

RESULTS OF 2003 INSECTICIDE AND ACARICIDE TRIALS IN EASTERN NEW YORK

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APPLE: *Malus domestica* 'Ginger Gold'

European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)

Green fruitworm (GFW): *Lithophane antennata* (Walker)

Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)

Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)

Redbanded leafroller (RBLR): *Argyrotaenia velutinana* (Walker)

Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)

EVALUATION OF INSECTICIDES AGAINST EARLY-SEASON INSECT PESTS OF APPLE, 2003 – Hudson Valley Lab: Treatments were applied to four-tree plots (one of which was 'Ginger Gold') replicated four times in a randomized complete block design. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering 1.5 gal/tree or 150 gal/acre – the necessary gallonage represents minimal amounts of foliage during the early season. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

Treatments were applied on various schedules as shown in Table 1. Developmental phenology was: tight cluster(TC) on 25 April; pink(P) on 29 April; petal fall(PF) on 20 May; and first cover(1C) on May 30. Evaluations were made on 2 June.

Damage to fruit was assessed by randomly selecting 100 fruits prior to 'June drop' and scoring for external damage. The 'LEP' category includes combined damage from green fruitworm, red-banded and oblique-banded leafrollers. Damage data from all categories were converted to percent damage and transformed by $\arcsin *(\text{square root of } x)$ prior to analysis by Fisher's Protected LSD.

In spite of excessive rainfall during late-May (2.64" between PF and 1C), treatments performed surprisingly well. Pressure from TPB was normal and because most treatments started at either TC or P, all performed well against this pest. Infestation pressure from PC, EAS and LEP was low during early season, and all treatments performed well. Regarding percent clean fruit, all treatments that started pre-bloom provided excellent control of early season insects.

Table 1 Efficacy of insecticides against early season fruit feeding insect complex on apple ¹, N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2003

Treatment	Formulation amt./100 gal.	Timing	% Damaged ² fruit				% Clean
			% TPB	% PC	% EAS	% LEP	
3 Guthion 50WP	12.0 oz	PF, 1C	0.8 bcde	0.3 abc	0.5 c	0.0 a	95.5 b
4 Calypso	1.0 oz	P, PF	0.8 cde	0.0 a	0.0 a	0.0 a	99.0 def
Guthion 50WP	12.0 oz	1C					
5 Calypso	1.3 oz	P, PF	1.1 e	0.0 a	0.0 a	0.0 a	98.7 cdef
Guthion 50WP	12.0 oz	1C					
6 Calypso	1.7 oz	PF	1.0 de	0.1 abc	0.9 c	0.0 a	96.5 bcd
Guthion 50WP	12.0 oz	1C					
7 Imidan 70WP + Silwet	21.3 oz. 16.0 oz	P, PF, 1C	0.1 abcde	0.0 a	0.0 a	0.0 a	99.9 f
8 Assail	1.1 oz.	P, PF, 1C	0.1 abc	0.6 c	0.0 a	0.0 a	98.9 def
9 Asana XL	5.8 oz.	P	0.2 abcde	0.0 ab	0.0 a	0.0 a	99.6 f
Avaunt	2.0 oz.	PF, 1C					
10 Imidan 70WP		P, PF, 1C	0.8 bcde	0.4 bc	0.2 abc	0.0 a	97.4 bcde
11 Actara	1.7 oz.	TC	0.1 abcd	0.0 a	0.0 a	0.0 a	99.8 f
Warrior	1.7 oz.	PF					
Guthion 50WP	12.0 oz	1C					
12 Warrior	1.7 oz.	TC	0.1 ab	0.0 a	0.0 a	0.0 a	99.9 f
Actara	1.7 oz.	PF					
Guthion 50WP	12.0 oz	1C					
13 Asana XL	5.8 oz.	TC	0.3 abcde	0.0 a	0.0 a	0.0 a	99.7 f
Guthion 50WP	12.0 oz	PF, 1-6C					
16 Asana XL	5.8 oz.	TC	0.0 a	0.1 abc	0.0 a	0.0 a	99.5 ef
Imidan 70WP	21.3 oz.	PF, 1-6C					
18 Untreated			3.8 f	4.7 d	4.2 d	0.2 b	75.2 a

1 Data from 'Ginger Gold' evaluation on 2 June. TC on 4/25, P on 4/29, PF on 5/20, 1C on 5/30.

2 Treatment means followed by the same letter are not significantly different.

(Fishers Protected LSD ($P < 0.05$)). Arcsin transformation used prior to statistical analysis.

APPLE: *Malus domestica* 'Delicious'

Green apple aphid (GAA): *Aphis pomi* De Geer

Potato leafhopper (PLH): *Empoasca fabae* (Harris)

Rose leafhopper (RLH): *Edwardsiana rosae* (Linnaeus)

White apple leafhopper (WALH): *Typhlocyba pomaria* McAtee

EVALUATION OF INSECTICIDES AGAINST FOLIAR FEEDING PESTS OF APPLE, 2003: Treatments were applied to four-tree (of which 'Delicious' was included) plots replicated four times in a randomized complete block design. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering 1.3 to 1.9 gal/tree or 130 to 190 gal/acre – the range in gallonage represents increasing amounts of foliage as the season progressed. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

Treatments were applied on various schedules as shown in Tables 2 and 3. Number of green apple aphids (GAA) on 5 terminal leaves/shoot were determined and rated on 0-3 scale (0=0 GAA / lf, 1 = 1-10 GAA / lf, 2 = 11-50 GAA / lf, and 3 = >50 GAA / lf). White apple leafhopper (WALH) infestations were assessed on 7 July (# nymphs on 5 mid-terminal leaves). Potato leafhopper (PLH) infestations were assessed on 28 July (# nymphs on 5 terminal leaves). Damage by WALH feeding (stippling) was assessed on 29 July by sampling 5 mature leaves per shoot and rating on a 0-5 scale. Leafroller (OBLR) damage (# damaged terminals), the number of leafminer (STLM) mines, and rosy apple aphid (RAA) were assessed on 12 August by using 3-minute timed counts. Data were subjected to log transformation prior to analysis by Fisher's Protected LSD.

Infestation pressure from GAA, PLH, WALH (Table 2), and 1st generation OBLR and STLM (Table 3), was low and the data are rather self-explanatory.

Table 2 Efficacy of insecticides against a foliar feeding insect complex on apple^{1,2}, Cornell's Hudson Valley Lab., Highland, N.Y.-2003

Treatment	Formulation amt./100 gal.	Timing	GAA rating 0-3	PLH #/leaf	WALH #/leaf	WALH stippling rating 0-5
4 Calypso 4SC Guthion 50WP	1.0 oz. 12.0 oz.	P, PF,4-C 1C	0.0 a	0.2 bc	0.0 a	0.0 a
5 Calypso 4SC Guthion 50WP	1.3 oz. 12.0 oz.	P, PF,4-C 1C	0.0 a	0.0 a	0.0 a	0.0 a
6 Calypso 4SC Guthion 50WP	1.7 oz. 12.0 oz.	PF,4-C 1C	0.2 c	0.0 a	0.0 a	0.0 a
7 Supracide 2E Damoil Imidan 70WP + LI700 Damoil Mesa Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz. 1.0 gal. 6.7 oz. 2.0 oz. 2.7 oz. 16.0 oz.	TC TC P, PF,1-2C PF PF 1C 3-4C 3-4C	1.0 d	0.0 a	0.0 a	0.0 a
8 Assail 70WG	1.1 oz.	P,PF,1-4C	0.0 a	0.0 a	0.0 a	0.1 a
9 Avaunt Asana XL	2.0 oz. 5.8 oz.	PF, 1C TC,P,2,4C	0.1 ab	0.0 a	0.0 a	0.1 a
10 Intrepid 2F Imidan 70WP	2.7 oz. 21.3 oz.	3-4C P,PF,1C	0.2 c	0.2 bc	0.5 b	1.7 cd
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	TC PF,3-4C 1C 2,4C	0.0 a	0.0 a	0.0 a	0.1 a
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	TC,4C PF 1C 2,4C	0.1 ab	0.2 bc	0.0 a	0.0 a
13 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	TC PF-4C	0.0 a	0.0 a	0.5 bc	1.8 d
16 Asana XL Imidan 70WP	5.8 oz. 21.3 oz.	TC PF-4C	0.1 ab	0.0 a	0.1 a	0.9 b
18 Untreated			0.1 ab	0.2 bc	0.8 cd	2.5 f

1 Data from 'Red Delicious'. Aphid (GAA) evaluation using 0-3 rating ; # PLH (potato leafhopper) nymphs by observing 5 apical terminal leaves on 7 July; and, # WALH (white apple leafhopper) nymphs by observing 5 mid-terminal leaves on 29 July. WALH leaf damage evaluation on 29 July, rating stippling on 0-5 scale. Application phenology: TC=4/25; P=4/29; PF=5/20; 1C=5/30; 2C=6/16; 3C=6/30; and 4C=7/24.

2 Treatment means followed by the same letter are not significantly different. (Fishers Protected LSD ($P < 0.05$)). Log₁₀ (x+1) transformation used prior to statistical analysis.

Table 3 Efficacy of insecticides for controlling foliar feeding insect complex on apple¹, Cornell's Hudson Valley Lab., Highland, N.Y.-2003

Treatment	Formulation amt./100 gal.	Timing	3-minute counts		
			1 st gen. OBLR foliar damage	# STLM mines	RAA damage
4 Calypso 4SC Guthion 50WP	1.0 oz. 12.0 oz.	P, PF,4--5C 1C	2.9 a	0.5 abc	0.0 a
5 Calypso 4SC Guthion 50WP	1.3 oz. 12.0 oz.	P, PF,4--5C 1C	2.5 a	0.3 abc	0.0 a
6 Calypso 4SC Guthion 50WP	1.7 oz. 12.0 oz.	PF,4--5C 1C	3.9 ab	0.0 a	0.0 a
7 Supracide 2E Damoil Imidan 70WP + LI700 Damoil Mesa Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz. 1.0 gal. 6.7 oz. 2.0 oz. 2.7 oz. 16.0 oz.	TC TC P,PF,1-2C PF PF 1C 3-5C 3-5C	4.3 ab	0.0 a	0.0 a
8 Assail 70WG	1.1 oz.	P, PF, 1-5C	5.1 ab	0.3 abc	0.1 a
9 Avaunt Asana XL	2.0 oz. 5.8 oz.	PF, 1C TC,P,2,4C	3.9 ab	0.6 abc	0.1 a
10 Intrepid 2F Imidan 70WP	2.7 oz. 21.3 oz.	3-4C P,PF,1C,5C	4.1 ab	1.3 bcd	1.7 de
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	TC PF,3C,5C 1C 2,4C	2.5 a	0.0 a	0.1 a
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	TC,3C,5C PF 1C 2,4C	4.3 ab	0.2 ab	0.0 a
13 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	TC PF-5C	2.3 a	2.9 def	1.8 ef
16 Asana XL Imidan 70WP	5.8 oz. 21.3 oz.	TC PF-5C	2.7 a	2.8 def	0.9 b
18 Untreated			7.9 b	6.5 f	2.5 g

¹Data from 'Red Delicious'. All evaluations made on 12 August. Leafroller (OBLR) evaluation by observing damaged terminal leaves / 3 minutes; Leaf miner (STLM) evaluation by observing # mines / 3 minutes on mid-terminal leaves. Rosy apple aphid (RAA) evaluation by observing fruit cluster damage / 3 minutes. Application phenology: TC=4/25; P=4/29; PF=5/20; 1C=5./30; 2C=6/16; 3C=6/30; 4C=7/24 and 5C=8/6.

²Treatment means followed by the same letter are not significantly different. (Fishers Protected LSD ($P < 0.05$)). Log₁₀ (x+1) transformation used prior to statistical analysis.

APPLE: *Malus domestica*, 'McIntosh'

Green apple aphid (GAA): *Aphis pomi* De Geer

Spirea aphid (SA): *Aphis spiraecola* Patch

Diptera larvae: Cecidomyiidae: *Aphidoletes aphidimyza*
Syrphidae spp.

EVALUATION OF INSECTICIDES AGAINST APHIDS AND A PREDATOR COMPLEX, 2003:

Treatments were applied once to single-tree plots (buffered by two nearest neighbor trees) replicated five times in a randomized complete block design. Applications were made dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering 2.0 gal/tree or 250 gal/acre. Trees on the M.26 rootstock were 10 yr-old and approximately 10 ft high.

Treatment efficacy was assessed pre treatment (7/2), 5d post treatment (7/7), and 12d post treatment (7/14). Thirty aphid-infested terminals/replicate were tagged for pretreatment counts and subsequent evaluation. Populations of aphids were estimated by a rating system where: 0 = no aphids; 1 = 1-10 aphids/terminal leaf; 2 = 11-100 aphids/terminal leaf; and 3 = >100 aphids/terminal leaf. At the same time, treatment effects on predators were assessed on tagged terminals by counting the number of larvae/5 apical terminal leaves. Prior to statistical analysis by Fisher's Protected LSD, a $\log_{10}(x+1)$ transformation was used to stabilize variance.

Table 4 Evaluation of insecticides for controlling aphid complex on apple
Cornell's Hudson Valley lab, Highland, N.Y.-2003

Treatment	Formulation amt./100 gal.	Timing	Aphid ¹			Aphid ¹	
			Pre cts	5 da post cts		12 da post cts*	
			2 July GAA 0-3 rating	GAA 0-3 rating	% Reduction GAA	GAA 0-3 rating	%Reduction GAA
5. Provado 1.6F	2.0 oz.	2 July	2.0 a	0.0 a	100.0	1.38 b	+591.2
6. Thiodan 50W	16.0 oz.	2 July	2.0 a	0.1 a	96.4	0.82 a	+311.9
7. Untreated	-	-	2.0 a	1.0 b	50.9	0.72 a	+260.9

Treatment	Predator Pre Cts ¹		Predator Post Cts ¹		% Reduction	
	2 July		7 July			
	# Cecid. larvae	# Syrphid. larvae	# Cecid. larvae	# Syrphid. larvae	Cecid. larvae	Syrphid. larvae
5. Provado 1.6F	0.20 a	0.01 a	0.00 a	0.00 a	100.0	100.0
6. Thiodan 50W	0.20 a	0.01 a	0.00 a	0.00 a	100.0	100.0
7. Untreated	0.20 a	0.01 a	0.17 b	0.15 b	13.9	+1381.5

Treatment means followed by the same letter are not significantly different (Fishers Protected LSD ($P < 0.05$)). Prior to statistical analysis, data were transformed by $\log_{10}(x+1)$.

¹ Data from 'McIntosh'. GAA = Green apple aphid / spirea aphid. Rating of 0-3 for green apple aphids / leaf (0=0 aphids / lf, 1 = 1-10 aphids / lf, 2 = 11-50 aphids / lf, 3 = >50 aphids / lf). Data for Cecid. larvae = # of larvae per five apical terminal leaves. Infested leaves were tagged and used for all sample dates of both aphid and predator counts in calculating % reduction. Cecid.= fly larvae in the family Cecidomyiidae; Syrphid = fly larvae in the family Syrphidae, all of which feed on aphids.

APPLE: *Malus domestica* 'Ginger Gold'

Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)

EFFICACY OF CARBARYL AGAINST CURCULIO WHEN USED AT PETAL FALL FOR APPLE THINNING, 2003 – Hudson Valley Lab: Treatments were applied to four-tree plots (one of which was 'Ginger Gold') replicated four times in a randomized complete block design. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering 1.5 gal/tree or 150 gal/acre – the necessary gallonage represents minimal amounts of foliage during the early season. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

Carbaryl (Sevin XLR) is being increasingly recommenced at petal fall for crop load adjustment on hard to thin apple cultivars. Because the effects of such treatment on plum curculio are unknown, we compared XLR at 1.0 and 2.0 pints/100, those two treatments tank mixed with Guthion, Guthion alone at 6.0 and 12.0 oz/100, and an untreated. Treatments were applied once at petal fall (20 May). Damage to fruit was assessed by randomly selecting 100 fruits on 28 May (8d post application) and scoring for external damage by PC adults. Damage data were converted to percent damage and transformed by $\arcsin *(\text{square root of } x)$ prior to analysis by Fisher's Protected LSD. At 8 days post treatment, either rate of Sevin XLR was more effective than the Guthion standard. The addition of Guthion 50W in a tank mix did not increase efficacy over that of XLR alone. Because Rainfall was excessive during the trial (2.32" between PF and 1C), results may reflect the superior rain fastness of XLR relative to Guthion 50WP. These results suggest that the use of Sevin XLR at petal fall will adequately protect apple against damage by PC.

Table 5. Efficacy of carbaryl against plum curculio when applied as a fruit thinning agent on apple. Cornell's Hudson Valley Lab., Highland, N.Y.-2003

Treatment ¹	Rate/100 gal	% PC damage
1 Sevin XLR	1.0 pt	1.6 a
2 Sevin XLR + Guthion 50W	1.0 pt + 6.0 oz.	1.9 ab
3 Sevin XLR	2.0 pt	4.8 ab
4 Sevin XLR + Guthion 50W	2.0 pt + 6.0 oz.	4.6 abc
5 Guthion 50W	6.0 oz.	5.9 bc
6 Guthion 50W	12.0 oz.	7.4 cd
7 Untreated	-	14.5 d

Means followed by the same letter are not significantly different ($P = 0.05$; Fisher's Protected LSD). Data transformed by $\arcsin \sqrt{x}$ prior to analysis to stabilize variance.

¹Applied once to 'Ginger Gold' at PF (20 May); evaluated on 28 May. Rainfall = 2.32" between application and evaluation at 8d postapplication.

APPLE: Malus domestica 'Delicious'

White apple leafhopper (WALH): *Typhlocyba pomaria* McAtee

EVALUATION OF INSECTICIDES AGAINST LEAFHOPPER PESTS OF APPLE, 2003: Treatments were applied to four-tree (of which 'Delicious' was included) plots replicated four times in a randomized complete block design. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering 1.3 to 1.9 gal/tree or 130 to 190 gal/acre – the range in gallonage represents increasing amounts of foliage as the season progressed. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

For management of WALH nymphs, we compared Applaud 70DF at two rates, FujiMite 5%EC, NNI750D 2.27EC, Provado and Thiodan standards, and an untreated. Subsequent to a pre-count of WALH nymphs, treatments were applied once on 21 July (approximate 4th cover period). Efficacy was evaluated 10d post application (31 July) by observing the number of nymphs/5 mid-terminal leaves on 5 terminals/tree. Data were subjected to $\log_{10}(x + 1)$ transformation prior to analysis by Fisher's Protected LSD.

At 10d post application, both standards (Provado at 1/2 maximum use rate) provided good control of WALH (Table 6). Both rates of Applaud were relatively ineffective, as the WALH population increased significantly after 10d. FujiMite and NII both provided excellent control of WALH, being essentially equal to the standards.

Table 6. Efficacy of insecticides against WALH nymphs on apple¹, Cornell's Hudson Valley Lab., Highland, N.Y. -2 003.

Treatment	Formulation amt./100 gal.	21 July ² pre-count	10d post-application	% WALH reduction ¹
		WALH nymph/leaf	WALH nymph/leaf	
1. Applaud 70DF	3.8 oz./100	1.0 c	1.2 b	+21.7
2. Applaud 70DF	7.6 oz./100	0.4 ab	1.0 b	+128.8
3. FujiMite 5% EC	10.7 oz./100	0.1 a	0.1 a	30.9
4. NNI - 750D 2.27EC	8.0 oz./100	0.7 bc	0.1 a	79.6
5. Provado 1.6F	1.0 oz./100	0.5 b	<0.1 a	93.1
6. Thiodan 50W	16.0 oz./100	0.6 bc	0.1 a	85.3
7. Untreated	-	0.7 bc	2.4 c	+237.1

Means followed by the same letter are not significantly different ($P=0.05$; Fishers Protected LSD). To stabilize variance, data were subjected to $\log_{10}(x+1)$ transformation prior to analysis.

¹Data from 'Red Delicious'. Evaluation of WALH by observing # nymphs / 5 mid-terminal leaves on 5 terminals/tree. Positive (+) designation indicates population increase.

²Treatments applied once on 21 July.

APPLE: *Malus domestica* 'Delicious'

A predatory phytoseiid(AMB): *Amblyseius fallacis* (Garman)

European red mite(ERM): *Panonychus ulmi* (Koch)

Twospotted spider mite (TSM): *Tetranychus urticae* Koch

A predatory stigmatid (ZM): *Zetzellia mali* (Ewing)

MITE CONTROL WITH MITICIDES , 2003: Treatments were applied to four-tree plots (of which 'Delicious' was included) replicated four times. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering from 1.3 to 1.9 gal/tree or 130 to 190 gal/acre – the range in gallonage represents increasing amounts of foliage as the season progressed. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Treatments were applied once (27 May) at 7d post petal fall. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from each plot on **15 July, 15 August and 30 August**. 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 were subjected to $\log_{10}(x + 1)$ transformation prior to analysis by Fisher's Protected LSD.

ERM and TSM populations were very low during 2003, and meaningful separation of treatments was not possible. The reasons for low mite populations are not clear; however ZM populations were quite high, particularly during the middle sample period, and may have accomplished biological control in these blocks. If so, it would suggest that all treatments were not detrimental to this valuable predator.

Table 7. Efficacy of miticides against a phytophagous mite and predator mite complex on apple¹, Cornell's Hudson Valley Lab., Highland, N.Y.-2003*Evaluation date : 7/15*

Treatment	Formulation amt./100 gal.	ERM	ERME	TSM	TSME	AMB	AMBE	ZM	ZME
1. Mesa	6.7 oz./100	0.0 a	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.1 a
2. Apollo pH 8.5	1.3 oz./100	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.4 a	0.4 a
3. Apollo pH 5.5	1.3 oz./100	0.0 a	0.4 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.1 a
4. Envidor 2430SC	4.7 oz./100	0.0 a	0.4 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	0.2 a
5. Envidor 2430SC	6.0 oz./100	0.1 a	1.5 a	0.0 a	0.0 a	0.2 a	0.1 a	0.1 a	0.2 a
6. AgriMek0.15EC	5.0 oz./100	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.2 a	0.1 a
Untreated		0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.2 a	0.2 a

Evaluation date: 8/15

1. Mesa	6.7 oz./100	0.0 a	0.1 a	0.0 a	0.0 a	0.2 a	0.0 a	0.3 a	0.1 a
2. Apollo pH 8.5	1.3 oz./100	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.6 a	0.2 a
3. Apollo pH 5.5	1.3 oz./100	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.6 a	0.9 a
4. Envidor 2430SC	4.7 oz./100	0.0 a	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a	0.4 a	0.4 a
5. Envidor 2430SC	6.0 oz./100	0.1 a	0.0 a	0.0 a	0.0 a	0.1 a	0.0 a	0.4 a	0.0 a
6. AgriMek0.15EC	5.0 oz./100	0.2 a	0.2 a	0.0 a	0.0 a	0.0 a	0.0 a	0.5 a	0.8 a
Untreated		0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.8 a	0.8 a

Evaluation date: 8/30

1. Mesa	6.7 oz./100	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.0 a	0.0 a	0.1 a
2. Apollo pH 8.5	1.3 oz./100	0.0 a	0.4 a	0.1 a	0.1 a	0.0 a	0.0 a	0.0 a	0.4 a
3. Apollo pH 5.5	1.3 oz./100	0.0 a	0.1 a	0.4 a	0.4 a	0.0 a	0.1 a	0.0 a	0.1 a
4. Envidor 2430SC	4.7 oz./100	0.0 a	0.0 a	0.0 a	0.2 a	0.1 a	0.0 a	0.0 a	0.2 a
5. Envidor 2430SC	6.0 oz./100	0.1 a	0.1 a	0.1 a	0.3 a	0.1 a	0.1 a	0.2 a	0.2 a
6. AgriMek0.15EC	5.0 oz./100	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.0 a	0.0 a	0.1 a
Untreated		0.1 a	0.1 a	0.1 a	1.4 a	0.1 a	0.0 a	0.0 a	0.2 a

Means followed by same letter are not significantly different ($P \leq 0.05$); Fishers Protected LSD). To stabilize variance, data were subjected to $\log_{10}(x + 1)$ transformation prior to analysis.

¹Data from 'Red Delicious'. ERM=European red mite; TSM=twospotted spider mite; Amb= *Amblyseius fallacis*; ZM=*Zetzellia mali*; and E=eggs.

APPLE: *Malus domestica* 'Delicious'

A predatory phytoseiid(AMB): *Amblyseius fallacis* (Garman)

European red mite(ERM): *Panonychus ulmi* (Koch)

Twospotted spider mite (TSM): *Tetranychus urticae* Koch

A predatory stigmatid (ZM): *Zetzellia mali* (Ewing)

MITE CONTROL WITH INSECTICIDES, 2003: Treatments were applied to four-tree plots (of which 'Delicious' was included) replicated four times. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering from 1.3 to 1.9 gal/tree or 130 to 190 gal/acre – the range in gallonage represents increasing amounts of foliage as the season progressed. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 9 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Treatments were applied on various schedules as shown in Table 8. Application phenology: tight cluster (TC) 4/25; pink (P)=4/29; petal fall (PF)=5/20; first cover (1C)=5/30; 2C=6/16; 3C=6/30; 4C=7/24; 5C=8/6; and 6C=8/15

Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from each plot on 1 July & 5 August. 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 were subjected to \sqrt{X} transformation prior to analysis by Fisher's Protected LSD.

Table 8. Evaluation of insecticides for controlling mite complex on apple^{1,2},
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.- July 1, 2003

Treatment	Formulation amt./100 gal.	ERM	ERME	TSM	TSME	AMB	AMBE	ZM	ZME	ARM
4 Calypso 4SC Guthion 50WP	1.0 oz. 12.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.5 fg	0.8 e-g	97.6 b-d
5 Calypso 4SC Guthion 50WP	1.3 oz. 12.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.2 b-e	0.5 b-g	165.3 cd
6 Calypso 4SC Guthion 50WP	1.7 oz. 12.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.0 a	0.1 a-c	0.2 a-d	212.3 d
7 Supracide 2E Damoil Imidan 70WP + LI700 Damoil Mesa Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz. 1.0 gal. 6.7 oz. 2.0 oz. 2.7 oz. 16.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	5.9 a
8 Assail 70WG	1.1 oz.	0.0 a	0.1 a	0.0 a	0.0 a	0.0 a	0.0 a	0.2 a-e	0.6 c-g	89.4 b-d
9 Avaunt	2.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.1 a	0.1 a	0.0 a	0.1 ab	81.2 b-d
10 Intrepid 2F Imidan 70WP	2.7 oz. 21.3 oz.	0.2 a	0.0 a	0.0 a	0.0 a	0.2 a	0.2 a	0.3 d-g	0.5 b-g	44.8 b
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	0.0 a	0.1 a	0.0 a	0.1 a	0.0 a	0.0 a	0.0 a	0.1 a-c	69.0 b-d
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	96.5 b-d
13 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.0 a	0.0 a	0.1 a	0.1 a	0.0 a	0.2 a	0.1 a-d	0.3 a-e	150.0 b-d
14 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.2 b-e	0.4 a-f	93.8 b-d
15 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.0 a	0.0 a	0.0 a	0.1 a	0.0 a	0.0 a	0.2 b-e	0.3 a-e	89.8 b-d
16 Asana XL Imidan 70WP	5.8 oz. 12.0 oz.	0.2 a	0.3 a	0.0 a	0.0 a	0.0 a	0.1 a	0.1 ab	0.2 a-d	141.9 b-d
17 Asana XL Imidan 70WP	5.8 oz. 12.0 oz.	0.1 a	0.0 a	0.0 a	0.1 a	0.1 a	0.0 a	0.2 b-e	0.4 a-f	74.3 b-d
18 Untreated		0.0 a	0.2 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 c-f	0.6 d-g	103.5 b-d

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

1 Data from 'Red Delicious'.

Table 8. Evaluation of insecticides for controlling mite complex on apple ^{1,2},
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y. - August 5, 2003

Treatment	Formulation amt./100 gal.	ERM	ERME	TSM	TSME	AMB	AMBE	ZM	ZME	ARM
4 Calypso 4SC Guthion 50WP	1.0 oz. 12.0 oz.	0.0a	0.0a	1.9e	1.7e-g	0.1ab	0.0a	1.9e	1.7eg	29.0a
5 Calypso 4SC Guthion 50WP	1.3 oz. 12.0 oz.	0.0 a-c	0.0 a	0.6 a-d	1.1 c-g	0.0 a	0.1 a	0.6 a-d	1.1c-g	51.4 a-e
6 Calypso 4SC Guthion 50WP	1.7 oz. 12.0 oz.	0.0 a-c	0.1 a	0.7 a-d	1.2 d-g	0.2 ab	0.0 a	0.7 a-d	1.2 d-g	59.8 a-f
7 Supracide 2E Damoil Imidan 70WP + LI700 Damoil Mesa Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz. 1.0 gal. 6.7 oz. 2.0 oz. 2.7 oz. 16.0 oz.	0.0 a-c	0.0 a	0.0 a	0.0 a	0.1 ab	0.0 a	0.0 a	0.0 a	50.2 a-e
8 Assail 70WG	1.1 oz.	0.4 bc	0.1 a	1.3 de	2.4 g	0.2 ab	0.1 a	1.3 de	2.4 g	95.4 c-f
9 Avaunt Asana XL	2.0 oz. 5.8 oz.	0.0 a	0.1 a	0.0 a	0.1 ab	1.5 c	0.4 a	0.0 a	0.1 ab	142.2 f
10 Intrepid 2F Imidan 70WP	2.7 oz. 21.3 oz.	0.0 a	0.0 a	0.7 a-d	0.9 a-f	0.0 a	0.0 a	0.7 a-d	0.9 a-f	24.9 a
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	0.0 a	0.0 a	0.1 ab	0.1 a	0.2 ab	0.0 a	0.1 ab	0.1 a	108.4 ef
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz. 1.6 oz.	0.0 ab	0.1 a	0.0 a	0.2 a-c	0.2 ab	0.1 a	0.0 a	0.2 a-c	104.9 d-f
13 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.4 c	0.1 a	0.7 a-d	1.0 c-g	0.4 b	0.5 a	0.7 a-d	1.0 c-g	74.7 b-f
14 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.2 a-c	0.2 a	0.3 a-c	0.5 a-d	0.1 ab	0.1 a	0.3 a-c	0.5 a-d	74.0 b-f
15 Asana XL Guthion 50WP	5.8 oz. 12.0 oz.	0.1 a-c	0.1 a	0.6 a-d	1.0 b-g	0.1 ab	0.0 a	0.6 a-d	1.0 b-g	39.1 a-c
16 Asana XL Imidan 70WP	5.8 oz. 12.0 oz.	0.2 a-c	0.8 b	0.2 ab	0.2 a-c	0.1 ab	0.1 a	0.2 ab	0.2 a-c	57.2 a-f
17 Asana XL Imidan 70WP	5.8 oz. 12.0 oz.	0.0 a	0.0 a	0.7 b-d	0.7 a-e	0.1 ab	0.1 a	0.7 b-d	0.7 a-e	30.9 ab
18 Untreated		0.1 a-c	0.1 a	1.1 c-e	1.5 d-g	0.1 ab	0.1 a	1.1 c-e	1.5 d-g	57.6 a-f

2 Data from 'Red Delicious'.

Mean separation by Fishers Protected LSD ($P < 0.05$). Arc Sine transformation used for statistical analysis. Treatment means followed by the same letter are not

APPLE: *Malus domestica* 'McIntosh'

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)

Misc. Heteroptera: Apple brown bug, *Atractotomus mali* (Meyer)

Apple red bug, *Lygidea mendax* Reuter

Mullein plant bug, *Campylomma verbasici* (Meyer)

Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)

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 ON APPLE, 2003:

Treatments were applied to four-tree plots (one of which was 'McIntosh') replicated four times in a randomized complete block design. Treatments were applied dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, delivering from 1.3 to 1.9 gal/tree or 130 to 190 gal/acre – the range in gallonage represents increasing amounts of foliage as the season progressed. All insecticide dilutions (presented as amt/100 gal) are based on a standard of 300 gal/acre trees. Trees on the M.26 rootstock were 8 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30.

Treatments were applied on various schedules as shown in **Table 9**. Application phenology: tight cluster (TC) 4/25; pink (P)=4/29; petal fall (PF)=5/20; first cover (1C)=5./30; 2C=6/16; 3C=6/30; 4C=7/24; 5C=8/6; and 6C=8/15

Damage to fruit was assessed by randomly selecting 100 fruit at harvest maturity (18 Sept), removing to the laboratory, and scoring for external damage by each pest; subsequently, fruits were dissected to detect internal damage. Early PC damage is characterized by the typical crescent-shaped scar resulting from the flap of apple epidermis made by an ovipositing female. Late PC damage is characterized by a feeding or oviposition cavity that lacks the typical crescent-shaped scar. Damage by early Lepidoptera includes GFW & OBLR; external Lepidoptera includes OBLR and/or red banded leafroller, and internal damage was caused primarily by CM. Damage by TPB (the typical inverted cone scars usually at the calyx end) was separated from damage by miscellaneous Heteroptera, which is typified by either raised pustules or by larger raised scars somewhat resembling damage by PC. Data were converted to % damaged fruit, and transformed by arcsine (square root of x) prior to analysis by Fisher's Protected LSD.

The 2003 production season was unusually wet. Due in large to foul weather, infestation pressure from all insects was generally low. Populations of early Leps., EAS, internal Leps., SJS, and miscellaneous Heteroptera (mirid bug complex) were low and rather easily controlled. However, high populations of PC, external Leps., and AM were present.

Only treatments #8, #9 and #11 maintained TPB damage below 1%. High indigenous populations of curculio are present at this site, providing a stern test for insecticide schedules. In

general, all treatments except Assail provided good protection from both early and late curculio. All treatments or schedules, except Calypso, performed well against external Leps. All treatments or schedules performed well against relatively low AM pressure. Relative to overall protection, treatments #9 through # 12 provided excellent insect control, giving >90% clean fruit. Due to a very wet July (4.15 inches rain, there was an unusually large gap between 3C and 4C applications that may have negatively affected the performance of some treatments.

Table 9. Evaluation of insecticides for controlling insect complex on apple¹
Cornell's Hudson Valley Lab., Highland, N.Y.-2003.

			% Damaged ² fruit							
Treatment	Formulation amt./100 gal.	Timing	TPB	Early Lep.	EAS	Early PC	Late PC	Ext. LEP	Int. Lep	
4 Calypso Guthion 50WP	1.0 oz 12.0 oz	P, PF, 4-6C 1C	1.9	c-e	0.1 a	0.1 a	0.2 a	0.5 ab	3.6 a-c	0.1 a
5 Calypso Guthion 50WP	1.3 oz 12.0 oz	P, PF, 4-5C 1C	3.5	de	0.0 a	0.0 a	0.0 a	0.5 ab	2.8 ab	0.0 a
6 Calypso Guthion 50WP	1.7 oz 12.0 oz	PF, 4-5C 1C	2.4	c-e	0.1 a	0.8 a	0.4 a	1.0 ab	5.8 bc	0.0 a
7 Supracide + 2% oil Imidan 70WP + Silwet Mesa + Damoil Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz 6.7 oz. 1.0 gal. 2.0 oz. 2.7 oz. 16.0 oz	DD DD P, PF, 1-2C P, 1-2C PF PF 1C 3-5C 3-6C	1.2	b-d	0.0 a	0.1 a	1.6 a-c	0.9 ab	0.6 a	0.1 a
8 Assail	1.1 oz.	P, PF, 1-6C	0.4	a-c	0.0 a	0.1 a	6.3 cd	0.1 ab	0.7 a	0.0 a
9 Asana XL Avaunt	5.8 oz. 2.0 oz.	TC,P,2, 4-6C PF, 1C	0.0	a	0.0 a	0.0 a	0.7 a	0.1 ab	0.2 a	0.1 a
10 Imidan 70WP Intrepid 2F	21.3 oz. 2.7 oz.	P, PF, 1,5-6C 3-4C	3.5	de	0.0 a	0.0 a	0.1 a	0.9 ab	1.0 ab	0.1 a
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz 1.6 oz.	TC PF, 3, 5C 1C 2, 4, 6C	0.2	a-c	0.2 a	0.0 a	0.2 a	<0.1 ab	0.3 a	0.0 a
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz 1.6 oz.	TC, 5C PF 1C 2, 4, 6C	1.1	b-d	0.0 a	0.1 a	0.1 a	0.1 ab	1.0 ab	0.0 a
18 Untreated			2.4	c-d	0.2 a	0.1 a	11.1 d	11.2 c	10.7 c	3.6 b

¹ Data from 'Red Max' McIntosh on 8 September.

² Mean separation by Fishers Protected LSD ($P \leq 0.05$). Arcsin transformation used for statistical analysis of data expressed as percentages. Treatment means followed by the same letter are not significantly different.

³ McIntosh phenology: 1/2" G on 3/29; TC on 4/25; Pink on 4/29, Bloom on 5/1; PF on 5/20, 1C on 5/30, 2C on 6/16, 3C on 6/30, 4C on 7/24, 5C on 8/6, 6C on 8/15.

Table 9 (cont.)

Evaluation of insecticides for controlling insect complex on apple ¹,
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2003

			% Damaged ² fruit					
Treatment	Formulation amt./100 gal.	Timing	Pct. AM	Tunnel AM	SJS	Misc. Hetrop.	Clean	
4 Calypso Guthion 50WP	1.0 oz 12.0 oz	P, PF, 4-6C 1C	0.4 a-c	0.5 ab	2.5 a	0.8 a	87.9 b-e	
5 Calypso Guthion 50WP	1.3 oz 12.0 oz	P, PF, 4-5C 1C	0.1 ab	0.1 ab	3.9 a	0.0 a	87.7 b-e	
6 Calypso Guthion 50WP	1.7 oz 12.0 oz	PF, 4-5C 1C	0.4 a-c	0.1 ab	0.2 a	0.1 a	88.2 b-e	
7 Supracide + 2% oil Imidan 70WP + Silwet Mesa + Damoil Provado 1.6F Intrepid 2F Imidan 70WP	16.0 oz. 2.0 gal. 21.3 oz. 16.0 oz 6.7 oz. 1.0 gal. 2.0 oz. 2.7 oz. 16.0 oz	DD DD P, PF, 1-2C P, 1-2C PF PF 1C 3-5C 3-6C	1.0 a-d	1.1 b	0.0 a	1.0 a	84.1 bc	
8 Assail	1.1 oz.	P, PF, 1-6C	0.7 a-c	0.0 a	0.0 a	0.2 a	84.8 bc	
9 Asana XL Avaunt	5.8 oz. 2.0 oz.	TC,P,2, 4-6C PF, 1C	0.1 a	0.1 ab	0.1 a	0.2 a	97.4 f	
10 Imidan 70WP Intrepid 2F	21.3 oz. 2.7 oz.	P, PF, 1,5-6C 3-4C	0.9 a-d	<0.1 ab	0.1 a	0.1 a	93.3 c-f	
11 Actara Warrior Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz 1.6 oz.	TC PF, 3, 5C 1C 2, 4, 6C	0.0 a	<0.1 ab	0.8 a	0.0 a	96.1 ef	
12 Warrior Actara Guthion 50WP Proclaim	1.7 oz. 1.7 oz. 12.0 oz 1.6 oz.	TC, 5C PF 1C 2, 4, 6C	0.1 a	0.8 ab	0.1 a	0.2 a	95.7 d-f	
18 Untreated			3.5 d	6.6 c	1.2 a	2.4 a	54.1 a	

¹ Data from 'Red Max' McIntosh on 8 September.

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

³ M^cIntosh phenology: 1/2" G on 3/29; TC on 4/25; Pink on 4/29, Bloom on 5/1; PF on 5/20, 1C on 5/30, 2C on 6/16, 3C on 6/30, 4C on 7/24, 5C on 8/6, 6C on 8/15.

PEAR: *Pyrus communis* L. 'Bartlett'

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

Pear rust mite (PRM): *Epirimerus pyri* (Nalepa)

PEAR PSYLLA CONTROL WITH CONVENTIONAL INSECTICIDE PROGRAMS,

2003: 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 25 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 treatments commenced 10d post petal fall (28 May): FujiMite 5%EC @ 8.0 oz/100 gal; Assail 70WP @ 0.85 oz/100 gal. + Dammoil @ 0.25 gal/100; AgriMek 0.15EC @ 2.5 oz/100 gal + Dammoil @ 0.25 gal/100 gal; and an untreated check. All plots received Guthion at petal fall (PF) and 12d post PF for plum curculio and pear midge. AgriMek was used in a standard split application program, with the 2nd application dictated 14d after the first application (17 June).

Insecticide efficacy against psylla was evaluated (6 & 23 June; 8 and 15 July) by sampling five terminals/treatment – from each we examined one proximal, one distal, and three mid-terminal leaves (25 leaf samples). Samples were removed to the laboratory, where psylla nymphs and eggs, and PRM were counted using a binocular scope. Data were transformed by $\log_{10}(X+1)$ prior to analysis by Fisher's Protected LSD test.

Pear rust mite populations were of no consequence (Table 10). Psylla populations remained low until the third sampling (23 June) when all treatments were over the threshold of 2 nymphs/leaf. Because of high egg and nymph numbers, FujiMite and Assail were reapplied on 1 July. Subsequent evaluations (8 July and 15 July) showed significant decreases in nymph and egg numbers. The current commercial standard treatment is AgriMek applied twice at the half rate (10 oz/acre each). Because FujiMite and Assail needed reapplication, these two treatments are apparently unequal to the efficacy of AgriMek.

Table 10. Efficacy of insecticides against pear psylla on 'Bartlett' pear. Cornell's Hudson Valley Lab., Highland, N.Y. - 2003

Evaluation date: 6 June

				# / Leaf*	# / Leaf*	# / Leaf*
				Nymphs	Eggs	Pear Rust Mites
Treatment	Application					
1 FujiMite 5%EC	8.0 oz	5/28		0.3 b	8.1 b	0.0 a
2 AgriMek 0.15EC	2.5 oz.	5/28		0.1 a	2.2 a	0.0 a
3 Assail	0.85 oz.	5/28		0.1 a	6.7 b	0.0 a
4 Untreated	-	-		0.2 a	12.1 b	0.0 a

Evaluation date: 23 June

				# / Leaf*	# / Leaf*	# / Leaf*
				Nymphs	Eggs	Pear Rust Mites
Treatment	Application					
1 FujiMite 5%EC	8.0 oz	5/28		3.3 a	11.1 a	0.0 a
2 AgriMek 0.15EC	2.5 oz.	5/28, 6/17		3.8 a	14.1 ab	0.0 a
3 Assail	0.85 oz.	5/28		5.2 a	20.0 bc	0.0 a
4 Untreated	-	-		6.1 a	25.4 c	0.0 a

Evaluation date: 8 July

				# / Leaf*	# / Leaf*	# / Leaf*
				Nymphs	Eggs	Pear Rust Mites
Treatment	Application					
1 FujiMite 5%EC	8.0 oz	5/28, 7/1		0.8 a	1.4 a	0.0 a
2 AgriMek 0.15EC	2.5 oz.	5/28, 6/17		0.9 a	1.4 a	0.0 a
3 Assail	0.85 oz.	5/28, 7/1		1.5 a	3.6 a	0.0 a
4 Untreated	-	-		2.1 a	11.0 b	0.0 a

Evaluation date: 15 July

				# / Leaf*	# / Leaf*	# / Leaf*
				Nymphs	Eggs	Pear Rust Mites
Treatment	Application					
1 FujiMite 5%EC	8.0 oz	5/28, 7/1		0.6 a	2.8 a	0.0 a
2 AgriMek 0.15EC	2.5 oz.	5/28, 6/17		1.1 ab	5.6	0.0 a
3 Assail	0.85 oz.	5/28, 7/1		0.6 a	4.0a	0.0 a
4 Untreated	-	-		2.6 b	6.5a	0.0 a

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.

¹Counts taken from 5 terminals/trmt. Five terminals/treatment were sampled and from each, one proximal, one distal, and three mid-terminal leaves (25 leaf samples) were examined. Application Timings: Petal Fall on 18 May; 2nd split AgriMek application (14d after 1st appn.) on 17 June; Rescue treatments of FujiMite and Assail on 1 July.

European corn borer (ECB): *Ostrinia nubilalis* (Hubner)

Corn earworm (CEW): *Helioverpa zea* (Boddie)

INSECT CONTROL ON SWEET CORN WITH FOLIAR SPRAYS OF

INSECTICIDES, 2003: 'Absolute' sweet corn was planted 27 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 starting at first silk. Applications were made as follows: Warrior, Warrior red dot, SpinTor and SpinTor + MSR (16, 19, 22 & 27 August); and, GF-317 (16, 19, 25 & 28 August). The six-day treatment interval for GF-317 was due to a delay in shipment of additional material. Efficacy was assessed 7d after the final application by examining 25 randomly selected ears per treatment/replicate. Percentage data were transformed by $\arcsin * (\text{sq. rt. } X)$ prior to analysis by Fisher's Protected LSD test.

After some years of unexplained absence, ECB populations have once again become a major pest in New York. Migratory populations of CEW were only moderate. Although low numbers of fall armyworm were caught in pheromone traps, no larvae were found in the harvest samples.

Under relatively low infestation pressure, all treatments performed better than untreated, and allowed damage levels impressively below the 5% infested ear threshold. No difference was found between SpinTor rates, or between SpinTor and the combination with MSR, or between the standard Warrior and the Warrior red dot formulation. The efficacy of GF-317 was greatly affected by the relatively high infestation of one replicate that was positioned next to a roadway.

Table 11. Efficacy of insecticides for managing European corn borer (ECB) and Corn earworm (CEW) on late season sweet corn. Cornell's Hudson Valley Lab, Highland, NY. – 2003.

Treatment	Rate	% damage		
		ECB	CEW	Total
SPINTOR 2SC	3.0 OZ/A	0.0 a	0.0 a	0.0
WARRIOR1E ¹	3.2 OZ/A	0.3 a	0.0 a	0.3
WARRIOR RED DOT 1E ¹	3.2 OZ/A	0.0 a	0.3 a	0.3
SPINTOR 2SC	6.0 OZ/A	0.5 a	0.3 a	0.8
WARIOR 1E ¹	2.6 OZ/A	1.0 a b	0.3 a	1.3
SPINTOR + MSR 2SC	3.0 OZ 24 OZ/A	0.5 a	1.0 a	1.5
GF 317 ²	3.2 OZ/A	0.8 a	1.8 a	2.6
UNTREATED		2.0 b	9.3 b	11.3

Means followed by the same letter are not significantly different ($P < 0.5$; Fisher's protected LSD). Percentage data transformed by $\arcsin * (\text{sq. rt. } X)$ prior to analysis. Evaluation on 5 Sept.

¹Lambda cyhalothrin

²Gamma cyhalothrin; one replicate next to a road had greater infestation than remaining replicates.

ONION: *Allium cepa* L. 'Spartan Banner 80'

Onion thrips: *Thrips tabaci* Lindeman

CONTROL OF ONION THRIPS WITH INSECTICIDES, CHESTER, NY 2003:

Onion was seeded into muck soil on 26 April using a cone seeder mounted onto a PlanetJr frame. Treatments were arranged in 1-row plots, 40 ft long, and replicated 4 times in a randomized block design. Insecticide emulsion treatments were applied over the plants with a CO₂ pressurized (100 PSI) backpack sprayer dispensing 38 GPA @ 2 MPH. Rates were based on 15" rows (34,848 linear ft./acre). Foliar sprays were applied on 2 July, 9 July, 17 July, 25 July and 31 July. Efficacy evaluations were made 5 to 7 days post application by harvesting 10 randomly selected plants per treatment-replicate, and examining the 4 youngest leaves for number of nymphs and adults by means of a 10-power 'OptiVisor' scope. Seasonal data were converted to cumulative thrips days per plant (1 nymph/plant for one day) by the formula: $CTD = [0.5(tpl_1 + tpl_2)] * d_{1-2}$, where tpl_1 is the number of thrips per leaf at time 1, tpl_2 is the number of thrips per leaf at time 2, and d_{1-2} is the number of days elapsed between the 2 counts. Data were subjected to $\log_{10}(x+1)$ transformation prior to analysis by Fisher's Protected LSD.

Weather for Southeastern NY during the '03 thrips season was generally wet. There were rain events during 20d of the 32d trial period (10.4" total rainfall). Because rainfall is generally detrimental to thrips survival, infestations were correspondingly low. However, populations were sufficient for reasonably good assessment of treatment effects. The treatment threshold is 3 thrips/leaf.

Because the effects of thrips damage are more easily measured over time, the use of cumulative thrips days is a preferred method of presenting results of field studies. In general, CTD's greater than 200 are required to cause economic loss.

Table 12. Efficacy of foliar insecticides against onion thrips. Cornell's Hudson Valley Lab., Highland NY – 2003.

Treatment	Rate/ acre	Av. number thrips per leaf				CTD ¹
		29 July (5d post.)	5 Aug (6d post)	14 Aug (8d post)	19 Aug (5d post)	
1. Vydate 2L	3.0 pt	0.7 a	0.2 a	1.3 a	0.8 ab	38.1
2. Vydate 2L	4.0 pt	1.3 a	0.3 a-c	1.7 a	0.3 a	40.7
3. Lannate LV	48 oz	1.3 a	0.2 a	1.2 a	1.7 b-d	44.7
4. Warrior 1E	3.2 oz	0.9 a	0.3 a-c	1.9 a	1.7 b-d	50.4
5. Assail 70WP	2.28 oz	1.0 a	0.5 a-d	2.5 a	0.9 ab	60.4
6. MSR 2SC	32 oz	1.4 a	0.6 b-d	3.0 a	2.0 b-d	62.5
7. IPM schedule ²	footnote 2	1.2 a	0.4 a-d	2.8 a	4.9 cd	67.9
8. SpinTor 2SC	4.5 oz	1.6 a	1.0 de	1.8 a	1.7 b-d	69.2
9. Vydate/MSR ³	3 pt/32 oz	1.2 a	0.5 a-d	3.5 a	2.6 b-d	69.6
10. Vydate/Warrior ³	3 pt/3.2 oz	1.7 a	0.7 c-e	2.8 a	2.5 b-d	71.1
11. MSR/Warrior ³	32 oz/3.2 oz	1.8 a	0.7 c-e	3.9 a	1.5 bc	79.0
12. Untreated	-	3.3 a	1.7 e	4.2 a	4.5 cd	114.2

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.

¹Cumulative thrips days = $[0.5(tpl_1 + tpl_2)] * d_{1-2}$, where tpl_1 is the number of thrips per leaf at time 1, tpl_2 is the number of thrips per leaf at time 2, and d_{1-2} is the number of days elapsed between the 2 counts.

²IPM schedule: two consecutive applications of SpinTor (4.5 oz/A), followed by two applications of MSR (32 oz/A).

³ Alternate applications of each.

ONION: *Allium cepa* L. 'Millenium'

Onion maggot: *Delia antiqua* (Meigen)

CONTROL OF ONION MAGGOT WITH INSECTICIDE DRENCH AND SEED TREATMENTS, PINE ISLAND, NY - 2003:

Two experiments were performed: (A) evaluation of seed treatments, and (B) assess resistance to Lorsban within local onion maggot populations. Onion was seeded (ca. 17 seeds/row foot) into muck soil on 8 April using a cone seeder mounted onto a PlanetJr frame. Treatments were arranged in 1-row plots, 40 ft long, and replicated 4 times in a randomized block design. In furrow drench treatments were applied using the cone seeder equipped with a CO₂ pressurized (100 PSI) sprayer dispensing 38 GPA @ 2 MPH. Insecticide treatment of onion seeds (film coating; fungicide also applied) was performed at Dept. of Hort. Sci. Seed Lab., NYSAES, Geneva. At ten days post emergence, a stand count in each treatment was determined by counting the number of seedlings per 20 ft of row marked from the center of each 40 ft plot. Efficacy evaluations, began 27 May and following at weekly intervals for 6 weeks, were made by examination of all wilted or dead plants and recording the number damaged by onion maggot. Numbers of damaged plants at each evaluation were divided by initial stand count to compute percent damage. Percentage data were subjected to arcsin * (sq. rt. X) transformation and counts transformed by $\log_{10}(x+1)$, prior to analysis by Fisher's Protected LSD.

Throughout most of the '03 season, Southeastern NY experienced above average rainfall (APPENDIX I; not entirely representative of Orange County). Plots however, were not subjected to undue stress prior to stand count estimation and efficacy evaluation.

Experiment A, evaluation of seed treatments – The similarity among stand counts suggest that seed treatments provided emergence relative to drench treatments. Very good control was provided by GUS-I (composition unknown), Icon (fipronil), Spintor (spinosad) and Trigard (1.4 – 3.0 % cumulative damage)(Table 13). The high degree of control provided by Spintor verified the efficacy obtained during last season's field trials –this neonicotinoid material has not before been noted for activity against dipteran larvae. Given the extremely wet conditions preceding and during the evaluations, all seed treatments fared much better than expected. Good performance by new chemistries as seed treatments is encouraging.

Experiment B– Evaluation of insecticide infurrow drench and seed-treatments to assess potential onion maggot resistance in local onion maggot populations. In a continuing project in both downstate and upstate onion production areas, Lorsban and other selected treatments are monitored annually at the same locations in efforts to monitor the relative susceptibility to Lorsban of local populations. Among all locations, treatments provided the same order of efficacy, i.e., Icon (fipronil) seed treatment > Trigard seed treatment + Lorsban > Lorsban alone > untreated (Table 14.). At Location 1 and 3, the performance of Lorsban alone was significantly poorer than the combination of Trigard + Lorsban, suggesting a potential for resistance to Lorsban. At location 2 however, the same response was not evident, suggesting that no significant degree of tolerance to Lorsban yet exists. In those areas, continued periodic rotation to other modes of action is warranted.

Table 13. Efficacy of insecticide seed-treatments against onion maggot, Pine Island, NY – 2003.

Treatment ¹	Rate ¹	Stand count (# plants/20' row)	Total no. damaged plants	Cumulative maggot damage (%)
GUS-I	50 g/kg	195 a	2.2 a	1.8 a
Icon ^{2,4}	25 g/kg	268 a	8.0 b	4.5 ab
Trigard + Lorsban D	50 g/kg + 1.3 oz/1000'	257 a	14.6 bc	6.0 abc
Entrust	25 g/kg	300 a	27.4 cd	10.4 cde
Spintor	25 g/kg	344 a	34.5 cde	11.7 cde
Lorsban D	1.3 oz/1000'	279 a	36.8 de	15.0 de
Crusier ³	50 g/kg	247 a	32.7 cde	16.3 e
Untreated check	-	273 a	74.0 e	27.6 f

Means followed by the same letter are not significantly different ($P < 0.5$; Fishers Protected LSD). Percentage data transformed by $\arcsin * (\text{sq. rt. } X)$ prior to analysis; count data transformed by $\log_{10}(x+1)$.

¹Seed treatment rates expressed as grams AI/kilogram of seed. All received PRO-GRO fungicide @ 20 g AI/kg. D = infurrow drench

²Seed treatment formulation of fipronil.

³Thiamethoxam

⁴Seed treatment of Spintor formulated for organic production.

Table 14. Evaluation of insecticide infurrow drench and seed-treatments to assess potential onion maggot resistance in local onion maggot populations, Pine Island, NY – 2003.

Treatment ¹	Rate	Cumulative % stand loss ²			Mean
		Location 1	Location 2	Location 3	
Icon ST ³	25 g/kg	2.7 d	2.2 b	1.2 d	2.0 d
Trigard ST + Lorsban D ⁴	50 g/kg + 1.3 oz/1000'	4.6 cd	2.5 b	2.1 cd	3.1 cd
Lorsban D ⁴	1.3 oz/1000'	13.2 b	3.6 b	8.3 ab	8.4 ab
Untreated	-	24.3 a	14.9 a	11.5 a	16.9 a

Means followed by the same letter are not significantly different ($P < 0.5$; Fishers Protected LSD). Data transformed by $\arcsin * (\text{sq. rt. } x)$ prior to analysis.

¹All treatments received PRO-GRO fungicide @ 20 g AI/kg; D = in furrow drench; ST = seed treatment.

²Three sample sites (commercial onion fields) separated by ca. 5 miles.

³Seed treatment formulation of fipronil. Seed treatment rates expressed as grams AI/kg of seed.

⁴D = infurrow drench

- MATERIALS TESTED -

Actara.....	Syngenta
Apollo.....	Makhteshim-Agan
AgriMek.....	Syngenta
Applaud.....	Nichino America, Inc
Asana.....	Dupont
Assail.....	Cerexagri
Avaunt.....	Dupont
Calypso.....	Bayer CropScience
Confirm.....	Dow
Crusier seed treatment.....	Bayer CropScience
Guthion.....	Bayer CropScience
GUS-I seed treatment.....	Gustafson
Endivor.....	Bayer CropScience
Entrust seed treatment.....	Dow AgroSciences
FujiMite.....	Nichino America, Inc
GF 317.....	Dow AgroSciences
Icon seed treatment.....	Bayer CropScience
Imidan.....	Gowan
Intrepid.....	Dow AgroSciences
Lannate LV.....	Dupont
Lorsban.....	Dow AgroSciences
Mesa.....	Gowan
MetaSystox R.....	Gowan
NNI 750D.....	Nichino America, Inc
Provado	Bayer CropScience
Sevin XLR.....	Bayer CropScience
SpinTor.....	Dow AgriSciences
Supracide.....	Gowan
Thiodan.....	FMC
Trigard seed treatment.....	Syngenta
Vydate.....	DuPont
Warrior.....	Syngenta
Warrior red dot.....	Syngenta

2003 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION Hudson Valley Laboratory, Highland, NY

All readings were taken at 0800 EST on the dates indicated

Date	MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER		
	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip
1	39	23		40	21	0.06	69	49	0.01	67	59	1.49	83	55		82	64	0.12	72	56	0.19
2	41	32		37	31		73	52	0.25	61	44	0.04	83	57		75	66	0.26	64	60	3.24
3	43	8	0.63	52	37	0.12	76	45	0.26	72	48	0.01	87	61		86	72		61	58	0.26
4	19	2		41	35	0.01	60	41		71	54	0.21	83	65		85	71	2.12	66	62	0.47
5	37	12		38	32	0.03	66	36		61	56	0.19	93	69	0.32	83	73	0.10	75	58	
6	47	28	0.24	38	27	0.16	64	41	0.06	71	53		92	72		85	67	0.74	75	52	
7	28	-3	0.50	43	26		64	46		77	55	0.01	91	65		83	68	0.03	74	51	
8	32	15		34	29		79	54	0.13	63	60	0.43	87	67	1.41	82	70	0.07	80	60	
9	44	31		39	32	0.24	61	53	0.08	68	58		89	68		82	71		75	55	
10	47	9		42	36	0.04	68	45		74	56		71	58	0.37	83	73	0.56	73	50	
11	27	6		54	37	0.04	72	54		80	60		76	62	0.16	82	69	2.56	75	53	
12	39	22		48	36	0.32	66	50	0.28	75	68		74	59	0.04	80	71	1.14	80	53	
13	50	33		67	38		66	51		71	65	0.67	81	59		84	72	0.03	73	58	
14	34	13	0.51	57	29		61	45	0.03	68	61	0.11	78	58		87	67	0.01	71	62	0.19
15	34	21		63	42		63	45		84	56		80	60		89	62	0.01	84	70	0.02
16	52	30		84	55		72	52		82	54		85	66	0.02	89	68		78	62	0.39
17	67	38		86	33		62	44		73	51		85	59		88	68	0.03	77	51	
18	68	44		47	34		67	38		72	58	0.17	84	64		81	63		76	57	
19	56	28		50	35		74	39		68	60		74	57	0.13	81	62		75	60	0.41
20	49	30	0.01	68	38		80	42		77	62	0.17	81	54		85	62		81	65	0.02
21	51	32	1.18	71	38		81	55	0.20	64	60	0.21	83	64		87	63		80	49	
22	65	43	0.04	68	48	0.19	64	51	0.01	66	57	0.79	84	67	1.36	90	70		73	51	
23	64	37		61	43	0.02	55	51	0.04	66	59	0.70	81	70	0.18	91	59	0.03	70	59	1.23
24	55	28		45	37		56	53	0.11	87	61		82	69	0.13	81	53		72	50	0.86

25 59 35 59 35 60 54 0.04 92 60 83 62 0.02 78 60 73 51

Date	MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER		
	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip
26	65	37		67	50	0.11	64	55	0.96	93	68		85	59		84	61		76	56	0.23
27	60	34	0.11	56	49	0.16	60	53	0.57	93	69		87	68	0.02	81	68		68	57	0.01
28	62	35		68	40		68	57	0.39	92	60		87	67		86	55		78	67	1.15
29	65	48		81	53		69	53	0.30	83	59		83	58		78	53		70	51	0.33
30	72	38		75	43		74	58	0.02	82	65		83	60		80	66	0.24	65	43	0.13
31	38	26					75	56	0.05				86	58		77	52				
Avg/																					
Total	48.7	26.3	4.03	56.0	37.3	1.50	67.4	49.0	3.79	75.1	58.5	5.20	83.3	62.5	4.16	83.4	65.1	8.05	73.7	56.2	9.13

25 59 35 59 35 60 54 0.04 92 60 83 62 0.02 78 60 73 51

Date	MARCH			APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER		
	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip	Max	Min	Precip
26	65	37		67	50	0.11	64	55	0.96	93	68		85	59		84	61		76	56	0.23
27	60	34	0.11	56	49	0.16	60	53	0.57	93	69		87	68	0.02	81	68		68	57	0.01
28	62	35		68	40		68	57	0.39	92	60		87	67		86	55		78	67	1.15
29	65	48		81	53		69	53	0.30	83	59		83	58		78	53		70	51	0.33
30	72	38		75	43		74	58	0.02	82	65		83	60		80	66	0.24	65	43	0.13
31	38	26					75	56	0.05				86	58		77	52				
Avg/																					
Total	48.7	26.3	4.03	56.0	37.3	1.50	67.4	49.0	3.79	75.1	58.5	5.20	83.3	62.5	4.16	83.4	65.1	8.05	73.7	56.2	9.13