RESULTS OF 1999 INSECTICIDE AND ACARICIDE TRIALS IN EASTERN NEW YORK

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- MATERIALS TESTED -

Actara	Novartis
Adage ST	Novartis
AgriMek	Novartis
Aphistar	Rohm & Haas
Apollo	Gowan
Asana	DuPont
Avaunt	Dupont
Asana	DuPont
Baythroid	Bayer
Calypso	Bayer
Capture	FMC Corp
Carzol	Agrevo
D2341	Uniroyal
Danitol	Valent
Dipel	Abbott
Esteem	Valent
EXP 240SC	Bayer
Fipronil	Rhone-Poulenc
Gaucho ST	Bayer
Guthion	Bayer
Imidan	Gowan
Lannate	DuPont
Lorsban	Dow
M-Pede	Mycogen
Neemix	Thermo Trilogy Corp
Penncap M	Elf Atochem
Pirimor	Bayer
Pyramite	BASF
Savey	Agrevo
SpinTor	Dow
Supracide	Gowan
TD2383-01	Elf Atochem
Trigard ST	Novartis
Vendex	Griffin
Vydate	DuPont
Warrior	Zeneca

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APPLE: *Malus domestica* 'Ginger Gold'; 'Delicious'

Apple maggot (AM): *Rhagoletis pomonella* (Walsh)
Codling moth (CM): *Cydia pomonella* (Linnaeus)
European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)
Green fruitworm (GFW): *Lithophane antennata* (Walker)
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Oriental fruit moth (OFM): *Grapholita molesta* (Busck)
Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)
San Jose scale (SJS): *Quadraspidiotus perniciosus* (Comstock)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)

HARVEST EVALUATION OF INSECTICIDES AGAINST FRUIT-FEEDING INSECTS, 1999: Treatments were applied to four-tree (of which 'Ginger Gold' and 'Delicious' were included) plots replicated four times in a randomized complete block design. All dilutions are presented as amt/100 gal - (based on 400 gallons/acre). All treatments were applied dilute to runoff using a high-pressure handgun sprayer at 300 psi delivering 57 gal/acre. Trees on the M.26 rootstock were 5 years-old, and had not yet filled their space. Treatments were applied on various schedules as shown in Tables 1 & 2. Damage to fruit was assessed by randomly selecting 100 fruit at harvest maturity and scoring for external damage by each pest; subsequently, fruits were dissected to detect internal damage. Damage by early Lepidoptera includes GFW & OBLR, while late Lepidoptera includes OFM & OBLR. Data were converted to % damaged fruit, and transformed by arcsin prior to analysis by Fisher's Protected LSD.

June and July were extremely dry (0.65 in. and 1.31 in., respectively), coupled with unusually high July temperatures (15d exceeding 95F). Because of dry soil conditions, AM emergence was very low and no damage from this pest occurred.

As shown by untreated 'Ginger Gold', pressure from PC was high (Table 1). Because test trees, being in the 5th leaf, bore relatively few fruit, exposure to PC was inordinately severe. In spite of this, all treatments provided very good control of PC. Pressure from early-season Lepidoptera was high - most schedules showed strength against this complex. In general all treatments on this early-maturing variety provided good protection. For 'Delicious' (Table 2), which matures ca. 40 days later than 'Ginger Gold', the results were very similar in most instances.

Table 1. Evaluation of insecticides for controlling insect damage on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Timing[3]	% PC	% Early Lep.	% Late Lep	% TPB	% EAS	% SJS	% CM	% AM	% Clean
Calypso 70WG	0.35 oz. 1.4 oz. 0.7 oz.	Pink PF 1-5C	0.2abc	1.3 bcd	1.0 bc	0.1abc	0.0a	0.0a	0.0a	0.0a	88.3 b
Calypso 70WG Guthion 50W Baythroid 2	1.4 oz. 8.0 oz. 0.35 oz.	P- 1C 2-4C 5C	0.0ab	0.3ab	<0.1a	0.3 bc	0.0a	0.0a	0.0a	0.0a	98.6 d
Baythroid 2 EXP CONA 240 SC	0.35 oz. 5.8 oz.	P-5C 3C	0.8 d	0.1a	0.8 bc	<0.1ab	<0.1a	0.0a	0.0a	0.0a	93.6 c
Baythroid 2 EXP CONA 240 SC	0.7 oz. 5.8 oz.	P-5C 3C	0.0a	<0.1a	0.3ab	0.0a	0.0a	0.0a	0.0a	0.0a	99.2 d
Avaunt 30WG LI700 Guthion 50W	1.2 oz. 6.0 oz. 8.0 oz.	2-4C 2-4C PF	0.2abc	2.6 d	0.5abc	0.2abc	<0.1a	0.0a	0.0a	0.0a	90.3 bc
Avaunt 30WG LI700 Guthion 50W Guthion 50W	1.2 oz. 6.0 oz. 2.0 oz. 8.0 oz.	2-4C 2-4C 2-4C PF, 1, 5C	0.4 cd	0.6ab	0.3ab	0.2 bc	0.1 b	0.0a	0.0a	0.0a	93.0 bc
Avaunt 30WG LI700 Guthion 50W	1.5 oz. 6.0 oz. 8.0 oz.	2-4C 2-4C PF, 1, 5C	0.3 bcd	1.1 bcd	0.7 bc	0.1abc	0.0a	0.0a	0.0a	0.0a	92.6 bc
Guthion 50W Dipel 2X 6.4WP	8.0 oz. 8.0 oz.	PF,1, 5C 10, 22 June, 2 July	0.7 cd	0.7ab	0.5abc	0.5 c	0.0a	0.0a	0.0a	0.0a	91.1 bc
Supracide 25WP Sunspray oil Imidan 70W	0.75 oz. 2.0 gal. 12.0 oz	1/2"G 1/2"G PF,1-5C	0.2abcd	1.0 bc	0.1a	0.1abc	0.0a	0.0a	0.0a	0.0a	94.4 c
Esteem 0.86 EC Guthion 50W Danitol 2.4E	2.5 oz. 8.0 oz. 2.7 oz.	TC PF,1C, 3C 2, 5C	0.4 cd	1.1 bcd	0.3ab	0.2abc	0.0a	0.0a	0.0a	0.0a	92.0 bc
Esteem 0.86EC Guthion50W Danitol 2.4E	2.5 oz. 8.0 oz. 2.7 oz.	TC PF,1C, 3C 2, 5C	0.3 bcd	2.5 cd	0.5abc	<0.1ab	0.0a	0.0a	0.0a	0.0a	92.4 bc
Untreated	-	-	81.0 e	15.8 e	1.4 c	0.2 bc	<0.1 b	0.0a	2.2 b	0.0a	5.6a

1 Data from ' Ginger Gold' on 5 August.

2 Mean separation by Fishers Protected LSD (P=<0.05). Arcsin transformation used for statistical analysis. Treatment means followed by the same letter are not significantly different.

3 M^c^Intosh phenology: 1/2" G on 4/2; TC on 4/12; Pink on 4/26, Bloom on 5/2; PF on 5/14 , 1C on 5/21, 2C on 6/10, 3C on 7/2, 4C on7/30, 5C on 8/18. Short interval between PF & 1C due to 1.25" rainfall on 5/20; seasonal AM trap threshold did not warrant application.

Table 2. Evaluation of insecticides for controlling insect damage on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Timing[3]	% Total PC	% Early Lep.	% Late Lep	% TPB	% EAS	% SJS	% CM	% AM	% Clean
Calypso 70WG	0.35 oz. 1.4 oz. 0.7 oz.	Pink PF 1-5C	0.5 bc	0.0a	1.2 b	0.2a	0.0a	0.0a	0.0a	0.0a	95.8 de
Calypso 70WG Guthion 50W Baythroid 2	1.4 oz. 8.0 oz. 0.35 oz.	P- 1C 2-4C 5C	0.0a	<0.1ab	0.7ab	<0.1a	0.0a	0.0a	0.0a	0.0a	98.3 ef
Baythroid 2 EXP CONA 240 SC	0.35 oz. 5.8 oz.	P-5C 3C	3.6 e	0.1ab	0.5ab	0.2ab	0.0a	0.8 c	0.0a	0.0a	86.3 b
Baythroid 2 EXP CONA 240 SC	0.7 oz. 5.8 oz.	P-5C 3C	<0.1ab	0.2ab	0.2a	<0.1a	0.0a	0.0a	0.0a	0.0a	99.0 f
Avaunt 30WG LI700 Guthion 50W	1.2 oz. 6.0 oz. 8.0 oz.	2-4C 2-4C PF, 1, 5C	0.2abc	<0.1ab	0.5ab	0.1a	<0.1a	0.2 b	0.0a	0.0a	96.1 def
Avaunt 30WG LI700 Guthion 50W Guthion 50W	1.2 oz. 6.0 oz. 2.0 oz. 8.0 oz.	2-4C 2-4C 2-4C PF, 1, 5C	0.0a	0.0a	0.3a	0.2ab	0.0a	0.0a	0.0a	0.0a	98.9 f
Avaunt 30WG LI700 Guthion 50W	1.5 oz. 6.0 oz. 8.0 oz.	2-4C 2-4C PF, 1, 5C	0.6 cd	2.3 d	0.8ab	0.2ab	0.0a	<0.1a	<0.1a	0.0a	90.7 bc
Guthion 50W Dipel 2X 6.4WP	8.0 oz. 8.0 oz.	PF,1, 5C 10, 22 June, 2 July	<0.1ab	0.1ab	0.8ab	0.8 b	0.0a	0.0a	0.0a	0.0a	94.5 cd
Supracide 25WP Sunspray oil Imidan 70W	0.75 oz. 2.0 gal. 12.0 oz	1/2"G 1/2"G PF,1-5C	0.4abc	0.6 bc	0.1a	0.4ab	0.0a	0.0a	<0.1a	0.0a	94.8 cde
Esteem 0.86 EC Guthion 50W Danitol 2.4E	2.5 oz. 8.0 oz. 2.7 oz.	TC PF,1, 3, 4C 2, 5C	1.8 de	1.3 cd	0.1a	0.4ab	0.0a	0.0a	0.0a	0.0a	89.2 bc
Esteem 0.86EC Guthion50W Danitol 2.4E	2.5 oz. 8.0 oz. 4.0 oz.	TC PF,1, 3, 4C 2, 5C	0.6 bcd	0.6 bc	<0.1a	<0.1ab	0.0a	0.0a	0.0a	0.0a	96.1 def
Untreated	-	-	68.7 f	12.9 e	4.7 c	<0.1ab	0.0a	<0.1a	0.6 c	0.0a	13.5 a

1 Data from 'Red Delicious' on 15 September.

2 Mean separation by Fishers Protected LSD (P=<0.05). Arcsin transformation used for statistical analysis. Treatment means followed by the same letter are not significantly different.

3 McIntosh phenology: 1/2" G on 4/2; TC on 4/12; Pink on 4/26, Bloom on 5/2; PF on 5/14 , 1C on 5/21, 2C on 6/10, 3C on 7/2, 4C on7/30, 5C on 8/18. Short interval between PF & 1C due to 1.25" rainfall on 5/20; seasonal AM trap threshold did not warrant application.

APPLE: *Malus domestica* 'Ginger Gold'

Apple maggot (AM): *Rhagoletis pomonella* (Walsh)
Codling moth (CM): *Cydia pomonella* (Linnaeus)
European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)
Green fruitworm (GFW): *Lithophane antennata* (Walker)
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Oriental fruit moth (OFM): *Grapholita molesta* (Busck)
Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)
San Jose scale (SJS): *Quadraspidiotus perniciosus* (Comstock)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)

HARVEST EVALUATION OF ACTARA INSECTICIDE AGAINST FRUIT-FEEDING INSECTS, 1999: Treatments were applied to four-tree (of which 'Ginger Gold' was included) plots replicated four times in a randomized complete block design. All treatments were applied dilute to runoff using a high-pressure handgun sprayer at 300 psi delivering 57 gal/acre. All dilutions are presented as amt/100 gal. - based on 400 gallons/acre. Trees on the M.26 rootstock were 5 years-old, and had not yet filled their space. Treatments were applied on various schedules as shown in Table 3. Damage to fruit was assessed by randomly selecting 100 fruit at harvest maturity (29 Aug) and scoring for external damage by each pest; subsequently, fruits were dissected to detect internal damage. Damage by early Lepidoptera includes GFW & OBLR, while late Lepidoptera includes OFM & OBLR. Data were converted to % damaged fruit, and transformed by arcsin prior to analysis.

June and July were extremely dry (0.65 in. and 1.31 in., respectively), coupled with unusually high July temperatures (15d exceeding 95F). Because of dry soil conditions, AM emergence was very low and no damage from this pest occurred.

As shown by untreated, pressure from PC was high. Treatments 1 & 2 were designed for control of SJS only – there was no pressure from this insect. Because test trees, being in the 5th leaf, bore relatively few fruit, exposure to PC was severe. All treatments (except for #5 in which 1st cover was omitted) provided control of PC that was comparable to Guthion. Most Actara schedules were generally weaker than Guthion against the Lepidoptera complex. Actara schedules applied PF through 2nd cover were good aganinst TPB. In general Actara treatments applied PF through 2nd cover provided protection equal to the standard Guthion.

Table 3. Evaluation of insecticides for controlling insect damage on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Form. amt /100 gal.	Timing[3]	% Total PC	% Early Lep.	% Late Lep	% TPB	% EAS	% SJS	% AM	% Clean
Actara 25WG	0.7 oz.	P	80.4 c	22.7 b	7.5 b	<0.1ab	0.0a	0.0a	0.0a	3.2a
Actara 25WG	1.125 oz.	P	69.6 c	31.1 bc	5.5ab	0.0a	0.0a	0.0a	0.0a	4.0ab
Actara 25WG	1.125 oz.	PF-2C	9.7a	3.8a	5.2ab	0.4abc	0.0a	0.0a	0.0a	56.6 c
Actara 25WG	1.375 oz.	PF-2C	7.2a	1.4a	4.9ab	0.9 c	0.0a	<0.1a	0.0a	59.7 c
Actara 25WG	1.375 oz.	PF, 2C	49.3 b	29.1 bc	9.1 b	0.3abc	0.0a	3.2a	0.0a	10.8 b
Guthion 50W	8.0 oz.	PF- 2C	7.5a	0.5a	1.9a	0.5bc	0.0a	0.0a	0.0a	78.3 d
Untreated	-		64.4 bc	47.1 c	11.7 b	0.3abc	0.0a	0.0a	0.0a	0.3a

1 Data from ' Red Delicious' on 15 september.

2 Mean separation by Fishers Protected LSD (P=<0.05). Arcsin transformation used for statistical analysis. Treatment means followed by the same letter are not significantly different.

3 M[c]Intosh phenology: 1/2" G on 4/2; TC on 4/12; Pink on 4/26, Bloom on 5/2; PF on 5/14 , 1C on 5/21, 2C on 6/8. 3C on 7/2. Short interval between PF & 1C due to 1.25" rainfall on 5/20.

APPLE: *Malus domestica* Borkhauser
'Jonnamac'
Obliquebanded leafroller (OBLR)
Choristoneura rosaceana (Harris)

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APPLE, COMPARISON OF INSECTICIDES AGAINST OBLIQUEBANDED LEAFROLLER, 1999: Treatments were applied to four-tree blocks with a truck-mounted airblast sprayer calibrated to deliver 200 gallons of water/acre to plots of 15-yr old M.26 /'Jonnamac' at Christ Brothers orchard, Milton, NY. Treatments along with an untreated check were arranged in a RCB design and replicated four times. . All dilutions are presented as amt/100 gal.- if rates were provided to us on a per acre basis, 100 gallon rates were based on 400 gallons/acre. Starting at first flight (10 Jun; 230 DD_{43}) Penncap M 2L (32.0 oz/100 gal), SpinTor 2SC (1.3 oz/100 gal) + Lannate 2.4L (8.0 oz /100 gal), SpinTor 2SC (2.5 oz/100 gal), Asana XL 0.66EC (5.8 oz/100 gal), Lorsban 50WS (12.0 oz/100 gal), and Guthion 50WP (8.0 oz/100 gal) were applied, followed by 14d interval cover sprays on 24 Jun and 7 July. Starting at first flight (10 Jun) Dipel 2X 6.4WP (11.0 oz/100 gal) was applied, followed by 7d interval cover sprays on 18 Jun and 28 Jun. Fruit damage from the overwintering and first generation of larvae was assessed (18 Aug) by harvesting 100 randomly selected fruit from the two center trees of each four-tree block and recording damaged and undamaged fruit.

All treatments except Guthion maintained OBLR damage levels below 6 percent (Table 4). Penncap M was significantly better than the majority of treatments. Unfortunately, this organophosphate insecticide in no longer labeled for apple. A reduced rate of SpinTor tank mixed with a reduced rate of Lannate was as effective as SpinTor at the full rate. The poor performance of Guthion verifies laboratory bioassay results that have shown resistance in the Milton OBLR populations. In general, failures by Hudson Valley orchardists to control OBLR with Lorsban, Penncap M, Dipel and Asana can likely be contributed to either inadequate timing of application or to inadequate coverage

Table 4. Evaluation of insecticides for controlling leafroller on apple, Crist Brothers Orchard[1] Milton, NY – 1999

Treatment	Formulation amt./100 gal.	Timing[3]	% Damaged fruit OBLR[2,4]
Penncap M	32.0 oz./100	10, 24 June, 7 July	0.9 a
SpinTor 2SC +	1.3 oz./100	10, 24 June, 7 July	3.5 ab
Lannate 2.4L	8.0 oz./100		
LI700	6.0 oz./100		
Dipel 2X 6.4WP	11.0 0z./100	10, 18, 28 June	3.8 b
SpinTor 2SC +	2.5 oz./100	10, 24 June, 7 July	4.0 b
LI700	6.0 oz./100		
Asana XL 0.66EC	5.8 oz./100	10, 24 June, 7 July	5.4 b
Lorsban 50WS	12.0 oz./100	10, 24 June, 7 July	5.9 b
Guthion 50WP	8.0 oz./100	10, 24 June, 7 July	17.8 c
Untreated	-		16.7 c

[1]Data from 'Jonnamac' on 18 August.

[2]Mean separation by Fishers Protected LSD (P=<0.05). Log transformation used for statistical analysis.
Treatment means followed by the same letter are not significantly different.

[3]Degree Day Accumulations (base 43) for OBLR model used in application timing: 232.5 DD on 10 June (first flight @ 200 DD), 423.6 DD on 18 June (first hatch @ 350 DD), 570.4 DD on June 24, 1040.1 DD on 7 July (100% hatch @ 950 DD),.

[4]OBLR evaluated by recording 1st generation fruit feeding damage on 100 apples from the two center trees of a four-tree block.

APPLE: *Malus domestica* 'Delicious'

Apple rust mite(ARM): *Aculus schlechtendali* (Nalepa)
A predatory phytoseid(AMB): *Amblyseius fallacis* (Garman)
European red mite(ERM): *Panonychus ulmi* (Koch)
Twospotted spider mite (TSM): *Tetranychus urticae* Koch
A predatory stigmaeid (ZM): *Zetzellia mali* (Ewing)

MITE CONTROL WITH INSECTICIDES, 1999: Treatments were applied to four-tree (of which 'Delicious' was included) plots replicated four times. All dulitions are presented as amt/100 gal.- (based on 400 gallons/acre). Treatments were applied dilute to runoff using a high-pressure handgun sprayer at 300 psi delivering 57 gal/acre. Trees on the M.7 rootstock were 4 years-old, and had not yet filled their space. Seasonal treatments were applied on various schedules as shown in Table 5. Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from each plot on 15 JUNE. Leaves were removed to the laboratory where they were brushed with a mite brushing machine, and the mites and eggs examined using a binocular scope.

All treatments had received 3-4 insecticide applications prior to the mite assessment on 15 JUNE, at which time ERM and TSM populations exceeded the June threshold (untreated, 8.0 and 3.6, respectively). In general, Calypso, Baythroid, Guthion (#8) and Supracide (#9) schedules were not significantly different than untreated. However, Avaunt (#'s 6 &7) and Esteem/Danitol provided good suppression of phytophagous mites. No schedule significantly flared ARM. No significant effects on predatory mites (AMB & ZM) were present.

Table 5. Evaluation of insecticides for controling early season mite complex on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

	Treatment	Formulation amt./100 gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
				Number per leaf						
1	Calypso 70WG	0.35 oz.	Pink	9.4 de	30.5 bcde	1.3abcd	2.6abc	<0.1a	<0.1a	140.9a
		1.4 oz.	PF							
		0.7 oz.	1-2C							
2	Calypso 70WG	1.4 oz.	P, PF, 1-2C,	5.9 de	35.3 bcde	3.4 d	3.2abc	<0.1a	<0.1a	40.7a
3	Baythroid 2	0.35 oz.	P-2C	4.8 cd	15.5 b	0.5ab	1.7ab	0.0a	0.0a	79.2a
4	Baythroid 2	0.7 oz.	P-2C	13.9 e	78.3 e	2.9 cd	10.1 c	<0.1a	<0.1a	50.2a
5	Avaunt 30WG	1.2 oz.	1-2C	4.5 bcd	24.4 bcd	0.9abc	3.5 bc	<0.1a	0.1a	52.7a
	LI700	6.0 oz.								
	Guthion 50W	8.0 oz.	PF							
6	Avaunt 30WG	1.2 oz.	1-2C	0.9a	4.6a	1.6 bcd	2.8abc	<0.1a	<0.1a	49.7a
	LI700	6.0 oz.								
	Guthion 50W	8.0 oz.	PF							
	Guthion 50W	2.0 oz.	1C							
7	Avaunt 30WG	1.5 oz.	1-2C	1.5ab	18.5 bc	0.9abc	1.1ab	<0.1a	<0.1a	41.1a
	LI700	6.0 oz.								
	Guthion 50W	8.0 oz.	PF							
8	Guthion 50W	8.0 oz.	PF,1C	7.2 de	50.5 cde	1.9 bcd	5.3 bc	<0.1a	<0.1a	60.8a
	Dipel 2X	8.0 oz.	2C							
9	Supracide 25WP	0.75 oz.	1/2"G	9.5 de	59.7 de	0.8abc	1.9ab	0.0a	<0.1a	54.7a
	Sunspray oil	2%	1/2"G							
	Imidan 70W	12.0 oz	PF,1-2C							
10	Esteem 0.86 EC	2.5 oz.	TC	1.7abc	21.3 bc	0.3ab	1.4ab	<0.1a	0.0a	68.7a
	Guthion 50W	8.0 oz.	PF,1C							
	Danitol 2.4E	2.7 oz.	2C							
11	Esteem 0.86EC	2.5 oz.	TC	1.4a	35.1 bcde	0.1a	0.3a	0.0a	0.0a	52.7a
	Guthion 50W	8.0 oz.	PF,1C							
	Danitol 2.4E	4.0 oz.	2C							
12	Untreated	-	-	8.0 de	44.4 cde	3.6 d	6.0 bc	0.0a	<0.1a	36.4a

1 Data from 'Red Delicious' on 15 June.

2 Mean separation by Fishers Protected LSD (P=<0.05). Log transformation of data prior to statistical analysis. Treatment means followed by the same letter are not significantly different.

3 McIntosh phenology: 1/2" G on 4/2; TC on 4/12; Pink on 4/26, Bloom on 5/2; PF on 5/14, 1C on 5/21. Short interval between PF & 1C due to 1.25" rainfall on 5/20, 2C on 10 June.

Apple rust mite(ARM): *Aculus schlechtendali* (Nalepa)
A predatory phytoseid(AMB): *Amblyseius fallacis* (Garman)
European red mite(ERM): *Panonychus ulmi* (Koch)
Twospotted spider mite (TSM): *Tetranychus urticae* Koch
A predatory stigmaeid (ZM): *Zetzellia mali* (Ewing)

MITE CONTROL WITH MITICIDES, 1999: Treatments were applied to four-tree (of which 'Delicious' was included) plots replicated four times in a randomized complete block design. All treatments were applied dilute to runoff using a high-pressure handgun sprayer at 300 psi delivering 57 gal/acre. All dilutions are presented as amt/100 gal – (based on 400 gallons/acre). Trees on the M.7 rootstock were 5 years-old, and had not yet filled their space. Seasonal treatments were applied on various schedules as shown in Table 6. Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from each plot. Leaves were removed to the laboratory where they were brushed with a mite brushing machine, and the mites and eggs examined using a binocular scope.

June and July were extremely dry (0.65 in. and 1.31 in., respectively), coupled with unusually high July temperatures (15d exceeding 95F). Because of these conditions, ERM populations did not develop to normal levels in the experimental block, and populations crashed in early-July – TSM populations however, developed rapidly during July and the remainder of the season (SEE pp 16-17 for TSM trial).

Mite assessments were made 2 JUNE, 2 JUNE and 7 JULY. Typically, assessments would continue until September, but ERM populations declined rapidly after 7 JULY. Except for dormant oil (#5), all applications were made when untreated populations were ca. 1.4 mites/leaf on 11 JUNE. By 22 JUNE, untreated populations reached 6.4 mites/leaf, but all treatments maintained ERM at very low levels. TSM populations were relatively high in the Pyramite treatment by 7 JULY.

Table 6. Evaluation of miticides for controlling mite species on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Timing[3]	2 June ERM	ERME	TSM	TSME	AMB	ZM	ARM
Pyramite 60W	1.1 oz.	11 June	3.6a	7.6a	0.5a	3.6 b	<0.1a	0.0a	21.6 b
TD2383-01 5F	6.4 oz.	11 June	1.2	2.5a	0.0a	<0.1a	0.0a	0.0a	13.5ab
Savey 50W	0.75 oz.	11 June	1.1a	2.5a	<0.1a	<0.1a	0.0a	0.0a	8.5a
Savey 50W	1.0 oz.	11 June	1.3a	2.7a	0.1a	0.0a	0.0a	0.0a	12.2ab
Apollo 4SC	0.5 oz.	11 June	0.3a	2.0a	<0.1a	<0.1a	0.0a	0.0a	8.0a
+ Sunspray 6E	2.0 gal.	14 April							
Apollo 4SC	0.5 oz.	11 June	0.5	1.6a	<0.1a	<0.1a	0.0a	0.0a	11.2ab
Untreated	-	11 June	1.4	3.6a	0.2a	0.2a	0.0a	0.0a	8.5a

Treatment	Formulation amt./100 gal.	Timing[3]	22 June ERM	ERME	TSM	TSME	AMB	ZM	ARM
Pyramite 60W	1.1 oz.	11 June	0.8a	8.3a	2.0 c	6.4 d	<0.1a	0.0a	23.8a
TD2383-01 5F	6.4 oz.	11 June	0.8a	7.8a	<0.1a	0.1a	0.0a	0.0a	36.8a
Savey 50W	0.75 oz.	11 June	0.8a	31.6a	0.3ab	4.4 cd	0.0a	0.0a	36.8a
Savey 50W	1.0 oz.	11 June	1.2a	28.4a	0.3ab	1.6 bc	<0.1a	0.0a	67.9a
Apollo 4SC	0.5 oz.	11 June	1.1a	13.4a	0.3ab	1.2ab	0.1a	0.0a	30.0a
+ Sunspray 6E	2.0 gal.	14 April							
Apollo 4SC	0.5 oz.	11 June	0.8a	13.6a	0.5ab	1.8 bc	0.0a	0.0a	43.8a
Untreated	-	11 June	6.4 b	15.9a	0.9 bc	0.6ab	<0.1a	<0.1a	36.4a

Treatment	Formulation amt./100 gal.	Timing[3]	7 July ERM	ERME	TSM	TSME	AMB	ZM	ARM
Pyramite 60W	1.1 oz.	11 June	<0.1a	3.3a	3.7 b	6.7 b	<0.1a	<0.1a	5.9a
TD2383-01 5F	6.4 oz.	11 June	<0.1a	0.6a	0.6a	<0.1a	<0.1a	0.0a	1.4a
Savey 50W	0.75 oz.	11 June	<0.1a	7.4a	<0.1a	0.6a	<0.1a	0.0a	8.4a
Savey 50W	1.0 oz.	11 June	<0.1a	5.8a	0.2a	1.1ab	0.0a	0.0a	4.6a
Apollo 4SC	0.5 oz.	11 June	0.7a	5.7a	0.1a	0.5a	0.0a	0.0a	2.3a
+ Sunspray 6E	2.0 gal.	14 April							
Apollo 4SC	0.5 oz.	11 June	<0.1a	6.7a	0.9a	2.1ab	0.1a	0.0a	1.2a
Untreated	-	11 June	1.4 b	6.2a	1.2ab	0.6a	<0.1a	0.0a	9.3a

1 Data from ' M.7 Red Delicious'.

2 Mean separation by Fishers Protected LSD (P=<0.05). Log transformation used for statistical analysis. Treatment means followed by the same letter are not significantly different.

3 All treatments received Guthion 50W@ PF – 2, 4C;Tree phenlolgy: TC on 4/12, Petal fall on 15 May, 1C on 21 May; 2C on 8 June, 4C on 30 July.

APPLE: *Malus domestica*, 'Empire'

Green apple aphid (GAA): *Aphis pomi* De Geer
Spirea aphid (SA): *Aphis spiraecola* Patch

EVALUATION OF INSECTICIDES AGAINST APHIDS AFFECTING APPLE, 1999: Treatments were applied to six-tree plots replicated four times in a randomized complete block design. All treatments were applied 11June, dilute to runoff, using a high-pressure handgun sprayer at 300 psi delivering 100 gal/acre. Trees on the M.9 rootstock were 10 years-old and 15 ft high. Treatment efficacy was assessed 3d and 10d postapplication by:

- Thirty aphid infested terminals/replicate were tagged for pretreatment counts and subsequent evaluation. Populations of aphids and predators were estimated by a rating system:
  GAA & SA - 0 = no aphids; 1 = 1-10 aphids/terminal leaf; 2 = 11-100 aphids/terminal leaf; 3 = >100 aphids/terminal leaf
  Cecidomyiid predator - 0 = no predators; 1 = 1-5 predators/leaf; 2 = >5 predators/leaf

Results are presented in Table 7. At 3d postapplication, all treatments (Pirimor, Provado and Aphistar) had reduced aphid populations by >70% (% reduction = reduction of initial aphid populations based on ratings). The greatest reduction was provided by Aphistar, followed by Pirimor @ 1.0 oz/100 and Provado – all providing >80% reduction. At 10d postapplication, only Aphistar and Pirimor @ 1.0 oz/100 still provided reduced aphid populations, all other treatments permitting an increase in population. The lowest rate of Pirimor consistently provided superior control, while the 1.5 and 2.0 oz rates consistently showed the greatest degree of detriment to Cecidomyiids. Reduction in aphid infestations in 10d posttreatment untreated check was likely due to relatively high predator survivorship, primarily Cecidomyiid larvae.

A number of insecticides have sufficient efficacy to reduce aphid populations somewhat. The most desirable aphicides however, are those that prevent or delay reinfestation by alates (winged adults). The success of a particular treatment to maintain reduced populations could be attributed to low toxicity to natural enemies, and/or to a generally high degree of residual activity or persistence.

Table 7. Evaluation of insecticides for controling aphid complex on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Timing	Pre Counts* 11 June Predators 0-2	Pre Counts* 11 June GAA/SA 0-3
Pirimor 50W	1.0 oz.	11 June	0.02	0.75
Pirimor 50W	1.5 oz.	11 June	0.05	0.26
Pirimor 50W	2.0 oz.	11 June	0.00	0.17
Provado 1.6F	2.0 oz.	11 June	0.00	0.12
Aphistar 50WP	2.0 oz.	11 June	0.00	0.42
Untreated	-	-	0.06	1.37

Treatment	Formulation amt./100 gal.	3 d Post Counts* 14 June Predators 0-2	3 d Post Counts* 14 June GAA/SA 0-3	% Reduct. GAA/SA
Pirimor 50W	1.0 oz.	0.06	0.09	88.1
Pirimor 50W	1.5 oz.	0.00	0.07	72.4
Pirimor 50W	2.0 oz.	0.00	0.05	73.1
Provado 1.6F	2.0 oz.	0.00	0.02	80.9
Aphistar 50WP	2.0 oz.	0.00	0.02	94.4
Untreated	-	0.00	1.07	21.6

Treatment	Formulation amt./100 gal.	10 d Post Counts* 21 June Predators 0-2	10 d Post Counts* 21 June GAA/SA 0-3	% Reduct. GAA/SA
Pirimor 50W	1.0 oz.	0.10	0.41	45.8
Pirimor 50W	1.5 oz.	0.02	0.36	-37.2
Pirimor 50W	2.0 oz.	0.00	0.23	-31.7
Provado 1.6F	2.0 oz.	0.00	0.42	-243.4
Aphistar 50WP	2.0 oz.	0.02	0.25	39.6
Untreated	-	0.11	0.67	50.8

1 Data from ' Empire' on M-9 rootstock.

* GAA = Green apple aphid; Spirea aphidSA; PredATORS = predominately Cecidomyiid larvae.
Rating of 0-3 for aphids/leaf where, 0=0/lf, 1 = 1-10/lf, 2 = 11-100/lf, 3 = >100/lf.
Rating of 0-2 for Cecidomyiid larvae/leaf where, 0 = 0/lf, 1 = 1-5/lf, 2 = >5/lf
Infested leaves were tagged and used for all sample dates of both aphid and preditor counts.

Apple rust mite(ARM): *Aculus schlechtendali* (Nalepa)
A predatory phytoseid(AMB): *Amblyseius fallacis* (Garman)
European red mite(ERM): *Panonychus ulmi* (Koch)
Twospotted spider mite (TSM): *Tetranychus urticae* Koch
A predatory stigmaeid (ZM): *Zetzellia mali* (Ewing)

MITE CONTROL WITH D2341 and AGRIMEK MITICIDES, 1999: Treatments were applied to four-tree plots (of which 'Delicious' was included) replicated four times in a randomized complete block design. All treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi. Trees on the M.7 rootstock were 2 years-old, and bore very little foliage – all treatments were applied at 100 gallon/acre, based on tree-row-volume determinations. Treatments were applied at petal fall (13 May; D2341 & AgriMek), at threshold (20 Aug.; D2341), and untreated. Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from each plot 5 times at irregular intervals. Leaves were removed to the laboratory where they were brushed with a mite brushing machine, and the mites and eggs examined using a binocular scope. Data transformed by arcsin prior to analysis by Fisher's Protected LSD.

June and July were extremely dry (0.65 in. and 1.31 in., respectively), coupled with unusually high July temperatures (15d exceeding 95F). Because of these conditions, ERM populations reached threshold levels in the experimental block early (28 June) – TSM populations developed rapidly during late-June and persisted until late-July.

Mite assessments were made 7 JUNE, 28 JUNE, 9 JULY, 29 JULY and 31 AUGUST. The petal fall application of D2341 provided a numerically poorer degree of ERM and TSM control than did AgriMek at petal fall, however the differences were not statistically significant (Table 8). The threshold application of D2341 (20 Aug), reduced mite numbers (ERM, TSM and ARM) to almost nonexistent numbers, suggesting very good rescue properties.

Table 8. Evaluation of miticides for controlling mite species on apple[1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

	Formulation		7 June						
Treatment	amt./Acre gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
D2341 50W	8.0 oz.	PF	1.5 a	0.7 a	<0.1 a	1.1 b	0.0a	0.0a	22.9 bc
D2341 50W	8.0 oz.	20 Aug	0.8 a	0.4 a	0.2 a	0.8 b	<0.1 a	<0.1 a	13.2 b
AgriMek + UF oil	5.0 oz.	PF	<0.1 a	<0.1 a	<0.1 a	<0.1 a	0.0a	0.0a	1.5 a
Untreated	-	-	0.8 a	0.9 a	0.2 a	0.9 b	<0.1 a	0.0a	48.3 c

	Formulation		28 June						
Treatment	amt./Acre gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
D2341 50W	8.0 oz.	PF	3.3 a	10.4 a	1.5 ab	2.6 ab	0.0a	0.0a	18.3 ab
D2341 50W	8.0 oz.	20 Aug	3.4 a	19.3 a	4.3 bc	5.6 bc	0.0a	0.0a	66.9 b
AgriMek + UF oil	5.0 oz.	PF	0.8 a	3.6 a	0.9 a	1.1 a	0.0a	0.0a	3.5 a
Untreated	-	-	4.1 a	19.0 a	5.5 c	8.0 c	0.0a	0.0a	66.9 b

	Formulation		9 July						
Treatment	amt./Acre gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
D2341 50W	8.0 oz.	PF	3.2 a	11.7 a	3.1 a	3.7 a	<0.1 a	<0.1 a	86.9 a
D2341 50W	8.0 oz.	20 Aug	1.3 a	6.2 a	4.8 a	3.1 a	<0.1 a	<0.1 a	46.2 a
AgriMek + UF oil	5.0 oz.	PF	1.8 a	6.2 a	3.8 a	4.5 a	0.0 a	0.1 a	69.6 a
Untreated	-	-	0.8 a	2.0 a	9.1 a	4.2 a	<0.1 a	0.0 a	54.3 a

	Formulation		29 July						
Treatment	amt./Acre gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
D2341 50W	8.0 oz.	PF	0.4 a	5.9 a	7.2 b	12.9 a	<0.1 a	<0.1 a	82.0 a
D2341 50W	8.0 oz.	20 Aug	1.2 a	4.1 a	6.8 b	8.8 a	0.0 a	<0.1 a	144.5 a
AgriMek + UF oil	5.0 oz.	PF	0.7 a	2.4 a	2.6 a	3.8 a	<0.1 a	0.0 a	103.7 a
Untreated	-	-	0.9 a	4.2 a	11.2 b	12.6 a	<0.1 a	<0.1 a	108.6 a

	Formulation		31 August						
Treatment	amt./Acre gal.	Timing[3]	ERM	ERME	TSM	TSME	AMB	ZM	ARM
D2341 50W	8.0 oz.	PF	0.2 a	0.7 a	3.6 b	3.5 a	0.1 a	0.2 a	83.3 a
D2341 50W	8.0 oz.	20 Aug	0.0 a	<0.1 a	<0.1	0.2 a	<0.1 a	0.2 a	14.0 a
AgriMek + UF oil	5.0 oz.	PF	0.3 a	0.3 a	3.2 b	1.5 a	<0.1 a	<0.1 a	45.6 a
Untreated	-	-	0.0 a	<0.1 a	0.6a	0.8 a	<0.1a	0.0 a	24.4 a

1 Data from ' M.7 Red Delicious'.

2 Mean separation by Fishers Protected LSD (P=<0.05). Log transformation used for statistical analysis. Treatment means followed by the same letter are not significantly different.

3 Application timing: Petal fall on 5/13; rescue on 20 Aug.

APPLE: *Malus domestica* Borkhauser
'McIntosh'; 'Delicious'
Two-spotted spider mite (TSSM);
Tetranychus urticae Koch

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COMPARISON OF RESCUE MITICIDE TREATMENTS AGAINST MID- AND LATE-SEASON OUTBREAKS OF TWO-SPOTTED SPIDER MITE, 1999: The '99 season was abnormally dry and hot in the lower Hudson Valley and in portions of the Champlain Valley. Such conditions predictably favored numerous outbreaks of two-spotted spider mite. This pest tends to occur later in the season than does European red mite and therefore, resudues of early-season miticide treatments targeted for ERM are often spent by the time conditions favoring TSSM occur. We were fortunate to have obtained the Pyramite registration for mid-season rescue, but its weakness against TSSM was either known or suspected – therefore its utility in many orchards was limited. Because data specifically against TSSM were scarce, we performed replicated trials in the Hudson Valley Lab research orchard to evaluate prospective rescue treatments.

Treatments were applied to four- and 1-tree plots (8 yr-old 'McIntosh' & 'Delicious', respectively, on M.9 rootstock) replicated four times in a RCB design. All treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi delivering 57 gpa. The blocks had been uniformly treated with Apollo at petal fall, but by late-June ('McIntosh) and early-August ('Delicious') TSSM populations were generally well above threshold.

In the 'McIntosh' trial (Table 9), the experimental miticide TD2383 (cyhexatin) was very effective. Although neither was expected to be efficacious against running mite populations, Vydate (at the high rate recommended for leafhoppers) and AgriMek were surprisingly effective at reducing TSSM populations. Mediocre performance of Pyramite against TSSM was expected, but the apparent ineffectiveness of Carzol was disappointing – given that it has traditionally been recommended in emergency rescue situations.

In the subsequent 'Delicious' trial (Table 10), TD 2383 was evaluated as previously. In addition, Vendex was added and Vydate was evaluated at reduced rate. AgriMek was evaluated using two penetrants, ultrafine oil and LI700. Under extreme mite infestations (mean=15 motiles/leaf), TD 2383, Vendex, Vydate (two appns @ high rate), and AgriMek + oil reduced TSSM >90% at 21d postapplication. The 16 oz rate of Vydate (two appns) provided good reduction and would probably suffice in most orchard situations. AgriMek + LI700 was considerably poorer than AgriMek + oil.

Results of these trials suggest that TD 2383 (registration status uncertain), Vendex, Vydate and AgriMek are effective rescue treatments for TSSM. In keeping with good biological control and resistance management protocol, the use of AgriMek in rescue situations is probably unwise. Although Vydate is detrimental to predacious mites, it is 'relatively' inexpensive, and might be advantageous in some situations – particularly if leafminers or leafhoppers are in evidence. During the '99 season, most Hudson Valley orchards were heavily populated by TSSM, the acuteness being amplified by drought conditions. It was one of those legendary years in which many growers had to make the tough choice between preservation of phtoseiid mites and control of phytophagous mites.

Table 9. Reduction of mid-season two-spotted spider mite on M.9/'McIntosh', Cornell's Hudson Valley Lab, Highland, NY - 1999

Treatment	Rate/100 gal[1]	Pretreat. popn. (motiles/ leaf)	% reduction 7d post appln*	% reduction 14d post appln*
TD 2383	6.4 oz	12.0	98.5	91.3
AgriMek	5.0 oz	13.0	80.5	88.4
Vydate**	32 oz	4.2	34.2	71.9
Pyramite	3.3 oz	15.0	66.1	38.5
Carzol	8.0 oz	4.6	0.0	0.0
Carzol + oil	4.0 oz + 2%	2.9	47.1	0.0

[1]Appln – 6/24
* Data corrected for untreated mortality by Abbott's formula.
**High rate labeled for aphids.

Table 10. Reduction of late-season two-spotted spider mite on M.9/'Delicious', Cornell's Hudson Valley Lab, Highland, NY - 1999

Treatment	Rate/100 gal	Pretreat. popn. (motiles/ leaf)	% redn.(eggs) 21d post appln.	% redn.(motiles) 21d post appln.
TD 2383	6.4 oz[2]	17.3	99.8	99.8 ab
Vendex	8.0[2]	16.2	99.3	97.5 ab
Vydate	32 oz*[1]	15.6	98.4	94.9 bc
AgriMek	5.0 oz + oil[2]	18.0	96.0	90.6 bc
Vydate	16 oz[1]	11.7	94.2	82.9 c
AgriMek	5.0 oz + LI700[2]	12.6	78.3	71.4 c
UNTREATED		13.7	-6.1	-95.2 d

[1]Applns – 3, 10 August
[2]Appln – 3 August
*High rate labeled for aphids.

Table 11. Assessment of Seasonal Organophosphate and Pyrethroid Insecticide Interactions on Mite Pests of Apple, Modena, N.Y.- 1999[1,2]

Treatment	Formulation amt./100 gal.	Appl. dates	6/25 Mean # of mites/leaf* ERM	6/25 TSM	6/25 ARM	7/19 Mean # of mites/leaf* ERM	7/19 TSM	7/19 ARM	8/20 Mean # of mites/leaf ERM	8/20 TSM	8/20 ARM	CMD[3] ERM+TSM	CMD[3] ARM	No. STLM mines per min. count
Apollo 4SC	2.0 oz.	15 April	0.0a	0.0a	7.9a	3.1bc	4.2bc	7.2a	1.8c	4.8c	0.2a	313	346	0.4a
Asana XL 0.66EC	5.8 oz.	14, 21 May												
		4, 15 June, 6, 22 July												
Apollo 4SC	2.0 oz.	15 April	0.0a	0.3a	4.1a	0.8ab	6.4bc	3.5a	0.4ab	7.3c	1.0a	342	257	53.6 c
Guthion 50 W	8.0 oz.	14, 21 May												
		4, 15 June, 6, 22 July												
Agri-Mek 0.15EC	5.0 oz.	14 May	0.0a	0.4a	20.1a	0.2a	0.4a	3.0a	0.1a	1.3ab	0.4a	54	578	0.0a
Asana XL 0.66EC	5.8 oz.	14, 21 May												
		4, 15 June, 6, 22 July												
Agri-Mek 0.15EC	5.0 oz.	14 May	0.0a	0.3a	1.6a	0.5a	1.4ab	0.4a	0.1a	1.5ab	0.1a	88	95	3.7 b
Guthion 50 W	8.0 oz.	14, 21 May												
		4, 15 June, 6, 22 July												
Pyramite	2.2 oz.	22 July	0.0a	0.2a	18.1a	3.9c	6.2bc	0.7a	0.2a	1.7b	0.5a	277	468	0.6a
Asana XL 0.66EC	5.8 oz.	14, 21 May												
		4, 15 June, 6, 22 July5												
Pyramite	2.2 oz.	22 July	1.5b	0.2a	3.7a	3.3bc	11.9c	5.0a	0.0a	0.3a	0.0a	398	250	51.4 c
Guthion 50 W	8.0 oz.	14, 21 May												
		4, 15 June, 6, 22 Jul												
Untreated			1.6b	0.6a	34.2a	6.9c	9.1c	1.2a	0.9b	1.6b	0.6a	473	880	53.0 c

[1]Data from 'Delicious'.

[2]Mean separation by Fishers Protected LSD. Data transformed by $Log_{10}(X + 1)$ prior to analysis. Treatment means followed by the same letter are not significantly different (P=<0.05).

[3]Cumulative Mite Days = $[0.5(mpl_1 + mpl_2]*d_{1\text{-}2}$, where mpl_1 is the number of mites per leaf at time 1, mpl_2 is the number of mites per leaf at time and $d_{1\text{-}2}$ is the number of days elapsed between the two counts.

*ERM = European red mite, TSM = Two spotted mite, ARM = Apple rust mite, STLM = Spotted tentiform leafminer

PEAR: *Pyrus communis* L. 'Bartlett'

Pear psylla(PP): *Cacopsylla pyricola* (Foerster)

PEAR PSYLLA CONTROL WITH CONVENTIONAL AND REDUCED-RISK INSECTICIDES, 1999: Treatments were applied to four-tree plots replicated three times in a RCB design. Each plot contained two trees each of 'Bartlett' and 'Bosc' cultivars, spaced 12 x 18 ft, 12 ft in height and 23 years old. All dilutions are presented as amt/100 gal – (based on 400 gallons/acre). Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi delivering 200 gpa. All plots received Guthion at petal fall (PF), fruit-set and 12d post PF for plum curculio and pear midge. Pear trees consistently produce new leaf tissue as the season progresses, leaving a proportion of the total foliage that is not impacted by single early-season applications. Because such untreated foliage serves as developmental sites for mid-season PP populations, many of the insecticides were evaluated as sequential split-applications at reduced rates. 'Reduced-risk' insecticides (dormant oil plus either Neemix or M-Pede) were compared to schedules of conventional insecticides. Treatment formulations, rates and application schedules are presented in the Table. Insecticide efficacy against PP was evaluated by sampling 25 spur leaves from five separate spurs until 5 June, and thereafter sampling five terminals/treatment each containing one proximal, one distal, and three mid-terminal leaves. Samples were removed to the laboratory, where PP nymphs and eggs were counted using a binocular scope. Cumulative psylla nymph days per leaf (CPD) were calculated as: $CPD = [0.5(ppl_1 + ppl_2)]*d_{1-2}$, where ppl_1 is the number of psylla nymphs per leaf at time 1, ppl_2 is the number of psylla nymphs per leaf at time 2, and d_{1-2} is the number of days elapsed between the two counts. Similarly, cumulative pear rust mite days were calculated. Data were transformed by arcsin square root prior to analysis by Fisher's Protected LSD test.

Because June and July were extremely dry (0.65 in. and 1.31 in., respectively), coupled with unusually high July temperatures (15d exceeding 95F), PP populations declined prematurely in all treatments prior to 15 July. Treatments that allowed <75 CPD/leaf generally provided good commercial control of PP (Table 12). Split-applications of AgriMek and Pyramite provided superior control compared to single early-season applications; but split-applications were not advantageous to the performance of Calypso and Provado. Although some treatments allowed high PRM cumulative days, these populations were generally not at damaging levels. Three applications of Neemix and M-Pede, preceded by dormant oil treatments, provided noteworthy control of PP and PRM populations.

Table 12. Evaluations of insecticides for controling Pear Psylla on Bartlett pear[1]
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal. Application Dates	5/25 # / Leaf* Nymphs	5/25 # / Leaf* Eggs	5/27 # / 3 min. vac** Adults
1	Calypso 70WG 0.35 oz. 10-14dPPF; 21 dPPA	0.1 a	3.0 b c d	14.5
2	Calypso 70WG 0.72 oz 10-14dPPF	0.5 a	3.7 b c d	14.0
3	Calypso 70WG 0.72 oz 10-14dPPF; 21 dPPA	0.3 a	3.2 b c d	14.0
4	Calypso 70WG 1.43 oz. 10-14dPPF	0.4 a	3.8 b c d	20.0
5	EXP 240SC 1.33 oz. 10-14dPPF	0.2 a	5.0 c d	32.0
6	EXP 240SC 2.0 oz. 10-14dPPF	0.7 a	1.5 a b	33.0
7	AgriMek 0.15 EC 6.7 oz. + UF 10-14dPPF	0.3 a	1.3 a b	7.0
8	AgriMek 0.15 EC 3.4 oz. + UF 10-14dPPF; 21 dPPA	0.5 a	1.3 a b	12.0
9	AgriMek 0.15 EC 2.2 oz. + UF 10-14dPPF; 21 dPPA; 21 dPPA + Sunsprya 6E oil 3% @ SB	0.1 a	0.6 a	4.0
10	Provado 1.6F 5.0 oz. 10-14dPPF	0.7 a	2.4 a b c d	11.0
11	Provado 1.6F 2.5 oz. 10-14dPPF; 21 dPPA	0.3 a	4.2 b c d	22.0
12	Pyrimite 50WP 3.3 oz. 10-14dPPF	0.4 a	1.6 a b	15.5
13	Pyrimite 50WP 1.7 oz. 10-14dPPF; 21 dPPA	0.3 a	1.7 a b	11.5
14	Neem 4.5 4.0 oz. 10-14dPPF; 21 dPPA; 21 dPPA + Sunsprya 6E oil 2% 3% @ SB, BB	0.7 a	1.7 a b c	2.0
15	M-Pede 1.5 gal. 10-14dPPF; 21 dPPA; 21 dPPA + Sunsprya 6E oil 2% 3% @ SB, BB, WB	0.0 a	0.8 a	2.5
	Untreated	0.4 a	6.5 d	22.0

1 Treatment means followed by the same letter are not significantly different (P<0.5; Fishers protected LSD). Data treated by $\log_{10}(x+1)$ transformation prior to analysis.

* Counts taken from 5 terminals / trmt. Each sample containing 1 proxmal, 1 distal, and 3 mid-terminal leaves.

** Hand held vacuum with collection bottles used for 3 minute sampling sweeps of foliage for pear psylla adults.

Application Timings: SB on 31 March; BB on 14 April; WB on 28 April; Petal Fall (PF) on 2 May; 10-14dPPF appl. on 20 May; 21dPPF on 2 June; (2) 21dPPF on 15 June;

Table 12. Evaluations of insecticides for controling Pear Psylla on Bartlett pear[1]
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Application Dates	6/7 # / Leaf* Nymphs	6/7 # / Leaf* Eggs	6/7 # / Leaf* PRM
1	Calypso 70WG 0.35 oz.	10-14dPPF; 21 dPPA	4.48 c d e	14.67 e f g	12.37 d e
2	Calypso 70WG 0.72 oz	10-14dPPF	4.15 c d e	8.20 d e	8.31 c d e
3	Calypso 70WG 0.72 oz	10-14dPPF; 21 dPPA	3.88 c d e	21.86 g h	19.46 e
4	Calypso 70WG 1.43 oz.	10-14dPPF	1.96 a b c	8.20 d e	0.84 a b
5	EXP 240SC 1.33 oz.	10-14dPPF	7.53 e	37.02 h	0.15 a
6	EXP 240SC 2.0 oz.	10-14dPPF	2.37 a b c	19.61 f g h	0.11 a
7	AgriMek 0.15 EC 6.7 oz.	10-14dPPF	2.94 b c d	6.31 c d	0.01 a
8	AgriMek 0.15 EC 3.4 oz.	10-14dPPF; 21 dPPA	0.91 a b	1.90 a	0.39 a b
9	AgriMek 0.15 EC 2.2 oz.	10-14dPPF; 21 dPPA; 21 dPPA	0.98 a b	2.79 a b c	0.05 a
10	Provado 1.6F 5.0 oz.	10-14dPPF	0.99 a b	10.17 d e f	1.69 a b c
11	Provado 1.6F 2.5 oz.	10-14dPPF; 21 dPPA	1.66 a b c	6.23 b c d	3.09 b c d
12	Pyrimite 50WP 3.3 oz.	10-14dPPF	0.79 a	3.19 a b c	0.36 a b
13	Pyrimite 50WP 1.7 oz.	10-14dPPF; 21 dPPA	0.83 a	4.74 b c d	0.03 a
14	Neem 4.5 4.0 oz.	10-14dPPF; 21 dPPA; 21 dPPA	0.81 a	2.72 a b	0.08 a
15	M-Pede 1.5 gal.	10-14dPPF; 21 dPPA; 21 dPPA	0.99 a b	3.12 a b c	0.05 a
16	Untreated		7.20 d e	16.34 e f g	0.18 a b

[1] Treatment means followed by the same letter are not significantly different (P<0.5; Fishers protected LSD). Data treated by $\log_{10}(x+1)$ transformation prior to analysis.

* Counts taken from 5 terminals / trmt. Each sample containing 1 proxmal, 1 distal, and 3 mid-terminal leaves.

Application Timings: SB on 31 March; BB on 14 April; WB on 28 April; Petal Fall (PF) on 2 May; 10-14dPPF appl. on 20 May; 21dPPF on 2 June; (2) 21dPPF on 15 June.

Table 12 Evaluations of insecticides for controling Pear Psylla on Bartlett pear[1]
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Application Dates	6/25 # / Leaf* Nymphs	6/25 # / Leaf* Eggs	6/25 # / Leaf* PRM
1	Calypso 70WG 0.35 oz. 10-14dPPF; 21 dPPA		4.4 c d e	13.8 d	1.6 a b
2	Calypso 70WG 0.72 oz 10-14dPPF		2.8 b c d e	6.4 b c d	10.5 c d
3	Calypso 70WG 0.72 oz 10-14dPPF; 21 dPPA		4.8 c d e	6.5 b c d	13.9 d
4	Calypso 70WG 1.43 oz. 10-14dPPF		2.9 b c d e	6.3 b c d	7.2 b c d
5	EXP 240SC 1.33 oz. 10-14dPPF		5.5 e	9.4 c d	1.4 a b
6	EXP 240SC 2.0 oz. 10-14dPPF		2.1 a b c d e	9.5 c d	3.1 a b c d
7	AgriMek 0.15 EC 6.7 oz. 10-14dPPF		3.4 b c d e	4.1 a b c	0.6 a
8	AgriMek 0.15 EC 3.4 oz. 10-14dPPF; 21 dPPA		2.2 a b c d e	1.4 a	0.6 a
9	AgriMek 0.15 EC 2.2 oz. 10-14dPPF; 21 dPPA; 21 dPPA		2.1 a b c d e	2.7 a b	0.3 a
10	Provado 1.6F 5.0 oz. 10-14dPPF		1.4 a b	2.2 a b	2.3 a b c
11	Provado 1.6F 2.5 oz. 10-14dPPF; 21 dPPA		2.0 a b c d	4.6 a b c	7.3 b c d
12	Pyrimite 50WP 3.3 oz. 10-14dPPF		3.0 b c d e	2.5 a b	1.7 a b
13	Pyrimite 50WP 1.7 oz. 10-14dPPF; 21 dPPA		0.6 a	3.5 a b c	0.7 a
14	Neem 4.5 4.0 oz. 10-14dPPF; 21 dPPA; 21 dPPA		3.7 b c d e	4.4 a b c	0.8 a
15	M-Pede 1.5 gal. 10-14dPPF; 21 dPPA; 21 dPPA		1.7 a b c	2.7 a b	0.3 a
16	Untreated		5.2 d e	8.8 c d	0.6 a

1 Treatment means followed by the same letter are not significantly different (P<0.5; Fishers protected LSD). Data treated by $\log_{10}(x+1)$ transformation prior to analysis.

* Counts taken from 5 terminals / trmt. Each sample containing 1 proxmal, 1 distal, and 3 mid-terminal leaves.

Application Timings: SB on 31 March; BB on 14 April; WB on 28 April; Petal Fall (PF) on 2 May; 10-14dPPF appl. on 20 May; 21dPPF on 2 June; (2) 21dPPF on 15 June.

Table 12. Evaluations of insecticides for controlling Pear Psylla on Bartlett pear[1]
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-1999

Treatment	Formulation amt./100 gal.	Application dates	7/12 # / Leaf* Nymphs	7/12 # / Leaf* Eggs	7/12 # / Leaf* PRM	Seasonal PRM days	Seasonal psylla nymph days
1 Calypso 70WG	0.35 oz.	10-14dPPF; 21 dPPA	0.8 a	2.7 a	0.7 a	253.8	162.1
2 Calypso 70WG	0.72 oz	10-14dPPF	0.6 a	3.0 a	4.9 a	379.3	131.8
3 Calypso 70WG	0.72 oz	10-14dPPF; 21 dPPA	0.5 a	2.7 a	3.7 a	607.7	156.2
4 Calypso 70WG	1.43 oz.	10-14dPPF	0.8 a	2.1 a	1.3 a	171.2	85.8
5 EXP 240SC	1.33 oz.	10-14dPPF	0.5 a	3.1	0.1 a	48.9	225.6
6 EXP 240SC	2.0 oz.	10-14dPPF	0.3 a	1.7 a	0.1 a	77.9	86.1
7 AgriMek 0.15 EC	6.7 oz.	10-14dPPF30.9	0.5 a	1.0 a	1.9 a	47.9	92.8
8 AgriMek 0.15 E143.6C	3.4 oz.	10-14dPPF; 21 dPPA	0.5 a	0.7 a	0.6 a	42.9	64.2
9 AgriMek 0.15 EC	2.2 oz.	10-14dPPF; 21 dPPA; 21 dPPA	0.9 a	1.6 a	0.44 a	30.9	64.5
10 Provado 1.6F	5.0 oz.	10-14dPPF	0.8 a	2.2 a	6.5 a	143.6	55.6
11 Provado 1.6F	2.5 oz.	10-14dPPF; 21 dPPA	0.3 a	0.9 a	3.1 a	224.4	70.1
12 Pyrimite 50WP	3.3 oz.	10-14dPPF	0.4 a	1.8 a	0.6 a	62.3	75.0
13 Pyrimite 50WP	1.7 oz.	10-14dPPF; 21 dPPA	0.2 a	2.2 a	0.5 a	38.0	30.6
14 Neem 4.5	4.0 oz.	10-14dPPF; 21 dPPA; 21 dPPA	0.6 a	1.50 a	0.82 a	43.0	85.7
15 M-Pede	1.5 gal.	10-14dPPF; 21 dPPA; 21 dPPA	0.4 a	0.99 a	1.50 a	39.9	47.9
16 Untreated			0.5 a	1.24 a	1.05 a	43.5	216.8

[1]Treatment means followed by the same letter are not significantly different ($P<0.5$; Fishers protected LSD). Data treated by $\log_{10}(x+1)$ transformation prior to analysis.

*Counts taken from 5 terminals / trmt. Each sample containing 1 proxmal, 1 distal, and 3 mid-terminal leaves.

Application Timings: SB on 31 March; BB on 14 April; WB on 28 April; Petal Fall (PF) on 2 May; 10-14dPPF appl. on 20 May; 21dPPF on 2 June; (2) 21dPPF on 15 June.

Corn earworm (CEW): *Heliocoverpa zea* (Boddie)
European corn borer (ECB): *Ostrinia nubilalis* (Hubner)

INSECT CONTROL ON LATE-SEASON SWEET CORN WITH FOLIAR SPRAYS OF INSECTICIDES, 1999: 'Sensor' sweet corn was planted 25 June in Tioga silt-loam soil at New Paltz, NY. Treatments were arranged in 2-row plots 488 ft. long, replicated 4 times in a randomized block design. Insecticide emulsions were applied by high-clearance sprayer (3 MPH), through three D3-25 cone nozzles/row, dispensing 51 GPA @ 100 PSI. Treatments were applied on either a 5-day or 7-day schedule starting at first silk on 23 AUG. Additional sprays were applied on 27 AUG and 1 SEPT. for the 5-day schedule, and on 30 AUG. for the 7-day schedule. Efficacy was assessed on 9 SEPT. by examining 25 randomly selected ears per treatment/replicate.

Weather for the '98 season was extremely dry during JUNE, JULY and AUG (APPENDIX I). Because supplemental water was applied by overhead irrigation, plant growth and development was normal.

Corn earworm infestations were extreme. European corn borer populations were present, but infestation pressure from this indigenous pest was only moderate. Data are presented in (Table 13). The traditional acceptance threshold for fresh market sweet corn is 95% worm-free ears. All treatments except for those including Penncap were acceptable under the CEW pressure present. Penncap was tank-mixed with Spintor to provide protection against corn leaf aphid (populations were insignificant). DMSO (synergist) was added to Penncap to evaluate potential additive effects. The 7-day schedule with Warrior provided excellent results, while the 7-day schedule of Capture was somewhat less effective.

TABLE 13. Evaluation of insecticides for management of late-season sweet corn insects, Hudson Valley Lab ., Highland, NY – 1999

Treatment	Rate (AI/acre)	% infested ears by species[1] ECB	CEW	% worm-free ears[2] by all species
Spintor 2SC + X77	0.07	0.0	0.0	100.0 a
Warrior 1E [7d sched.]	0.025	0.0	1.0	99.0 a
Spintor 2SC + X77	0.094	0.0	3.0	97.0 a
Spintor 2SC + X77	0.047	0.0	3.0	97.0 a
Capture 2E	0.04	0.0	3.0	97.0 a
Capture 2E	0.033	1.0	3.0	96.0 a
Baythroid 2E	0.044	2.0	3.0	95.0 a
Capture 2E [7d sched.]	0.04	2.0	4.0	94.0 a
Spintor 2SC + Penncap 2L	0.047 + 0.5	2.0	5.0	93.0 a
Penncap 2L + DMSO	1.0 + 3.0%	2.0	19.0	79.0 b
Penncap 2L	1.0	0.0	23.0	77.0 b
UNTREATED	-	1.0	23.0	76.0 b
				SEM = ±1.69

[1]ECB=European corn borer; CEW=corn earworm. Harvest date=9 Sept.

[2]Means followed by the same letter are not significantly different (DMRT, P=0.05)

ONION: *Allium cepa* L. 'Spartan Banner 80'
Onion maggot: *Delia antiqua* (Meigen)

CONTROL OF ONION MAGGOT WITH INSECTICIDE DRENCH AND SEED TREATMENTS, PINE ISLAND, NY 1999: Treatments were arranged in 1-row plots, 40 ft long, and replicated 4 times in a randomized block design. Insecticide drench treatments were applied in-furrow using a cone seeder equipped with a CO_2 pressurized (100 PSI) sprayer dispensing 38 GPA @ 2 MPH. Seed treatments were applied in a similar fashion, except no liquid insecticide was included. Dr. Al Taylor, Dept. of Hort. Sci., NYSAES, Geneva, performed treatment of onion seeds. Ten days postemergence (27 May), stand count was estimated by counting the number of seedlings per 20 ft of row marked from the center of each 40 ft plot. Efficacy evaluations were made 29 June by examination of all wilted or dead plants and recording the number damaged by onion maggot.

Throughout most of the '99 season, Southeastern NY experienced above average temperatures and below normal rainfall (APPENDIX I). Due to these conditions, plots were subjected to considerable stress prior to stand count estimation and efficacy evaluation.

Results are presented in Table 14. The Beauvaria seed treatment allowed extremely high damage by maggot, ca. 74% higher than untreated, suggesting that this fungal organism is attractive to maggot flies. Beauvaria also significantly reduced seedling emergence. Only Trigard seed treatment and Lorsban drench treatment allowed damage significantly lower than untreated. Fipronil seed treatments have previously provided good control of maggot – it is likely that poor soil moisture conditions affected efficacy of this and other seed treatments.

Table 14. Management of onion maggot with insecticide drench and seed treatments, Pine Island NY –1999

Treatment[1]	Rate	% seedlings[2] damaged by maggot	% reduction[2,3] of emergence
Beauvaria ST	1X	90.0 a	55.9 d
UNTREATED	-	16.1 b	-
Adage ST	5 g AI/kg	14.0 bc	28.0 abc
EXP ST	50 g AI/kg	12.3 bc	18.6 ab
Gaucho ST	50 g AI/kg	11.8 bc	39.8 bcd
Vydate ST	50 g AI/kg	11.6 bc	48.7 cd
Fipronil ST	30 g AI/kg	10.0 bc	30.6 abc
Adage ST	10 g AI/kg	9.6 bcd	24.2 ab
Trigard ST	50 g AI/kg	7.0 cd	33.5 abcd
Lorsban 4E D	1.5 lb AI/A	3.7 d	12.7 a
		SEM = ±1.9	SEM =± 1.7

[1]ST, seed treatment; D, drench

[2]Means followed by the same letter are not significantly different ($P \leq 0.05$). Data subjected to arcsin transformation prior to analysis.

[3]Reduction of initial stand (based on untreated= 236 plants/20 ft row) due to treatment effects.

1999 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Laboratory, Highland, NY

All readings were taken at 0800 EST on the dates indicated

	APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER		
Date	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip
1	75	44		70	36		89	59		82	68		92	75		77	53	
2	71	50		75	37		86	67		81	73		97	59		85	55	
3	67	47		75	52		86	68		86	67	0.12	88	57		88	55	
4	63	42	0.01	67	50	0.13	84	51		92	72	0.10	87	54		91	59	
5	51	32		64	52	0.01	75	47		93	74	0.60	89	64		89	66	
6	57	30		76	55		79	50		100	76		87	57	0.02	83	72	0.40
7	65	41	0.02	71	57		83	64		98	64	0.12	89	57		84	71	0.84
8	69	41		65	59	0.07	96	68		87	58		88	64	0.10	76	70	0.50
9	77	45		64	51	0.18	93	65		81	60	0.01	85	58		81	68	0.54
10	49	38	0.10	72	44		86	58	0.01	75	64	0.11	79	50		84	67	0.52
11	55	27		67	41		77	50		85	53		78	61		76	57	0.02
12	48	35	0.16	70	43		81	45		78	50		84	66	0.02	78	52	
13	55	35		72	38		83	67		81	61		75	64		78	54	
14	57	40		68	39		84	65		80	54		89	69	0.52	77	54	
15	63	37		71	40		81	58	0.04	80	55		85	62	0.09	77	63	
16	69	45		74	40		81	50		90	64		76	61	0.34	71	58	0.80
17	48	35	0.22	73	41		73	58		97	70		83	66		63	56	4.22
18	56	44	0.01	74	49		63	55	0.06	99	69		93	67		69	49	
19	62	36		75	63	0.09	74	47		98	70		85	60		74	45	
20	60	32	0.06	72	50	1.25	80	54		92	64		84	60		75	52	
21	56	32	Trace	71	39		80	55		86	62		71	59	0.11	72	60	0.15
22	65	47		75	47		77	53		82	65		63	59	0.14	60	50	0.32
23	54	49	0.08	81	54	0.01	87	55		83	70		70	54		60	45	0.10
24	51	30	0.36	63	58	0.59	90	58		96	69		84	56		74	50	
25	57	29		65	46	0.34	89	59		98	68		87	60		77	57	0.01
26	64	42		66	54		82	65		96	65	0.01	85	64	0.80	73	42	
27	73	38		68	52		94	59		91	65	0.01	66	62	0.39	69	50	
28	61	39		72	46		92	74		96	64		79	64	0.05	73	59	
29	62	35		77	50		96	74	0.45	93	62		88	65		77	65	
30	68	35		87	50		88	61	0.23	94	64	0.06	85	53		74	59	1.03
31				86	53					95	67		72	55				
Avg/Total	60.9	38.4	1.02	71.8	47.9	2.67	83.6	58.6	0.79	89.2	64.7	1.14	82.7	60.7	2.58	76.1	57.2	9.45