2 EC)	16	100	99.9
Vendex (50% wp)	8	82.7	100
Vendex (50% wp)*	8	88.5	100
Plictran (50% wp)	6	99.8	99.9
Crometon (40% wp)	20	83.1	27.9
KHS 0137 (50% EC)	8	99.8	96.8
UC 55304 (4#/gal)	8	96.8	99.8
UC 55304 (4#/gal)	16	95.9	99.8
UC 21865 (75% wp)	21	86.2	0
UC 21865 (75% wp)	42	80.8	93.2
Omite (30 W)	20	95.6	99.9
Controls:		Avg no. hatched mites/leaf	
		63	53

*Soluble packet

plastic containers. Depending on the availability of predators, 10 to 15 adult females were used/replicate. The predators were provided with twospotted spider mites as food during the test period.

Table 24.—Efficiency of various acaricides applied as a single spray against the European red mite. Host: Red Delicious apple. Orchard 16A—Geneva, NY, 1977.

Material and formulation	Oz form./ 100 gals.	Percent reduction in population	
		days after 7/19/77 treatment	8 15
Malonoben (50% wp)	4	94.2	98.8
Malonoben (2 EC)	8	98.9	99.3
UC 55304 (4#/gal)	8	98.7	99.5
RH 6564 (3.37#/gal)	7.6	97.4	96.0
XE 567 (50% wp)	4	99.4	99.8
XE 626 (50% wp)	4	99.7	99.7
XE 333 (2.7#/gal)	6	98.9	99.7
PP 199 (2#/gal)	6.4	100	99.9
DPX 3792 (2 EC)	4	99.3	98.4
Plictran (50% wp)	4	100	99.8
Controls:		Avg no. hatched mites/leaf	
		165	145

Table 25.—Relative toxicity of various classes of pesticides to Guthion resistant field-collected populations of two phytoseiid mites as determined by slide-dip method. Geneva, NY, 1976-1977.

Material and formulation	Oz form./100 gals. water	% mortality at 24 h ^a	
		<i>A. fallacis</i>	<i>I. pyri</i>
Insecticides-Acaricides			
Lorsban (50% wp)	16	100	81
Sumathion (40% wp)	32	17	47
Morestan (25% wp)	16	14	22
Pirimor (50% wp)	4	18	4
Galecron (4 EC)	8	95	99
Omite (6 E)	8	22	3 ^b
Ydlate (2#/gal)	32	58	NI ^b
Bam (1-1/2#/gal)	20	58	58
Ambush (2#/gal)	4	96	NI
Endrin (1.6#/gal)	32	6	NI
Penncap M (2 EC)	32	2	19
Fungicides			
Lilly 222 (12.5 EC)	4	43	NI
Afugan (30% EC)	4	18	NI
Nimrod (25% EC)	8	4	NI
Difolatan (4 EC)	160	42	NI
Ferbam (76% wp)	32	1	NI
Herbicides			
Simazine (80% wp)	20	11	NI
Simazine (80% wp)	48	8	NI
Experimental Compounds			
Bay Web 6447 (50% wp)	8	9	NI
UC 21865 (50% wp)	16	93	NI
PP 199 (50% cs)	3	13	NI
Chevron 20096 (50% wp)	32	18	NI
FMC 33297 (3.2 EC)	4	98	NI
R 28627 (40% wp)	8	7	4
DPX 3792 (2#/gal)	16	100	NI
Crometon (40% wp)	10	37	26
Crometon (40% wp)	20	84	28
UC 21865 (75% wp)	21	44	NI
UC 21865 (75% wp)	42	82	NI
XE 567 (50% wp)	4	24	14
XE 567 (50% wp)	8	40	20
XE 626 (50% wp)	4	29	11
XE 626 (50% wp)	8	13	NI
XE 333 (2.7#/gal)	6	24	8
XE 333 (2.7#/gal)	12	11	NI
RH 6564 (3.37#/gal)	8	56	NI
RH 6564 (3.37#/gal)	15	48	NI
UC 55304 (4#/gal)	8	76	NI
UC 55304 (4#/gal)	16	89	NI
KHS 0137 (50% EC)	8	95	NI
RE 23962 (50% wp)	8	NI	35
RE 23962 (50% wp)	16	NI	55

^a/Represents values after correction by Abbott's formula. Values are an average of 5-6 replications. Twenty adult females of *A. fallacis* and 10 of *I. pyri* were separately tested in each replicate.

^b/NI = No Information

Table 26.—Residual toxicity of various pesticides to a Guthion tolerant laboratory colony of *A. fallacis*. Geneva, NY, 1977.

Material and formulation	Oz form./ 100 gals.	% mortality-days after treatment				
		0	2	5	9	14
Lannate (1.8 EC)	32	100	98	100	100	93
Guthion (50% wp)	8	34	29	3	0	-
Ambush (2#/gal)	6.4	100	100	100	100	100
PP 199 (2#/gal)	6.4	68	19	23	0	0
DPX 3792 (2 EC)	8	35	4	0	0	-
Pirimor (50% wp)	4	32	10	2	0	-
Malonoben (50% wp)	4	63	13	20	8	1
XE 626 (50% wp)	6	30	7	1	0	-
XE 567 (50% wp)	6	11	13	2	0	-



RESULTS AND DISCUSSION

Test 25.—Laboratory Trials, 1976-1977. The results of contact toxicity tests against both species of predatory mites are presented in Table 25. The insecticide Endrin has been cleared for use in Hudson Valley apple orchards under special permit for mouse control. The data indicates that Endrin would have no effect on *A. fallacis* populations which overwinter in the ground cover. The same is true for the herbicide, Simazine.

Test 26.—Laboratory-field Trials, Geneva, NY, 1977. Results of a test determining the residual toxicity of a series of commercial and experimental pesticides against *A. fallacis* are given in Table 26. Lannate and Ambush residues were still highly toxic 14 days after application. These materials would not be acceptable in an integrated pest management system in which predatory mites play an important role.

TEST MATERIALS

Materials	Formulation	Supplier
Afugan Ambush	30% EC 2.0 EC	American Hoechst Corp. ICI United States, Inc.
BAAM	1.5 EC	The Upjohn Company
Bay Meb 6447	50% wp	Mobay Chemical Corp.
Benlate	50% wp	DuPont Company
Captan	80% wp	Stauffer Chemical Co.
Carzol	95% wp	NOR-AM Agric. Prod., Inc.
CH 20096	50% wp	Chevron Chemical Co.
Croneton	40% wp	Mobay Chemical Corp.
Demeton	6.0 EC	Mobay Chemical Corp.
Difolatan	44/g	Chevron Chemical Corp.
DPX 3792	2.0 EC	DuPont Company
Endrin	1.6#/g	Shell Chemical Company
Exhalt 800		Kay Fries Chem., Inc.
Ferbam	76% wp	DuPont Company
FMC 33297	3.2 EC	FMC Corp.
Fundal	95% wp	NOR-AM Agric. Prod., Inc.
Galecron	4.0 EC	Ciba-Geigy Corp.
Guthion	50% wp	Mobay Chemical Corp.
Imidan	50% wp	Stauffer Chemical Co.
Kelthane	35% wp	Rohm & Haas Company
KHS 0137	50% EC	Mobay Chemical Corp.
Lannate	1.8 EC	DuPont Company
Lilly 222	12.5 EC	Elanco Inc.
Lorsban	25% wp	Dow Chemical Company
Malonoben	2.0 EC	Gulf Oil Chemicals Co.
Malonoben	50% wp	Gulf Oil Chemicals Co.
Manzate	80% wp	DuPont Company
Morestan	25% wp	Mobay Chemical Corp.
Nimrod	25% EC	ICI United States, Inc.
Oil-Ethion		FMC Corp.
Omite	6 EC	Uniroyal Chemical
Omite	30% wp	Uniroyal Chemical
Penncap M	2.0 EC	Pennwalt Corp.
Petroleum Oil		Sun Oil Company
Pirimor	50% wp	ICI United States, Inc.
Plictran	50% wp	Dow Chemical Company
Polyram	80% wp	FMC Corporation
PP 199	2#/g	ICI United States, Inc.
PP 199	4#/g	ICI United States, Inc.
R 28627	40% wp	Stauffer Chemical Co.
RE 20966	50% wp	Chevron Chemical Corp.
RE 23962	59% wp	Chevron Chemical Corp.
RH 6564	3.37#/g	Rohm & Haas Company
Simazine	80% wp	Ciba-Geigy Corp.
Sumathion	40% wp	Stauffer Chemical Co.
Temik	15 G	Union Carbide Corp.
Topsin M	70% wp	Pennwalt Corp.
UC 21865	75% wp	Union Carbide Corp.
UC 55304	46/g	Union Carbide Corp.
Vendex	50% wp	Shell Chemical Co.
Ydate	2.0 EC	DuPont Company
XE 333	2.7#/g	Chevron Chemical Corp.
XE 567	50% wp	Chevron Chemical Corp.
XE 626	50% wp	Chevron Chemical Corp.
Zardex	40% wp	Zoecor Corporation



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