RESULTS OF 2008 INSECTICIDE AND ACARICIDE STUDIES IN EASTERN NEW YORK

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Acknowledgements

The following companies contributed greatly in providing support for these trials; in providing materials used in both research trials and in the maintenance of our orchards, as well as grant funding for studies included in this report. BASF Corporation, Bayer, Dow AgroSciences, DuPont Agricultural Enterprise, Gowan Company, ISK Biosciences, Syngenta, United Phosphorus, and Valent. New York Farm Viability Institute, New York State Apple Research and Development Program, Toward Sustainability Foundation.

- Materials Tested –

Formulation	Company
Apple	
A15645A SC	Syngenta
A15397B SC	Syngenta
Actara 25WDG	Syngenta
AgriMek 0.15EC	Syngenta
Altacor	E.I. DuPont De Nemours & Co.
Asana XL 0.66EC	E.I. DuPont De Nemours & Co.
Assail 30SG	Cerexagri
Baythroid 2E	Bayer
Belt SC	Bayer
Calypso SC 480	Bayer
Damoil (oil)	Drexel
Delegate WG	Dow AgroSciences
Entrust 80WP	Dow AgroSciences
GF-120	Dow AgroSciences
Guthion 50WP	Bayer
Imidan 70WP	Gowan
LI700 (NIS)	UAP Loveland Inc.
Movento 150SC	Bayer
Omega	ISK Biosciences Corp.
Provado 1.6F	Bayer
Savey 50WP	Syngenta
Sevin XLR	Bayer
Surround WP	BASF
Warrior 1CS w/Zeon	Syngenta
Pear	
AgriMek 0.15EC	Syngenta
COMPOUND X	Company A
COMPOUND Y	Company A
Damoil	Drexel
Delegate WG	Dow AgroSciences
PureSpray 10E	Petro-Canada
Surround WP	BASF
Onion	
Entrust	Dow AgroSciences
Mundial 500	BASF
Poncho 600	Valent
Trigard	Syngenta

APPLE: Malus domestica, cv. 'Ginger Gold', 'Red Delicious'

European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)
Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)
Green fruitworm (GFW): *Lithophane antennata* (Walker)
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Redbanded leafroller (RBLR): *Argyrotaenia velutinana* (Walker)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)

EVALUATION OF INSECTICIDES FOR CONTROLLING THE EARLY FRUIT FEEDING INSECT COMPLEX ON APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10' x 30'. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 1. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May.

Treatments applied season long over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Fruit evaluations were made on 3 June of 'Red Delicious' and 'Ginger Gold' cultivars **(Table 1a-b)**. Fruit damage was assessed after 'June drop' by randomly selecting 50 fruits from each variety and scoring for external damage. Damage to 'dropped fruit' was assessed by randomly selecting 50 fruits from under the tree canopy and scoring fruit for external damage. The 'LEP' category includes combined damage from green fruitworm, redbanded and obliquebanded leafrollers. Damage to the foliage by overwintering OBLR feeding was assessed by randomly selecting 10 growing terminal shoots and scoring foliage as exhibiting typical feeding damage of the larvae. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis using Fisher's Protected LSD ($P = < 0.05$). Untransformed data are presented in each table.

Infestation pressure from TPB was very high in the early developing Ginger Gold variety. Temperatures above 70°F (beginning 18 April) during the week leading up to pink (24 April) prompted higher than normal plant bug activity in tree fruit. PC injury was more severe in later developing Red Delicious. Overall PC damage to fruit was lower than normal. Cool temperatures lingering from petal fall to 2nd cover (< 70°F from 5/7 to 5/25) decreased PC activity with 2.3% and 4.7% damage observed in untreated Ginger Gold & Red Delicious fruit respectively. When fruit damage ratings were combined statistical significance was observed in efficacy against most of the early season insect complex **(Table 1b)**.

Pre-bloom pyrethroid applications combined with Calypso 480SC at PF – 1st cover was very effective at controlling PC and reducing the lepidoptera complex damage to fruit. All materials proved very effective when applied at the pink through PF stages at managing the EAS on these varieties.

Table 1a — Evaluation of insecticides for controlling the early season insect complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Percent injury per 100 Ginger Gold (GG) / Red Del. (RD) fruit[2]

Treatment	Formulation amt./A.	Timing	TPB GG	TPB RD	PC GG	PC RD	EAS GG	EAS RD	LEP GG	LEP RD	Clean % GG	Clean % RD
Actara	4.0 oz./A	P, PF-1C	11.0 a	4.8 a	1.5 a	2.7 a	0.0 a	0.0 a	3.0 a	5.0 ab	85.0 a	85.9 ab
Calypso 480SC Baythroid XL Calypso 480SC	4.0 oz./A 2.8 oz./A 6.0 oz./A	P PF 1C	8.0 a	7.3 a	4.0 a	0.3 a	0.8 a	1.5 ab	1.8 a	2.0 ab	86.0 a	91.8 b
Asana XL Calypso 480SC	14.5 oz./A 6.0 oz./A	P PF-1C	7.0 a	3.5 a	5.0 a	1.0 a	0.0 a	0.0 a	0.8 a	0.0 a	91.3 a	96.3 b
Asana XL Calypso 480SC	14.5 oz./A 6.0 oz./A	TC, P PF-1C	3.5 a	1.5 a	0.0 a	0.0 a	0.3 a	0.0 a	0.5 a	0.0 a	96.0 a	98.5 b
Untreated			9.8 a	7.7 a	2.3 a	4.7 a	7.8 b	8.0 b	5.3 a	7.0 b	75.0 a	73.0 a

Table 1b — Mean percent injury of Ginger Gold & Red Delicious[2]

Treatment	Formulation amt./A.	Timing	% TPB	PC	EAS	Lep.	Clean
Actara	4.0 oz./A	P, PF, 1C	8.3 b	2.0 a	0.0 a	3.9 bc	85.4 b
Calypso 480SC Baythroid XL Calypso 480SC	4.0 oz./A 2.8 oz./A 6.0 oz./A	P PF 1C	7.6 b	2.1 a	1.1 a	1.9 bc	88.9 bc
Asana XL Calypso 480SC	14.5 oz./A 6.0 oz./A	P PF-1C	5.3 ab	2.6 a	0.0 a	0.4 ab	93.8 bc
Asana XL Calypso 480SC	14.5 oz./A 6.0 oz./A	TC, P PF-1C	2.5 a	0.0 a	0.1 a	0.3 a	97.3 c
Untreated			8.8 b	3.3 a	7.9 b	6.0 c	74.1 a

Dates corresponding to tree phenology for 'McIntosh' occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on the tree 3 June after 'June-drop' for 'Ginger Gold' and 'McIntosh'

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

APPLE: Malus domestica, cv. 'Red Delicious'

Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Green apple aphid (GAA): *Aphis pomi* De Geer
Spirea aphid (SA): *Aphis spiraecola* Patch
Multicolored Asian ladybird beetle (MALB): *Harmoinia axyridis*

EVALUATION OF INSECTICIDES FOR CONTROLLING THE EARLY SEASON INSECT FOLIAR FEEDING COMPLEX ON APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 2. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May.

Treatments applied season long over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Foliar evaluations were made on 3 & 6 June of 'Red Delicious' (**Table 2**). Aphid populations were determined to be present if exceeding 5 individuals and rated as number of live or dead colonies per terminal. Damage to the foliage by overwintering OBLR feeding was assessed by randomly selecting 10 growing terminal shoots and scoring foliage as exhibiting typical leaf feeding damage of the larvae. MALB was assessed by visual 3-minute counts around each tree. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis using Fisher's Protected LSD ($P = < 0.05$). Untransformed data are presented in each table.

Infestation pressure from the overwintering OBLR larvae was very high across most varieties with significant foliar feeding occurring in plots untreated during the pre-bloom period. Substantial populations of the predatory MALB beetle maintained moderate to low populations of the GAA complex during the early part of the season. Pre-bloom applications of Asana 0.66EC XL at tight cluster and or pink gave excellent control of the overwintering OBLR larvae. All treatments gave statistically significant control in efficacy than the untreated plots.

Table 2 Evaluation of insecticides for controlling the foliar feeding insect complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

			insect presence or leaf injury on 10 terminals / tree [2]			
Treatment	Formulation amt./A.	Timing	6/6 GAA live colonies	6/6 GAA dead colonies	6/6 MALB / 3 min.	6/3 OBLR feeding
Actara	4.0 oz./A	P, PF, 1C	0.0 a	0.0 a	0.5 ab	5.0 ab
Calypso 480SC	4.0 oz./A	P	0.0 a	0.0 a	0.0 a	2.0 a
Baythroid XL	2.8 oz./A	PF				
Calypso 480SC	6.0 oz./A	1C				
Asana 0.66EC XL	14.5 oz./A	P	0.5 a	0.5 ab	0.0 a	0.0 a
Calypso 480SC	6.0 oz./A	PF-1C				
Asana 0.66EC XL	14.5 oz./A	TC, P	0.0 a	0.0 a	0.0 a	0.0 a
Calypso 480SC	6.0 oz./A	PF-1C				
Untreated			3.5 b	1.0 b	1.0 b	8.5 b

Dates corresponding to tree phenology for McIntosh occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days,-which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on 9-11 July on Red Delicious foliage. GAA believed to be composed of the green (*Aphis pomi*) and spirea (*Aphis spiraecola*) aphid complex (1998 species identification); MALB, multicolored Asian ladybird beetle (*Harmoinia axyridis*);. OBLR damage accessed for obliquebanded leafroller (*Choristoneura rosaceana* Harris) overwintering larvae feeding damage.

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

APPLE: Malus domestica, cv. 'Ginger Gold', 'McIntosh'

Codling moth (CM): *Cydia pomonella* (Linnaeus)

EVALUATION OF INSECTICIDES AGAINST THE 1ST GENERATION CODLING MOTH, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 3. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days on 9 June and 25 July for 1st and 2nd generations respectively from temperatures derived using 'Skybit' forecasts and verified using iButton and Hobo ground temperature collection sensors stationed in the Hudson Valley Laboratory orchard.

Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Evaluations were made on 3 June of 'McIntosh' and 'Ginger Gold' cultivars **(Table 3)**. Fruit damage was assessed after 'June drop' by randomly selecting 50 fruits from each variety. Scoring for external damage caused by larvae feeding exhibited frass at the calyx end or feeding puncture in the fruitlet. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis using Fisher's Protected LSD (P = < 0.05). Untransformed data are presented in each table.

Infestation pressure from CM was moderate with 6.5% damage observed in untreated fruit of Ginger Gold and 4.5% damage in McIntosh. Of the Ginger Gold variety, all treatments were observed to be statistically significant regarding their efficacy against the CM over the untreated yet did not provided separation between treatments. In McIntosh however we observed a clear rate response and statistical differences between treatments.

The standard treatment of Imidan 70WP timed for both early 1st generation CM emergence followed by a 21-day application for late emergence gave acceptable commercial control. Voliam Flex (A15645A) at 196 g ai/ha and Voliam Express (A15645A) at 132 g ai/ha rates also gave acceptable control with Voliam Flex exhibiting stronger activity on the CM population. The Baythroid XL 1L, Calypso 480SC 4F and Guthion 50WP 50WS beginning at PF through 2nd cover provided excellent early season CM feeding management.

Table 3 Evaluation of insecticides for controlling 1st generation codling moth on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

			Percent 1st generation codling moth injury per 100 fruit [2]		
Treatment	Formulation amt./A.	Timing	McIntosh	Ginger Gold	Mean
Actara A15645A + LI700	4.0 oz./A 112 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	0.5 a	1.5 a	1.0 ab
Actara A15645A + LI700	4.0 oz./A 168 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	0.5 a	0.5 a	0.5 ab
Actara A15645A + LI700	4.0 oz./A 196 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	1.0 ab	0.3 a	0.6 ab
Actara A15397B + LI700	4.0 oz./A 66 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	2.8 bc	2.3 a	2.5 c
Actara A15397B + LI700	4.0 oz./A 98 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	1.3 ab	1.5 a	1.4 abc
Actara A15397B + LI700	4.0 oz./A 132 g ai/ha 0.25%	P, PF, 1C CM biofix + 250DD, 21d CM, 21d	1.5 ab	1.5 a	1.5 bc
Actara Imidan 70W	4.0 oz./A 80.33 oz./A	P, PF, 1C CM biofix + 250DD, 21d	1.3 ab	1.0 a	1.1 ab
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	Pink PF 1C 2C	0.0 a	0.3 a	0.1 a
Untreated			4.5 c	6.5 b	5.5 d

Dates corresponding to tree phenology for McIntosh occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on the tree 3 June after 'June-drop' for 'Ginger Gold' and 'McIntosh'

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

APPLE: Malus domestica 'Red Delicious'

Japanese beetle (JB): *Popillia japonica* (Newman)
Potato leafhopper (PLH): *Empoasca fabae* Harris
Rose leafhopper (RLH): *Edwardsina rosae* (L)
White apple leafhopper (WALH): *Typhlocyba pomaria* McAtee
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)

EVALUATION OF INSECTICIDES AGAINST MID-SEASON FOLIAR FEEDING INSECT PESTS OF APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 4. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days on 9 June and 25 July for 1st and 2nd generations respectively from temperatures derived using 'Skybit' forecasts and verified using iButton and Hobo ground temperature collection sensors stationed in the Hudson Valley Laboratory orchard.

Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Evaluations were made on 9 & 11 July on 'Red Delicious' cultivar (**Table 4**). Foliar presence or damage was assessed by randomly selecting 10 terminal shoots from each tree. Scoring for leafhopper presence by counting the number of LH nymph or JB adult per 5 mid-terminal leaves; foliar damage caused by JB adult or OBLR larvae feeding was differentiated by skeletonizing (JB) rated on a severity 0-3 scale or larval surface and edge feeding (OBLR) on 5 apical-terminal leaves on 10 terminals for presence or absence. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis using Fisher's Protected LSD (P = < 0.05). Untransformed data are presented in each table.

There were no apparent differences between treatments with regard to leafhopper populations as all treatments provided excellent control of the nymph population. The variable density and nature of the Japanese beetle population throughout the research orchard was not effectively managed by treatments aimed at the adult beetle or subsequent feeding by any of the treatments. There was however a significant rate response of A15645A used at 196 g ai/ha with regards to reducing the OBLR foliar feeding damage.

Table 4 Evaluation of insecticides for controlling the foliar feeding insect complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

			insect presence or leaf injury # lvs / terminal / tree or timed visual assessment[2]			
Treatment	Formulation amt./A.	Timing	LH complex nym. (mid)	Jap. Beetle adult / 3 min.	Jap. Beetle lf.dam. (mid)	OBLR lf.dam. (apical)
Actara A15645A + LI700	4.0 oz./A 112 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.5 a	3.3 a	1.5 a	9.8 c
Actara A15645A + LI700	4.0 oz./A 168 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.3 a	3.5 a	3.8 a	5.3 abc
Actara A15645A + LI700	4.0 oz./A 196 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.0 a	4.3 a	5.8 a	3.0 a
Actara A15397B + LI700	4.0 oz./A 66 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.0 a	2.3 a	2.5 a	3.0 a
Actara A15397B + LI700	4.0 oz./A 98 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.3 a	0.8 a	1.3 a	3.8 a
Actara A15397B + LI700	4.0 oz./A 132 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.0 a	3.5 a	3.5 a	2.5 a
Actara Imidan 70W	4.0 oz./A 80.33 oz./A	P, PF, 1C CM, 21d	0.5 a	3.5 a	4.5 a	5.3 abc
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	P PF 1C 2C	0.5 a	4.0 a	4.0 a	5.5 abc
Untreated			2.3 a	3.8 a	4.3 a	7.8 bc

Dates corresponding to tree phenology for McIntosh occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on 9-11 July on Red Delicious foliage. LH complex during evaluations were primarily composed of rose leafhopper (*Edwardsinia rosa)*. OBLR damage accessed for obliquebanded leafroller (*Choristoneura rosaceana* Harris) 2nd generation larvae feeding damage.

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

APPLE: Malus domestica 'Red Delicious'

Apple rust mite (ARM): *Aculus schlechtendali* (Nalepa)
European red mite (ERM): *Panonychus ulmi* (Koch)
Two spotted spider mite (TSM): *Tetranychus urticae* Koch
A predatory stigmaeid (ZM): *Zetzellia mali* (Ewing)
A predatory phytoseiid (AMB): *Neoseiulus (=Amblyseius) fallacies* (Garman)

EVALUATION OF INSECTICIDES FOR MANAGING THE FOLIAR-FEEDING MITE COMPLEX OF APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 5. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days on 9 June and 25 July for 1st and 2nd generations respectively from temperatures derived using 'Skybit' forecasts and verified using iButton and Hobo ground temperature collection sensors stationed in the Hudson Valley Laboratory orchard.

Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from Red Delicious of each plot on 1 and 29 July. Leaves were removed to the laboratory where they were brushed using a mite-brushing machine onto glass plates and the mites and eggs examined using a binocular scope ($\geq$18X). To stabilize variance in these evaluations, transformation using the Log_{10} (X + 1) was conducted prior to analysis using Fisher's Protected LSD (P=<0.05). Untransformed data are presented in each table.

In general, phytophagous mite populations were subdued this season as near weekly rains and persistent predatory mite presence hampered population build-up. The predatory mite complex appeared less effected by the rainfall. Early evaluations demonstrated a numeric increase in ERM populations in treatments 10 & 11 receiving pre-bloom applications of Asana XL. However there were no significant differences between treatments in season long evaluations. There were very few predatory stigmaeids (ZM) in treatments receiving either single or multiple pre-bloom applications of Asana XL, followed by Calypso 480SC post bloom. Yet in treatments 8 & 9, Baythroid XL applied at PF followed by Calypso 480SC did not appear to be as harmful to this predatory mite.

Table 5 Evaluation of insecticides for controlling foliar feeding mite complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

	Formulation		# mite or mite egg / 25 leaf sample[2]						
Treatment	amt./A.	Timing	ERM	ERME	TSM	AMB	ZM	ZME	ARM
Actara A15645A + LI700	4.0 oz./A 112 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	2.3 a	0.8 a	< 0.1 a	< 0.1 a	0.7 a	1.3 a	127.4 a
Actara A15645A + LI700	4.0 oz./A 168 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.2 a	< 0.1 a	< 0.1 a	< 0.1 a	0.6 a	0.5 a	121.0 a
Actara A15645A + LI700	4.0 oz./A 196 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	0.1 a	0.1 a	< 0.1 a	1.4 a	1.8 a	147.5 a
Actara A15397B + LI700	4.0 oz./A 66 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	0.0 a	0.0 a	< 0.1 a	1.0 a	0.9 a	156.8 a
Actara A15397B + LI700	4.0 oz./A 98 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.1 a	0.3 a	< 0.1 a	0.0 a	1.0 a	0.7 a	129.6 a
Actara A15397B + LI700	4.0 oz./A 132 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 a	1.0 a	1.1 a	185.1 a
Actara Imidan 70W	4.0 oz./A 80.33 oz./A	P, PF, 1C CM, 21d	0.3 a	0.5 a	< 0.1 a	0.3 a	0.9 a	0.4 a	132.3 a
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	P PF 1C 2C	0.3 a	< 0.1 a	0.0 a	< 0.1 a	0.9 a	0.5 a	146.6 a
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	P PF 1C 2C	0.2 a	0.3 a	0.0 a	0.1 a	0.8 a	0.7 a	169.0 a
Asana 0.66EC XL Calypso 480SC	14.5 oz./A 6.0 oz./A	P PF-1C	4.4 a	7.3 a	< 0.1 a	0.1 a	< 0.1 a	0.5 a	154.8 a
Asana 0.66EC XL Calypso 480SC	14.5 oz./A 6.0 oz./A	TC, P PF-1C	1.0	2.2 a	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 a	166.4 a
Untreated			< 0.1 a	0.3 a	< 0.1 a	< 0.1 a	0.8 a	0.5 a	183.7 a

Dates corresponding to tree phenology for McIntosh occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on 1 July on Red Delicious foliage.

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

Table 5 (con't) Evaluation of insecticides for controlling foliar feeding mite complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Treatment	Formulation amt./A.	Timing	# mite or mite egg / 25 leaf sample[2] ERM	ERME	TSM	AMB	ZM	ARM
Actara A15645A + LI700	4.0 oz./A 112 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	0.3 a	1.0 a	0.2 abc	1.7 def	38.9 a
Actara A15645A + LI700	4.0 oz./A 168 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 ab	1.1 cd	37.0 a
Actara A15645A + LI700	4.0 oz./A 196 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	< 0.1 a	0.3 a	0.1 ab	1.9 ef	24.0 a
Actara A15397B + LI700	4.0 oz./A 66 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 ab	1.7 def	30.7 a
Actara A15397B + LI700	4.0 oz./A 98 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	0.1 a	0.4 a	1.2 a	0.2 abc	2.3 f	75.2 a
Actara A15397B + LI700	4.0 oz./A 132 g ai/ha 0.25%	P, PF, 1C CM, 21d CM, 21d	< 0.1 a	0.2 a	0.3 a	0.2 bc	1.4 cde	39.0 a
Actara Imidan 70W	4.0 oz./A 80.33 oz./A	P, PF, 1C CM, 21d	0.0 a	0.3 a	< 0.1 a	0.2 abc	0.9 bc	45.9 a
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	P PF 1C 2C	0.0 a	< 0.1 a	0.4 a	< 0.1 a	0.9 c	25.8 a
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A	P PF 1C 2C	< 0.1 a	< 0.1 a	0.2 a	< 0.1 ab	0.8 abc	31.8 a
Asana 0.66EC XL Calypso 480SC	14.5 oz./A 6.0 oz./A	P PF-1C	0.0 a	< 0.1 a	< 0.1 a	0.4 c	0.4 ab	68.2 a
Asana 0.66EC XL Calypso 480SC	14.5 oz./A 6.0 oz./A	TC, P PF-1C	0.1 a	0.4 a	0.3 a	0.2 abc	0.3 a	25.3 a
Untreated			< 0.1 a	< 0.1 a	0.2 a	< 0.1 ab	1.0 cd	21.4 a

Dates corresponding to tree phenology for McIntosh occurred for tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August.. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[1] Evaluations made on 29 July on Red Delicious foliage.

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

APPLE: Malus domestica, cv. 'McIntosh', 'Red 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)
Lesser apple worm (LAW): *Grapholita prunivora* Walsh
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Oriental fruit moth (OFM): *Grapholitha molesta* (Busck)
Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)
Redbanded leafroller (RBLR): *Argyrotaenia velutinana* (Walker)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)

HARVEST EVALUATION OF INSECTICIDES AGAINST SEASONAL INSECT PESTS OF APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days on 9 June and 25 July for 1st and 2nd generations respectively from temperatures derived using 'Skybit' forecasts and verified using iButton and Hobo ground temperature collection sensors stationed in the Hudson Valley Laboratory orchard.

Treatments were applied on various schedules as shown in **Table 6.** Dates corresponding to tree phenology for McIntosh occurred for PF on 17 May, 1st cover on 30 May, 2nd cover on 20 June, 3rd cover on 1 July, 4th cover on 12 July. Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Damage to fruit was assessed by randomly selecting 50 fruits from each tree and scoring for internal and external damage. Damage by plum curculio occurring during the PF – 2C periods causes callousing from ovipositional scars designated as 'E. PC'. Fruit damaged by mid-season PC adult feeding is designated as 'L. PC'. The 'E. LEP' category includes combined damage from green fruitworm, red-banded and oblique-banded leaf rollers. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis using Fisher's Protected LSD (P = < 0.05). Untransformed data are presented in each table.

Infestation pressure from PC was light (12.7% damage in untreated fruit). Low PC damage levels were due to the extended cool post bloom period this season. Damage was relatively low during early season from EAS and E. LEP. However TPB, SJS, and internal lep. damage levels were very high. TPB populations moved into apple during an 8-day pre-bloom period of temperatures above 70° F. Treatments with tight cluster pyrethroids suffered less damage from TPB than those with pink and or PF treatments. Treatments ranged from 95.5% clean fruit in the most effective treatment to 48.9% clean in the untreated when SJS damage was excluded from the evaluation. As treatments were not applied specifically for the SJS crawler stage, treatments provided ineffective commercial management for this insect. Calypso 480SC applied at PF-1C at the 6 oz./A rate provided excellent control of PC. Baythroid substituted for Calypso at PF appeared somewhat weaker yet not statistically different.

Table 6 Evaluation of insecticides for controlling the fruit feeding insect complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

			% Damaged fruit [2]					
Treatment	Formulation amt./A.	Timing	TPB	EAS	E. LEP	E. PC	L.PC	SJS
A15645A[3]	112 g ai/ha	CM, 21d	10.5 a	0.5 a	0.5 a	10.5 a	3.0 a	48.5 a
A15645A[3]	168 g ai/ha	CM, 21d	4.0 a	0.0 a	2.7 a	4.0 a	1.3 a	92 bcd
A15645A[3]	196 g ai/ha	CM, 21d	7.9 a	0.0 a	0.5 a	7.9 a	0.0 a	52.8 a
A15397B[3]	66 g ai/ha	CM, 21d	10.5 a	0.0 a	0.5 a	10.5 a	1.5 a	72.5 abcd
A15397B[3]	98 g ai/ha	CM, 21d	5.9 a	0.5 a	0.0 a	6.0 a	1.0 a	68.8 abc
A15397B[3]	132 g ai/ha	CM, 21d	10.5 a	0.5 a	0.5 a	10.5 a	1.0 a	69.2 abc
Actara	4.0 oz./A	P, PF, 1C	6.3 a	0.0 a	1.0 a	6.3 a	0.0 a	93.4 d
Imidan 70W	80.33 oz./A	CM, 21d						
Calypso 480SC	4.0 oz./A	P	5.5 a	0.0 a	0.5 a	5.5 a	1.0 a	55.5 a
Baythroid XL	2.8 oz./A	PF						
Calypso 480SC	6.0 oz./A	1, 4C						
Guthion 50WP	1.5 lb./A	2C						
Belt SC	5.0 oz./A	3, 5C						
+ Damoil	0.25%	3, 5C						
Provado 2.4L		5C						
Calypso 480SC	4.0 oz./A	P	13.2 a	0.5 a	0.5 a	13.2 a	1.0 a	63.5 ab
Baythroid XL	2.8 oz./A	PF						
Calypso 480SC	6.0 oz./A	1, 4C						
Guthion 50WP	1.5 lb./A	2C						
Belt SC	5.0 oz./A	3, 5C						
+ LI700	0.25%	3, 5C						
Provado 2.4L		5C						
Asana 0.66EC XL	14.5 oz./A	P	4.0 a	0.0 a	0.0 a	4.0 a	0.0 a	94.5 cd
Calypso 480SC	6.0 oz./A	PF-1C						
Belt SC	5.0 oz./A	4C						
+ Damoil	0.25%	4C						
Provado 2.4L		4C						
Imidan 70W	80.33 oz./A	5C						
Asana 0.66EC XL	14.5 oz./A	TC, P	1.5 a	0.0 a	0.5 a	1.5 a	1.5 a	62.5 ab
Calypso 480SC	6.0 oz./A	PF-1C						
Belt SC	5.0 oz./A	4C						
+ LI700	0.25%	4C						
Provado 2.4L		4C						
Imidan 70W	80.33 oz./A	5C						
Untreated			6.7 a	2.0 a	0.0 a	6.7 a	12.7 a	46.7 a

[1] Data taken from Red Delicious harvested 22 September. Applications timed specifically for the first hatch of CM were calculated using 250 and 1250 degree-days, which occurred on 9 June and 25 July respectively for 1st and 2nd generations; All applications made using a tractor mounted John Bean Airblast delivering 154.6 GPA at 300 psi. traveling at an average of 2.5 mph.

[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.

3 Treatments received Actara at P, PF and 1C; treatments received LI700 at 0.25% at CM 250DD and 21d post application.

Table 6 (cont.) Evaluation of insecticides for controlling foliar feeding insect complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

			% Damaged fruit [2]					
Treatment	Formulation amt./A.	Timing	Int. Lep.	Ext. Lep.	Am.P.	Am.T.	Clean	Clean no. SJS
A15645A[3]	112 g ai/ha	CM, 21d	4.5 a	3.3 a	6.3 a	2.5 a	26.8 bc	61.7
A15645A[3]	168 g ai/ha	CM, 21d	2.0 a	4.0 a	0.7 a	0.7 a	5.3 ab	91.0
A15645A[3]	196 g ai/ha	CM, 21d	2.5 a	3.0 a	1.0 a	1.0 a	37.8 c	82.8
A15397B[3]	66 g ai/ha	CM, 21d	3.5 a	1.0 a	< 0.1 a	0.0 a	16.0 abc	79.4
A15397B[3]	98 g ai/ha	CM, 21d	5.0 a	1.0 a	2.0 a	0.0 a	20.3 abc	82.0
A15397B[3]	132 g ai/ha	CM, 21d	6.7 a	2.6 a	0.6 a	0.6 a	21.7 bc	79.9
Actara Imidan 70W	4.0 oz./A 80.33 oz./A	P, PF, 1C CM, 21d	6.2 a	2.2 a	0.0 a	0.0 a	2.5 a	88.7
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP Belt SC + Damoil Provado 2.4L	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A 5.0 oz./A 0.25%	P PF 1, 4C 2C 3, 5C 3, 5C 5C	2.5 a	4.0 a	1.5 a	0.5 a	37.0 c	85.6
Calypso 480SC Baythroid XL Calypso 480SC Guthion 50WP Belt SC + LI700 Provado 2.4L	4.0 oz./A 2.8 oz./A 6.0 oz./A 1.5 lb./A 5.0 oz./A 0.25%	P PF 1, 4C 2C 3, 5C 3, 5C 5C	2.2 a	3.0 a	1.5 a	0.0 a	19.9 bc	71.8
Asana 0.66EC XL Calypso 480SC Delegate Belt SC + Damoil Provado 2.4L Imidan 70W	14.5 oz./A 6.0 oz./A 6.0 oz./A 5.0 oz./A 0.25% 80.33 oz./A	P PF-1C 3C 4C 4C 4C 5C	4.5 a	0.0 a	0.5 a	0.5 a	5.5 ab	95.5
Asana 0.66EC XL Calypso 480SC Belt SC + LI700 Provado 2.4L Imidan 70W	14.5 oz./A 6.0 oz./A 5.0 oz./A 0.25% 80.33 oz./A	TC, P PF-1C 4C 4C 4C 5C	3.0 a	4.0 a	1.5 a	1.5 a	31.5 bc	89.1
Untreated			20.0 a	7.3 a	4.7 a	2.0 a	22.7 abc	48.9

[1] Data taken from Red Delicious harvested 22 September.
[2] Mean separation using Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Percent data were transformed using the arcsine transformation. Untransformed data presented.
3 Treatments received Actara at P, PF and 1C; treatments received LI700 at 0.25% at CM 250DD and 21d post application.

APPLE: Malus domestica 'Red Delicious'

Apple rust mite (ARM): *Aculus schlechtendali* (Nalepa)
European red mite (ERM): *Panonychus ulmi* (Koch)
Two spotted spider mite (TSM): *Tetranychus urticae* Koch
A predatory stigmaeid (ZM): *Zetzellia mali* (Ewing)
A predatory phytoseiid (AMB): *Neoseiulus (=Amblyseius) fallacies* (Garman)

EVALUATION OF FUNGICIDES AND MITICIDES FOR MANAGING THE FOLIAR-FEEDING MITE COMPLEX OF APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in **Table 6.** Dates corresponding to tree phenology for McIntosh occurred for PF on 17 May, 1st cover on 30 May, 2nd cover on 20 June, 3rd cover on 1 July, 4th cover on 12 July. Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Phytophagous and predacious mite populations were evaluated by sampling 25 leaves from Red Delicious of each plot on 17 June, 23 July and 13 August. Leaves were removed to the laboratory where they were brushed using a mite-brushing machine onto glass plates and the mites and eggs examined using a binocular scope ($\geq$18X). To stabilize variance in these evaluations, transformation using the Log_{10} (X + 1) was conducted prior to analysis using Fisher's Protected LSD (P=<0.05). Untransformed data are presented in each table. Fruit was scored for russet using a 0-3 scale in which, 0 is free of russet, 1 exhibited russet around the stem, 2 exhibited russet up to the fruit shoulder but not beyond, and 3 exhibited russet over the shoulder and down the sides of the fruit.

In general, suppression of mite from frequent rains and moderating temperatures held populations below action threshold. Evaluations of the mite populations in treated plots showed few significant differences between treatments related to phytophagous miticidal effects of treatments on field populations. Relatively high populations of phytoseiid and stigmaeid mite predators were present throughout the season, maintaining biological control of the remnant phytophagous mite populations in our plots. Although not statistically significant, both of the Omega treatments did show numerically lower rust mite populations and relatively high phytoseiid numbers during the peak of mite activity, demonstrating low impact on *Neoseiulus fallacies*, a common predatory mite. AgriMek 0.15EC did demonstrate superior control of the ARM in the 17 June rating. Fruit receiving 0.25% v/v oil in tank mixtures applied to the fruit in 1st through 4th cover applications exhibited no differences in russet compared to conventional miticide programs.

Table 6a Evaluation of fungicide & miticide for causing fruit russet on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Treatment	Formulation amt./A.	Timing	Percent damage of russet on Ginger Gold[2] 0	1	2	3
Omega	13.8 oz./A	1-4C	15.7 a	47.4 a	31.4 a	5.6 a
Omega Damoil	13.8 oz./A 0.25% v/v	1-4C 1-4C	11.5 a	49.0 a	37.5 a	2.0 a
AgriMek EC Damoil	6.0 oz./A 0.25% v/v	1C	9.7 a	53.7 a	34.6 a	2.1 a
Untreated			7.0 a	47.5 a	41.0 a	4.5 a

Harvest of Ginger Gold on 22 August.

Table 6b Evaluation of fungicides and miticide for controlling foliar feeding mite complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Treatment	Formulation amt./A.	Timing	# mite or mite egg / leaf sample[2] ERM	ERME	TSM	AMB	ZM	ZME	ARM
Omega	13.8 oz./A	1-4C	0.1 a	0.2 a	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 a	60.2 b
Omega Damoil	13.8 oz./A 0.25% v/v	1-4C 1-4C	< 0.1 a	0.2 a	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 a	76.5 b
Savey 50WP	6.0 oz./A	1C	0.0 a	< 0.1 a	0.0 a	< 0.1 a	< 0.1 a	0.0 a	161.1 bc
AgriMek EC Damoil	6.0 oz./A 0.25% v/v	1C	< 0.1 a	< 0.1 a	0.0 a	0.0 a	< 0.1 a	< 0.1 a	7.7 a
Damoil	0.25% v/v	1C	< 0.1 a	0.3 a	0.0 a	< 0.1 a	< 0.1 a	< 0.1 a	134.7 bc
Untreated			0.0 a	0.0 a	0.0 a	< 0.1 a	0.2 a	< 0.1 a	219.2 c

Data taken from Red Delicious on 17 June.

Table 6b (con't) Evaluation of fungicides and miticide for controlling foliar feeding mite complex on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Treatment	Formulation amt./A.	Timing	# mite or mite egg / leaf sample[2] ERM	ERME	TSM	AMB	ZM	ZME	ARM
Omega	13.8 oz./A	1-4C	< 0.1 a	0.2 a	< 0.1 a	0.4 b	0.1 a	0.1 a	41.6 a
Omega Damoil	13.8 oz./A 0.25% v/v	1-4C 1-4C	< 0.1 a	0.3 a	< 0.1 a	0.4 b	0.1 a	< 0.1 a	82.6 a
Savey 50WP	6.0 oz./A	1C	< 0.1 a	0.1 a	< 0.1 a	0.2 ab	0.2 a	< 0.1 a	34.4 a
AgriMek EC Damoil	6.0 oz./A 0.25% v/v	1C	< 0.1 a	0.2 a	0.0 a	< 0.1 a	< 0.1 a	< 0.1 a	45.8 a
Damoil	0.25% v/v	1C	< 0.1 a	0.4 a	0.1 a	0.1 a	0.3 a	0.3 a	29.4 a
Untreated			< 0.1 a	0.1 a	< 0.1 a	0.1 a	0.3 a	0.2 a	79.2 a

1. Data taken from Red Delicious on 23 July.

Treatment	Formulation amt./A.	Timing	# mite or mite egg / leaf sample[2] ERM	ERME	TSM	AMB	ZM	ZME	ARM
Omega	13.8 oz./A	1-4C	0.0 a	< 0.1 a	< 0.1 a	0.2 a	0.2 a	0.1 a	9.9 a
Omega Damoil	13.8 oz./A 0.25% v/v	1-4C 1-4C	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1 a	< 0.1a	< 0.1 a	6.6 a
Savey 50WP	6.0 oz./A	1C	< 0.1 a	0.0 a	0.0 a	0.2 a	0.1 a	0.2 a	10.2 a
AgriMek EC Damoil	6.0 oz./A 0.25% v/v	1C	0.0 a	< 0.1 a	< 0.1 a	0.2 a	0.1 a	< 0.1 a	13.9 a
Damoil	0.25% v/v	1C	0.0 a	< 0.1 a	0.0 a	< 0.1 a	0.4 a	0.2 a	7.2 a
Untreated			< 0.1 a	< 0.1 a	< 0.1 a	0.1 a	0.4 a	0.4 a	13.1 a

1. Data taken from Red Delicious on 13 August. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Dates corresponding to tree phenology for McIntosh occurred for PF on 17 May, 1st cover on 30 May, 2nd cover on 20 June, 3rd cover on 1 July, 4th cover on 12 July.

2 Log10 (X+1) transformation applied to data. Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different. Mite sampled by examining 25 terminals leaves per tree using mite brushing machine to remove mite onto soaped glass plates for evaluation under dissecting scope > 18x magnification. ERM = European red mite Panonychus ulmi; TSM = Two spotted spider mite Tetranychus urticae ; ZM = Zetzellia mali; (AMB): Neoseiulus (=Amblyseius) fallacies (Garman), ARM = apple rust mite Aculus schlechtendali.

APPLE: Malus domestica 'Red Delicious'

Sna Jose scale (SJS): *Quadraspidiotus perniciosus*

EVALUATION OF INSECTICIDES AGAINST MID-SEASON SAN JOSE SCALE DAMAGE TO APPLE, 2008 – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots, replicated four times in a randomized complete block design. All applications were applied concentrate using a tractor mounted John Bean® Airblast sprayer delivering 300 psi. and 154.6 GPA, traveling at 2.4 to 2.6 mph. Trees on the M.26 rootstock were 13 yr-old, approximately 10 ft high and planted to a research spacing of 10 x 30. Alternate rows of unsprayed trees were adjacent to treated plots for reduction of drift, increased insect distribution and pressure.

Treatments were applied on various schedules as shown in Table 4. Dates corresponding to tree phenology for McIntosh occurred for delayed dormant (DD / silver tip) on 8 April, green tip (GT) on 10 April, 1/2" green on 14 April, tight cluster (TC) on 21 April, pink on 24 April, 1st PC oviposition or PF on 17 May, 1st cover on 30 May, 2nd cover on 21 June, 3rd cover on 12 July, 4th cover on 25 July, 5th cover on 8 August and 6th cover on 25 August. Predictive models for the first emergence of San Jose scale were calculated using 500 and 1451 degree-days on for 1st and 2nd generations respectively were made on 30 May and 22 July respectively, taken from temperatures derived using 'Skybit' forecasts and verified using iButton and Hobo ground temperature collection sensors stationed in the Hudson Valley Laboratory orchard. Applications for the 1st and second generation were made on 30 May and 28 July respectively. The delay in the 2nd generation application was due to continual rains from 21 – 28 July.

Treatments applied over the entire block for crop size management and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane DF 3 lbs./A on 25 & 30 April, 6, 14, and 23 May; Procure 2.3 lbs./A on 30 April, Nova 40WP 4.0 oz./A on 6, 14, 23 May and 6 June; Flint 2.0 oz./A on 20 June and 3 July; NAA 2.0 ppm + Damoil 32.0 oz./A on 16 May on Ginger Gold, Red Delicious and McIntosh, NAA 5.0 ppm + Damoil 32.0 oz./A on 21 May on Golden Delicious; Topsin M 1.0 lb./A on 1 August; Pristine 38WP 1.0 lb./A on 9 August.

Evaluations were made for 1st generation SJS infestations on McIntosh apple on 7 July and at harvest for combined 1st and 2nd generation damage to Ginger Gold fruit by randomly sampling 50 fruit throughout the canopy. The 1st generation damage was rated for % damage. Severity ratings employed a 0-3 scale in which 0 was clean, 1 had < 2 black cap per fruit, 3 having > 2 blackcap per fruit.

Single applications of Movento timed using the 1st generation SJS degree-day model, approximately 16 days from observed crawler emergence, provided excellent control of fruit damage, the higher rate providing slightly better control of the 1st generation (**Table** 7). Rainfall prolonging the 2nd generation application reduced the efficacy of Movento as SJS crawler and white cap stage were present immediately prior to the application. This is evident in substantially higher levels of fruit infestation observed during the harvest evaluation. Applications directed against the crawler stage of both Provado and Damoil were relatively ineffective at reducing fruit injury from SJS.

Table 7 Evaluation of insecticides for controlling San Jose scale populations on apple [1], N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2008

Treatment	Formulation amt./A.	Timing	1st gen San Jose scale % infested fruit	1st gen San Jose scale Severity rating (0-3)	2nd gen San Jose scale % infested fruit at harvest 8/22
Actara	5.5 oz./A	PF	2.9 a	1.13 a	3.3 a
Baythroid	2.8 oz./A	30 May			
Movento 240SC	6.0 oz./A	500 DD (1C); 1451DD (4C)			
LI700	0.25% v/v	500 DD (1C); 1451DD (4C)			
Actara	5.5 oz./A	PF	0.8 a	1.00 a	4.5 a
Baythroid	2.8 oz./A	30 May			
Movento 240SC	9.0 oz./A	500 DD (1C); 1451DD (4C)			
LI700	0.25% v/v	500 DD (1C); 1451DD (4C)			
Actara	5.5 oz./A	PF, 1-3C	13.8 c	2.18 c	11.8 a
Provado	8.0 oz./A	6/16; 7/28			
Actara	5.5 oz./A	PF, 1-3C	8.7 b	1.85 b	11.3 a
Damoil	1%	6/16; 7/28			
Untreated			17.7 d	2.04 d	11.5 a

Data taken from Rogers McIntosh on 7 July & Ginger Gold on 22 August at harvest.

1st and 2nd generation SJS crawler emergence & white cap phase observed on 16 June and 28 July respectively. Degree day model accumulations used for applications (500 DD ; 1451DD) occurred on 30 May and 22 July.

APPLE: Malus domestica, cv. 'Empire', 'Tydeman'

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

HARVEST EVALUATION OF DELEGATE AND SPINTOR AGAINST OBLIQUEBANDED LEAFROLLER DAMAGE ON APPLE, 2008 – CLINTONDALE, NY: The objective of this study was to evaluate the efficacy of Delegate WG in a high pressure block of commercial orchard using standard growing practices and using conventional management application equipment.

A 5-acre block containing Empire and Tydeman apple cultivars was selected near Clintondale, in Ulster County, NY, after finding a large overwintering population of OBLR larvae in the tree canopy. Treatments were applied to 2 five-acre blocks using a grower operated Turbomist® airblast sprayer and New Holland 95F tractor calibrated to deliver 77 GPA using 150 psi., traveling at 2.5 – 2.9 mph. Trees on the M.26 rootstock were 17 yr-old, approximately 15 ft high, 14' wide, and planted to a commercial spacing of 10' x 20'. The commercial orchard used a standard grower program in an adjacent block employing SpinTor that we compared to Delegate insecticide, both insecticides timed for the 1st hatch of the OBLR summer generation followed by a second application for extended emergence.

Developmental phenology corresponding to application dates beginning at pink on 22 April, bloom on 28 April, petal fall (PF) on 7 May, first cover (1C) on 23 May, second cover (2C) on 30 May, third cover (3C) for 1st hatch of OBLR summer generation on 24 June, forth cover application (4C) on 11 July, fifth cover application (5C) on 25 July.

Treatments applied over the two blocks for crop size management, insect and disease control included: Captan 80 WDG at 4.5 lbs./A on 9 April in alternate rows; Lorsban 4E at 48 oz./A, Penncozeb 75 DF at 3 lbs./A, Captan 80 WDG at 1.95 lbs./A and Apollo at 6 oz./A on 22 April over the entire orchard; Penncozeb 75 DF at 3 lbs./A, Captan 80 WDG at 1.95 lbs./A and Microthiol D at 4.5 lbs./A and Solubor at 2.6 lbs./A on 25 April in alternate rows; Penncozeb 75 DF at 3 lbs./A, Captan 80 WDG at 2.25 lbs./A and Microthiol D at 4.5 lbs./A and Solubor at 2.6 lbs./A on 1 May in alternate rows; Penncozeb 75 DF at 3 lbs./A, Captan 80 WDG at 2.25 lbs./A and Microthiol D at 4.5 lbs./A, Solubor at 2.6 lbs./A and Topsin 0.6 lbs./A on 7 May in alternate rows; Ralley at 1.8 lbs./A, Captan 80 WDG at 2.25 lbs./A, Penncozeb 75 DF at 3 lbs./A, Imidan 70W at 2.4 lbs./A, Intrepid at 16.8 oz./A, Solubor at 1.8 lbs./A and LI700 at 4.8 oz./A on 13 May over the entire orchard; Ralley at 1.8 lbs./A, Captan 80 WDG at 3.3 lbs./A, Imidan 70W at 2.4 lbs./A and Solubor at 1.8 lbs./A on 23 May over the entire orchard; Captan 80 WDG at 3.75 lbs./A, Imidan 70W at 2.4 lbs./A, LI700 4.8 oz./A and Solubor at 1.8 lbs./A on 30 May in alternate rows; Captan 80 WDG at 3.75 lbs./A, Imidan 70W at 2.4 lbs./A, on 9 June in alternate rows; Delegate WG at 4 oz./A or SpinTor SC at 5.5 oz./A, LI700 at 9.6 oz./A, Provado 1.6F at 2.25 oz./A, Topsin at 0.45 lbs./A, Captan 80 WDG at 3.0 lbs./A, and Epson Salt at 15 lbs./A and Microthiol D at 4.5 lbs./A on 24 June, 11 July over the entire orchard; Captan 80 WDG at 4.5 lbs./A, Imidan 70W at 2.4 lbs./A Microthiol

D at 4.5 lbs./A, LI700 at 4.8 oz./A, Provado 1.6F at 1.5 oz./A, Topsin at 0.6 lbs./A, on 25 July over the entire orchard.

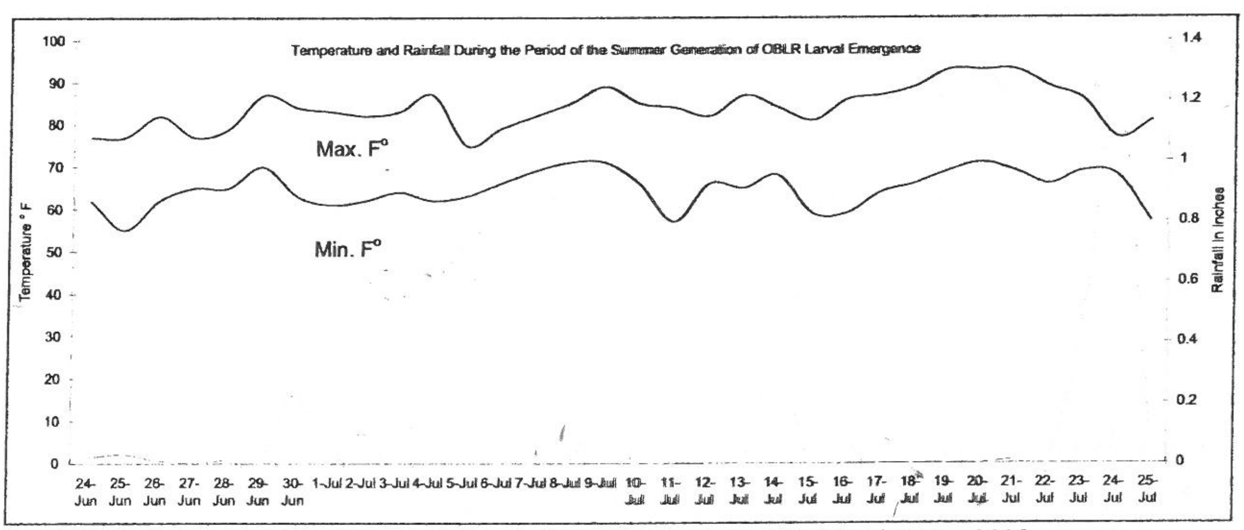
Evaluations were made for damaged apple caused by the summer generation of the OBLR from samples of Tydeman on 7 August and Empire on 18 September selected from both SpinTor and Delegate treated blocks. We assessed fruit damage from OBLR by randomly selecting 1000 fruits from 10 trees, along 4 rows within each block, and scoring for external fruit injury. An additional 500 fruit were by randomly selected from drops and scored for external fruit injury from beneath the same trees. No damage from 2nd generation OBLR was observed in either tree harvested or dropped fruit in Delegate treated trees of Tydeman or Empire varieties. The SpinTor treated fruit had a combined damage level of 3.2%, with 2.3% damage observed in dropped fruit in the two combined varieties.

Recommendations made to the grower for Delegate treatments were based on the degree-day developmental model for OBLR 1st hatch on 24 June, yet successive days of rain, totaling 1.71", kept the 2nd application from being made until 11 July. Rainfall may have contributed to the relatively low populations and subsequent low damage levels observed at harvest. Delegate appears to have greater efficacy compared to its predecessor, which in part, may be due to enhanced weathering capacity during the first week in July (Graph 1).

Table 11 Evaluations of Two Spinosad Based Insecticides to Manage OBLR Damage on Apple. Coy Farm, Clintondale, N.Y.-2008[1].

Treatment	Formulation amt./A	Application Dates	% Ext. Lep[2]	% Clean
SpinTor SC	5.5 oz.	24 June, 11 July	3.2	96.8
Delegate WG	4.0 oz.	24 June, 11 July	0.0	100.0

1 Data taken Tydeman and Empire varieties on 7 August and 18 September respectively.
2 External lepidopteran damage caused primarily by the Obliquebanded leafroller (OBLR) *Choristoneura rosaceana* (Harris)



Graph 1. Environmental conditions relative to OBLR emergence, Highland, NY – 2008.

APPLE: Malus domestica, cv. 'Cortland', 'Empire', 'Fuji', 'Gala', 'Red Delicious', 'Rome',

Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Codling moth (CM): *Cydia pomonella* (Linnaeus)

HARVEST EVALUATION OF ALTACOR AGAINST OBLIQUEBANDED LEAFROLLER DAMAGE ON APPLE, 2008 – Milton, NY: The objective of this study was to evaluate the efficacy of Altacor in a region within the Hudson Valley with historically high infestations of OBLR and fruit damage occurs. The commercial orchard used a standard grower program in an adjacent block that we compared to a season long DuPont insecticide / fungicide program, employing the growers practices, conventional management and application equipment.

A 5-acre mixed variety block containing Cortland, Empire, Fuji, Gala, Red Delicious, Rome apple cultivars was selected in Milton, Ulster County, NY, where historically high infestation levels and overwintering populations of OBLR larva had been observed. Treatments were applied to 2 five-acre blocks using a grower operated Turbomist® 30P Airblast sprayer delivering 140 psi. and 112.8 GPA, traveling at 3.6 mph. Trees on the M.26 rootstock were 23 yr-old, approximately 12 ft high, 15' wide, and planted to a commercial spacing of 9' x 20'.

Developmental phenology corresponding to application dates beginning at pink on 20 April, bloom on 28 April, petal fall (PF) on 6 May @ 80% PF of McIntosh, first cover (1C) on 20 May, second cover (2C) on 1 June, third cover (3C) for 1st hatch of OBLR summer generation on 18 June, forth cover application (4C) on 9 July, fifth cover application (5C) on 4 August. Recommendations made to the grower for Altacor treatments were based on the degree-day developmental model for OBLR 1st hatch using pheromone trap data from Milton, NY.

Treatments applied over the DuPont Trial block for crop size management, insect and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Manzate ® Pro-Stick™ fungicide at 2 lbs./A on 20, 30 April, 6, 20 May, 18 June, Captan 50WP at 2 lb./A on 10 July, 4 August, Asana® XL at 14.5 ozs./A on 20 April; Avaunt® at 6.0 oz./A on 6, 20 May, Altacor at 4 oz./A on 18 June, Assail at 8.0 ozs./A on 10 July and 4 August. Treatments applied over the Grower Standard block for crop size management, insect and disease control included: COCS 3 lbs./A and 1% Damoil on 8 April, Dithane fungicide at 2 lbs./A on 20, 30 April, 6, 20 May, 18 June, Captan 50WP at 2 lb./A on 10 July, 4 August, Lorsban at 3.0 qts./A on 20 April; Imidan at 32.0 oz./A on 6, 20 May, 18 June, Assail at 8.0 ozs./A on 10 July and 4 August. Evaluations were made for the summer generation of the OBLR on 18 September. Fruit damage was assessed by randomly selecting 500 fruits from 5 trees in 4 locations within each block and scoring for internal and external fruit injury.

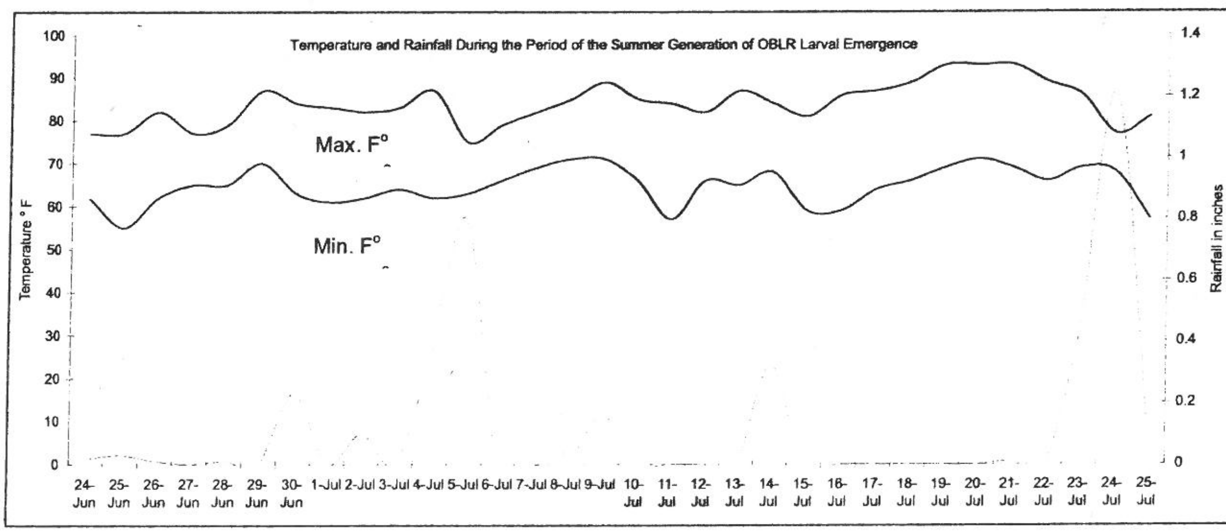
Infestation pressure from OBLR was relatively low, with 3.1% fruit damage from OBLR in the grower standard 'Rome' variety, while CM damage was undetectable during mid-season 2nd generation.

CM larvae, entry sites or frass were observed during fruit evaluations. The single application using 4.0 oz./A of Altacor was comparable to the Imidan grower standard in efficacy against the OBLR, allowing 2.7% and 2.3% fruit injury from Altacor and Imidan respectively **Table 12**. Altacor, in a single application, may have had extended efficacy had we experienced less rainfall during the OBLR emergence period (**Graph 1**). Greater levels of control would likely have been achieved had the grower followed-up with a recommended second application during the 2nd week of July.

Table 12 Evaluation of Altacor Insecticide to Manage OBLR Damage on Apple. Clarke Farms, Modena, N.Y.-2008[1].

Treatment	Formulation amt./A	Application Dates	% Ext. Lep[2]	% Clean
Altacor	4.0 oz.	24 June	2.7	97.3
Imidan 70WP	32.0 oz.	24 June	2.3	97.7

1. Data taken Tydeman and Empire varieties on 7 August and 18 September respectively.
External lepidopteran damage caused primarily by the Obliquebanded leafroller (OBLR) *Choristoneura rosaceana* (Harris)



Graph 1. Environmental conditions relative to OBLR emergence, Highland, NY – 2008.

PEAR: *Pyrus communis* L. 'Bartlett', 'Bosc'

Pear psylla: *Cacopsylla pyricola* (Foerster)
Codling moth (CM): *Cydia pomonella* (Linnaeus)
Pear rust mite (PRM): *Epitrimerus pyri*
Fabraea Leaf Spot (FLS) *Fabraea maculata*

EFFICACY OF INSECTICIDES AGAINST PEAR PSYLLA ADULTS, EGGS AND NYMPHS, 2008: – Cornell University's Hudson Valley Lab: Treatments were applied to four-tree plots replicated four 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 28 years old. All dilutions are presented as amt/100 gal. – (based on 400 gallons/acre). Treatments were applied dilute to runoff using a tractor mounted high-pressure handgun sprayer operated at 300 psi delivering ≥350 GPA.

'Bartlett' phenology beginning at onset of 1st egg or bud burst (BB) on 11 April; green cluster (GC) on 22 April; white bud (WB) on 25 April; 100% bloom on 7 May; PF application on 14 May @ 80% PF of Bartlett; 1C application on 25 May; 2C on 2 June; 3C on 12 June; 4C on 24 July as a 'rescue' treatment; 5C on 8 August. 'Bartlett' was harvested on 22 August. No treatments were applied over the block for crop size management this season due to reduced crop load from frost during bloom..

Scheduled applications were made against the first generations of pear psylla, and evaluations were to determine the treatment effects on adult, egg and nymph populations. During the period from green cluster through petal fall, evaluations were used to determine treatment effects on springform adult ovipositional deterrence, including subsequent 1st generation nymph emergence. Pre-bloom evaluations began on 3 April, in which 25 fruiting buds per treatment were evaluated followed by assessments on 10 April through 1 May in which 25 fruiting cluster leaves per treatment were evaluated.

Application schedules in **Tables 13 - 18** were designed to evaluate treatments against the 1st and 2nd generation pear psylla adult, egg, nymph and pear rust mite populations. Adult numbers were assessed (30 May, 4 and 12 June) by 3-minute vacuum sweeps of randomly selected apical foliage using a handheld vacuum to which was connected 500 mL screened nalgene bottles. Psylla nymph, egg and rust mite numbers were assessed by collecting leaf samples on shoots beginning with 25 basal leaves of 5 shoots in spring (23, 30 April), and continuing with 1 distal, 1 proximal and 3 mid-shoot leaves of 5 shoots per treatment through the remainder of the season (16 and 30 May; 4, 9 and 23 June). Samples were removed to the laboratory where target pests were counted using a binocular scope. Leaves were evaluated on 17 July using a 0-5 scale, sampling 25 leaves from five terminals per treatment to assess the severity of foliage exhibiting FLS lesions. Percent defoliation ratings conducted 31 July and 22 August were performed using 2 evaluators per tree in which the mean of 2 quadrants of the tree were assessed for remaining foliage. Fabraea spore release evaluations were made using infection sites removed from foliage collected from each of the three treatments. Fabraea spores were collected from 25 leaf disks 4mm in diameter from 25 leaves per plot from each of four replicates, immersing disks in 1 ml water and vortexing after 30 seconds. Entomospore density was evaluated using a hemacytomer. Germ tube growth was determined by streaking individual leasons from each 12 leaves per plot onto acidified PDA plates grown for 24 hours at 70°F, then observing 50 entomospores / streak for each of the 12 steaks per replicate to determine percent germ tube growth. Bartlett fruit was harvested on 18 August and scored for insect, FLS, frost and russet. The transformation using the Log_{10} (X + 1) was applied for adult and foliar evaluations. To stabilize variance, percentage data were transformed by arcsine *(square root of x) prior to analysis. Fisher's Protected LSD (P=<0.05) was performed on all data; untransformed data are presented in each table.

Against early-season adults, the 50 lb/A single application of Surround WP at swollen bud was equivalent in ovipositional deterrence, control of egg and subsequent nymph populations to the standard 3% oil application in evaluations made during pre-bloom and early post petal fall observations (**Table 13**). Applications beginning 10 days post petal fall, 25 May, directed against 1st generation pear psylla nymph and adult population resulted in varying degrees of control in all treatments with Surround, 1% oil alone, Movento and Delegate providing excellent pear psylla nymph management (**Table 14**).

Applications of 1% oil allowed less overall foliar damage from Fabraea leaf spot when compared to both untreated and psylla only treated foliage. Damage to foliage in the form of leaf scorch from pear psylla and FLS caused significant levels of defoliation. Oil alone was comparable in control of severity and overall defoliation to those managed using fungicides and effective pear psylla insecticide treatments (**Table 14**). . The mode of action of oil appears to control Fabraea by reducing both spore release and spore germination as demonstrated in **Table 15**. Fabraea was reduced both in incidence and severity using season long oil applications (**Table 16**). Although oil alone did not provide commercially acceptable control of FLS on Bartlett fruit in 2008 (**Table 18**), it did protect Bartlett fruit during the 2007-growing season without the aid of contact fungicides. Season long oil applications exhibited slightly higher russet ratings than the Surround / oil combinations yet provided greater control of FLS with higher yielding fruit in category 0 with no FLS lesions. Treatments employing Dithane provided acceptable levels of Fabraea control given the very high disease pressure in our research block this season

Oil alone throughout the season does not manage fruit feeding insects as observed in **Table 17**, This treatment exhibited approximately 30% fruit injury from the pest complex, principally plum curculio, internal lepidopteran complex and leafroller complex. However, the combination of early season Surround up to the 1st Cover spray followed then with by-weekly summer oil applications produced >94% clean fruit from insect injury. The combination of these two materials may prove to be an effective solution to both insect and disease for organic production in the Northeast. The use of oil alone beyond the 77 to day harvest interval for mancozeb use may provide acceptable late season commercial pear management of both psylla and Fabraea leaf spot providing less fruit residue compared to ziram or ferbam, with a low day to harvest requirement in mixed plantings of early and late season fruit.

Table 13 Evaluations of insecticide schedules on pear psylla oviposition on Bartlett pear. Hudson Valley Lab., Highland, N.Y.-2008.

			23 April		30 April	
Treatment	Formulation amt./100 gal.	Application Dates	nymphs / 25 lvs	eggs / 25 lvs	nymphs / 25 lvs	eggs / 25 lvs
Damoil Damoil	3 % V/V 1.0 % V/V	BB GC, WB, PF, 1C	<0.1 a	0.6 ab	<0.1 a	0.2 a
Surround WP Damoil	50.0 lbs./A 1.0 % V/V	BB, WB, PF, 1C 2-6C	<0.1 a	<0.1 a	0.0 a	0.0 a
Asana 0.66XL Insite	14.5 oz./A 2.0 oz./A	GC GC	<0.1 a	4.3 bc	0.3 a	6.6 cd
Asana 0.66XL	14.5 oz./A	GC	<0.1 a	9.3 c	0.3 a	7.8 de
Untreated control	-	-	0.1 a	4.2 bc	0.6 ab	7.0 cde

1 Data taken on Bartlett.

			16 May		30 May	4 June
Treatment	Formulation amt./100 gal.	Application Dates	nymphs / lf.	eggs / lf.	adults / 3 min. vac. sweep	
Damoil Damoil	3 % V/V 1.0 % V/V	BB GC, WB, PF, 1C	<0.1 a	0.2 ab	22.8 bc	16.8 bcd
Surround WP Damoil	50.0 lbs./A 1.0 % V/V	BB, WB, PF 1C	<0.1 a	0.0 a	0.0 a	1.8 a
Asana 0.66XL Insite AgriMek 0.15EC	14.5 oz./A 2.0 oz./A 20.0 oz./A	GC GC 25 May	0.4 ab	0.8 bcd	17.0 b	45.5 def
Asana 0.66XL AgriMek 0.15EC	14.5 oz./A 20.0 oz./A	GC 2 June	2.0 cd	0.7 bcd	31.5 bcd	17.5 bc
Untreated control	-	-	2.3 d	3.6 bcd	35.3 bcd	117.0 f

1 Data taken on foliage of Bartlett. BB on 11 April, GC on 22 April, WB on 25 April, PF on 14 May, 1C on 2 June.
2 Percentage data were transformed by arcsine *(square root of x) prior to analysis. Foliar data for leaf curl midge were transformed using the Log10 (X + 1) conducted prior to analysis. Untransformed data are presented in each table. Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different.

Table 14 Evaluations of insecticide schedules on pear psylla and pear rust mite populations on Bartlett pear. Hudson Valley Lab., Highland, N.Y.-2008.

Treatment	Formulation amt./100 gal.	Application Dates	9 June # / 25 lvs nymph	9 June # / 25 lvs egg	9 June PRM	12 June Adult sweep	23 June # / 25 lvs. nymph	23 June # / 25 lvs. egg	23 June PRM
Damoil Damoil	3 % V/V 1.0 % V/V	BB GC, WB, PF, 1-6C	2.1 bc	4.3 ab	0.1 a	30.0 a	0.3 a	0.8 a	< 0.1 a
Surround WP Damoil	50.0 lbs./A 1.0 % V/V	BB, WB, PF 1-6C	0.1 a	<1.6 a	0.1 a	34.0 a	2.3 ab	5.8 b	0.7 abc
Asana 0.66XL Insite AgriMek 0.15EC	14.5 oz./A 8.0 oz./A 20.0 oz./A	GC GC 2 June	2.9 bcd	17.2 cde	0.4 a	47.3 a	2.9 bc	4.1 b	0.7 abc
Asana 0.66XL AgriMek 0.15EC	14.5 oz./A 20.0 oz./A	GC 25 May	4.5 b-f	10.3 bcd	0.2 a	57.5 a	4.8 b	1.7 ab	0.2 ab
COMPOUND X Imidan 70WP	75 g/Ha 64.0 oz./A	1st hatch 1st 2nd PF	14.5 g	62.4 f	0.7 ab	64.0 a	10.0 d	8.1 b	6.1 d
COMPOUND X Imidan 70WP	100 g/Ha 64.0 oz./A	1st hatch 1st 2nd PF	5.5 c-f	36.2 ef	7.3 bcd	49.3 a	2.8 bcd	6.0 b	0.9 abc
COMPOUND X Imidan 70WP	150 g/Ha 64.0 oz./A	1st hatch 1st 2nd PF	7.1 c-f	46.4 f	5.8 abc	56.3 a	5.3 bcd	6.8 b	2.3 a-d
COMPOUND X + Damoil Imidan 70WP	150 g/Ha 32.0 oz. / 100 64.0 oz./A	1st hatch 1st 2nd 1st hatch 1st 2nd PF	8.5 fg	35.7 ef	1.1 ab	95.5 a	7.1 bcd	6.6 b	12.5 bcd
COMPOUND Y Imidan 70WP	100 g/Ha 64.0 oz./A	1st hatch 1st 2nd PF	7.6 e-g	41.4 ef	15.5 d	69.5 a	8.6 cd	11.4 b	3.6 cd
Delegate + Damoil Imidan 70WP	7.0 oz./A 32.0 oz. / 100 64.0 oz./A	2 June 21dpPF. PF	3.5 b-e	10.2 bcd	17.7 cd	16.8 a	1.7 ab	3.8 b	1.1 abc
Movento + LI700 Imidan 70WP	14.0 oz./A 32.0 oz. / 100 64.0 oz./A	2 June 2 June PF	2.1 b	8.1 bc	0.2 a	33.5 a	2.8 bc	3.4 b	0.2 ab
Untreated control	-	-	7.4 c-f	25.4 def	10.7 d	73.3 a	4.4 bc	4.2 b	7.6 d

1 Data taken on foliage of Bartlett. BB on 11 April, GC on 22 April, WB on 25 April, PF on 14 May, 1C on 2 June.
2 Percentage data were transformed by arcsine *(square root of x) prior to analysis. Foliar data for leaf curl midge were transformed using the Log10 (X + 1) conducted prior to analysis. Untransformed data are presented in each table. Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different

Table 15 Evaluations of insecticide and fungicide schedules of Fabraea leaf spot damage on Bartlett pear. Hudson Valley Lab., Highland, N.Y.-2008.

			% Leaves with Fabraea			Disease severity ratings		
						0-5 scale	% Defoliation	
Treatment	Formulation amt.	Application Dates	17 Jul	31 Jul	22 Aug	17 Jul	31 Jul	22 Aug
Damoil	3 % v/v	BB	60.0 ab	72.0 b	88.3 bc	0.78 ab	5.7 a	8.1 a
Damoil	1.0 %	GC, WB, PF, 1-6C						
Surround WP	50.0 lbs./A	BB, WB, PF	53.0 ab	80.8 b	96.5 cd	0.69 ab	5.7 a	14.7 a
Damoil	1.0 % v/v	1-6C						
Asana 0.66XL	14.5 oz./A	DD	82.0 bc	99.5 cd	100.0 d	1.54 b	19.8 b	53.8 c
Insite	8.0 oz./A	DD						
AgriMek 0.15EC	20.0 oz./A	2 June						
Asana 0.66XL	14.5 oz./A	DD	32.0 a	41.8 a	53.3 a	0.33 a	5.7 a	9.4 a
AgriMek 0.15EC	20.0 oz./A	25 May						
Manzate	1.0 lb./100	PF, 1-2, 4C						
Sovran	1.5 oz./100	PF, 1-2, 4C						
COMPOUND X	150 g/Ha	1st hatch 1st, 2nd	69.0 b	71.3 b	79.5 b	0.96 ab	16.8 b	14.5 a
+ Damoil	32.0 oz. / 100	1st hatch 1st, 2nd						
Imidan 70WP	64.0 oz./A	PF						
Manzate	1.0 lb./100	PF, 1-2, 4C						
Sovran	1.5 oz./100	PF, 1-2, 4C						
Delegate +	7.0 oz./A	2 June	60.0 ab	92.8 c	96.0 cd	1.07 ab	18.3 b	29.8 b
Damoil	32.0 oz. / 100	21dpPF.						
Imidan 70WP	64.0 oz./A	PF						
Manzate	1.0 lb./100	PF, 1-2, 4C						
Sovran	1.5 oz./100	PF, 1-2, 4C						
Movento +	14.0 oz./A	2 June	73.0 bc	97.3 cd	100.0 d	1.47 b	35.3 c	70.3 d
LI700	32.0 oz. / 100	2 June						
Imidan 70WP	64.0 oz./A	PF						
Untreated control	-	-	95.0 c	100.0 d	97.0 cd	2.95 c	56.9 d	87.6 e

1 Data taken on foliage of Bartlett. BB on 11 April, GC on 22 April, WB on 25 April, PF on 14 May, 1C on 2 June.

2 Percentage data were transformed by arcsine *(square root of x) prior to analysis. Foliar data for leaf curl midge were transformed using the Log10 (X + 1) conducted prior to analysis. Untransformed data are presented in each table. Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different

Table 16	Effect of oil applications on spore production and germination of Fabarea lesions from Bosc foliage. Hudson Valley Lab., Highland, N.Y.-2008.			
Treatment	Formulation amt.	Application Dates	% of 4-cell spores with at least one germ tube after 24 hr on agar	Spores released per 4-mm diam. leaf disk during 30-sec vortexing
Damoil	3 % v/v	DD	19.9	217
Damoil	1.0 %	GC, WB, PF, 1-6C		
Delegate +	7.0 oz./A	2 June	43.4	2400
Damoil	32.0 oz. / 100	21dpPF.		
Imidan 70WP	64.0 oz./A	PF		
Manzate	1.0 lb./100	PF, 1-2, 4C		
Sovran	1.5 oz./100	PF, 1-2, 4C		
Movento +	14.0 oz./A	2 June	53.8	3833
LI700	32.0 oz. / 100	2 June		
Imidan 70WP	64.0 oz./A	PF		
% reduction between oil and standard fungicide program			54.2 %	91.0 %

1 Data taken on foliage of Bosc on 7 August.

Table 18 Evaluations of insecticide schedules on harvested fruit exhibiting russet and Fabraea damage of Bartlett pear. Hudson Valley Lab., Highland, N.Y.-2008.

Treatment	Formulation amt./100 gal.	Russett rating 0	1	2	3	4	5	Fabraea rating 0	1	2
Damoil Damoil	3 % V/V 1.0 % V/V	0.3 a	15.8 abc	77.5 d	5.3 abc	1.3 abc	0.0 a	48.8 b	15.8 ab	35.5 b
Surround WP Damoil	50.0 lbs./A 1.0 % V/V	0.3 a	48.5 d	51.3 abc	0.0 a	0.0 a	0.0 a	18.3 a	11.3 ab	70.5 c
Asana 0.66XL Insite AgriMek 0.15EC + Damoil Dithane	14.5 oz./A 8.0 oz./A 20.0 oz./A 0.25% V/V 64.0 oz./A	0.5 a	27.0 cd	71.3 cd	1.3 ab	0.0 a	0.0 a	79.8 c	17.8 ab	2.5 a
Asana 0.66XL AgriMek 0.15EC + Damoil	14.5 oz./A 20.0 oz./A 0.25% V/V	0.0 a	21.8 bc	64.5 bcd	13.0 b-e	0.8 a-d	0.0 a	3.0 a	9.3 a	87.0 c
COMPOUND X Imidan 70WP Dithane	75 g/Ha 64.0 oz./A 64.0 oz./A	0.0 a	12.3 abc	69.3 cd	12.0 c-f	5.8 c-f	0.8 ab	71.5 bc	23.8 ab	4.8 a
COMPOUND X Imidan 70WP Dithane	100 g/Ha 64.0 oz./A 64.0 oz./A	0.0 a	19.3 abc	68.3 cd	8.8 b-e	3.0 b-e	0.0 a	82.8 c	12.8 ab	3.8 a
COMPOUND X Imidan 70WP Dithane	150 g/Ha 64.0 oz./A 64.0 oz./A	0.0 a	6.5 ab	47.5 abc	22.5 def	10.3 def	13.5 bc	84.5 c	13.0 ab	2.8 a
COMPOUND X + Damoil Imidan 70WP Dithane	150 g/Ha 0.25% V/V 64.0 oz./A 64.0 oz./A	0.3 a	30.5 cd	62.3 bcd	6.8 a-d	0.5 ab	0.0 a	81.0 c	15.8 ab	2.8 a
COMPOUND Y Imidan 70WP Dithane	100 g/Ha 64.0 oz./A 64.0 oz./A	0.0 a	3.8 ab	40.0 ab	27.3 f	13.0 f	15.8 c	76.8 c	18.3 ab	4.8 a
Delegate + + Damoil Imidan 70WP Dithane	7.0 oz./A 0.25% V/V 64.0 oz./A 64.0 oz./A	0.0 a	17.0 abc	42.5 ab	11.8 b-f	6.8 def	22.0 c	60.5 bc	23.8 b	15.8 ab
Movento Damoil Imidan 70WP	2.5 oz./A 3.0 gal. / 100 64.0 oz./A	0.0 a	19.8 abc	72.3 cd	7.3 abc	0.8 a-d	0.0 a	4.3 a	8.8 ab	87.0 c
Untreated control	-	0.0 a	4.0 a	32.8 a	26.3 ef	11.8 f	21.3 c	15.0 a	16.5 ab	68.5 c

1 Data taken on Bartlett harvested 18 August. BB on 11 April, GC on 22 April, WB on 25 April, PF on 14 May, 1C on 2 June.
2 Percentage data were transformed by arcsine *(square root of x) prior to analysis. Untransformed data are presented in each table. Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different.

2EVALUATION OF COMMERCIAL ONION SEED TREATMENTS FOR ONION MAGGOT CONTROL IN THE HUDSON VALLEY OF NEW YORK

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Report prepared November 20, 2008

OBJECTIVE

To evaluate efficacy of fipronil, clothianidin and spinosad as pelleted seed treatments, acquired from major seed enhancement companies, for managing onion maggot, *Delia antiqua* (Meigen), in dry bulb onion, *Allium cepa* L., in the Hudson Valley of New York.

MATERIALS AND METHODS

This experiment was conducted in one commercial muck field in Orange County of New York in 2008. Fields were selected based on a history of high onion maggot pressure. Onion seeds, cultivar 'Arsenal', were planted on 16 April in Pine Island. Each plot was a single row 30-ft long. Plots were separated by a 3-ft alley within rows. There were no guard rows. Average row width was 15 inches and seeds were planted at a density of approximately 12 per ft.

The main treatments included three novel insecticides, clothianidin (@ a rate of 4.59 g a.i./100 g of seed = 0.18 mg a.i./seed), fipronil (@ a rate of 2.5 g a.i./100g seed) and spinosad (@ a rate of 5.1 g a.i./100g seed = 0.2 mg a.i./seed). Additionally, there were 10 seed enhancement companies that treated seeds with these insecticides. The experiment was a 3 (insecticide) x 10 (seed enhancement company) factorial and included a non-insecticide control and a standard insecticide treatment, arranged as a randomized complete block design replicated 5 times (32 treatments total). All treatments including the untreated control were treated with Thiram (188 mg a.i./100 g of seed) and Allegiance (15 mg a.i./100 g of seed) and a drench treatment of Manzate at a rate of 76.8 fl oz/acre to control early-season diseases.

Baseline plant stand counts were taken about three weeks after planting on 5 May to determine if any treatments affected seedling emergence. Similarly, a final plant stand count was taken on 9 July at the end of the first onion maggot generation. The number of plants dying due to onion maggot feeding was recorded on a weekly or bi-weekly basis beginning at the first sign of maggot damage until after the end of the first generation in early July. Seedlings containing maggot larvae or those clearly dying from maggot feeding (but larva not present) were recorded as killed by onion maggot and then removed from the plot.

The cumulative number of seedlings killed by the first generation of onion maggots was divided by the sum of this total plus the final plant stand count to obtain a final proportion of plants killed by onion maggot for each plot. These data were analyzed using an analysis of variance procedure of Super ANOVA and treatment means were compared using a Fisher's Protected LSD at $P < 0.05$. Data were transformed using a square root $(x + 1)$ function before analysis, but untransformed means are presented.

RESULTS AND DISCUSSION

Two weeks of relatively dry conditions after planting followed by 1.5" of rain allowed for a relatively uniform germination level of seedling emergence and establishment across all treatments in 2008. Onion maggot pressure was higher than we've observed in the recent past.

There were no negative trends in seedling emergence that were consistent for any of the products or seed treatment companies. However, the Agricoat was numerically lower across treatments compared to the other manufacturers. In 2007 it was noted in the laboratory that Agicoat's coating disintegrated relatively quickly in water compared with the other coatings leading to reduced germination in trials at the Sodus location (Nault study, 2007). This aspect of coat degradation may in part account for a reduced trend in germination emergence.

The currently labeled product, Trigard, was effective against onion maggot (**Table 2**). All new products, regardless of the seed enhancement company, reduced damage to an acceptable or near acceptable levels. Collective data across commercial seed enhancement companies were compared for efficacy among the three active ingredients. The least amount of onion maggot damage occurred in the Poncho 600 treatment followed by Entrust and then Mundial 500 (**Table 3**). In 2007 we observed the same trend in efficacy, however, statistically significant differences were noted in only 2 of 3 sites.

Data also were combined across all insecticide products to determine if the type of commercial pellet influenced the level of onion maggot control (**Table 4**). Differences were observed among the pelleting companies with the least amount of onion maggot damage observed for seeds treated by Agricoat, Seed Dynamics, Setco and Nunhems. Incotec and Kamterter observed the highest degree of OM damage of treated seed. The others were intermediate between these groups.

Table 1. Average percent onion seedling emergence in the Hudson Valley in New York in 2008.

Trmt #	Product	Active Ingredient	Seed Treater	% Seedling emergence[1] Pine Island
1	Non-treated	-	Incotec	**145.0**
2	Trigard	cyromazine	Incotec	**196.0**
3	Entrust	spinosad	Incotec	**232.4**
4	Mundial	fipronil	Incotec	**194.0**
5	Poncho	clothianidin	Incotec	**166.8**
6	Entrust	spinosad	Eastern Seed Services	**203.6**
7	Mundial	fipronil	Eastern Seed Services	**190.6**
8	Poncho	clothianidin	Eastern Seed Services	**182.2**
9	Entrust	spinosad	GTG	**177.0**
10	Mundial	fipronil	GTG	**188.2**
11	Poncho	clothianidin	GTG	**171.6**
12	Entrust	spinosad	Kamterter	**129.8**
13	Mundial	fipronil	Kamterter	**163.6**
14	Poncho	clothianidin	Kamterter	**175.6**
15	Entrust	spinosad	Nunhems	**183.4**
16	Mundial	fipronil	Nunhems	**196.6**
17	Poncho	clothianidin	Nunhems	**194.8**
18	Entrust	spinosad	Seed Dynamics	**147.2**
19	Mundial	fipronil	Seed Dynamics	**126.4**
20	Poncho	clothianidin	Seed Dynamics	**166.0**
21	Entrust	spinosad	Seminis	**168.4**
22	Mundial	fipronil	Seminis	**149.0**
23	Poncho	clothianidin	Seminis	**162.2**
24	Entrust	spinosad	Skagit Seed Services	**155.2**
25	Mundial	fipronil	Skagit Seed Services	**191.6**
26	Poncho	clothianidin	Skagit Seed Services	**187.4**
27	Entrust	spinosad	Seteco	**152.0**
28	Mundial	fipronil	Seteco	**189.8**
29	Poncho	clothianidin	Seteco	**181.2**
30	Entrust	spinosad	Agricoat	**144.4**
31	Mundial	fipronil	Agricoat	**146.8**
32	Poncho	clothianidin	Agricoat	**159.8**

[1] Means followed by the same letter are not significantly different ($P > 0.05$; Fisher's Protected LSD; n = 5 in all locations).

Table 2. Percent of onion plants killed by onion maggot in the Hudson Valley in New York in 2008.

Trt #	Product	Active Ingredient	Seed Treater	Mean % onion plants killed by onion maggot [1] Pine Island	
1	Non-treated	-	Incotec	**40.2**	k
2	Trigard	cyromazine	Incotec	**10.0**	f g h
3	Entrust	spinosad	Incotec	**9.5**	f g h
4	Mundial	fipronil	Incotec	**21.3**	j
5	Poncho	clothianidin	Incotec	**9.5**	f g h
6	Entrust	spinosad	Eastern Seed Services	**8.7**	f g
7	Mundial	fipronil	Eastern Seed Services	**15.1**	h i j
8	Poncho	clothianidin	Eastern Seed Services	**5.6**	c d e f
9	Entrust	spinosad	GTG	**9.4**	f g h
10	Mundial	fipronil	GTG	**11.9**	g h
11	Poncho	clothianidin	GTG	**6.2**	d e f
12	Entrust	spinosad	Kamterter	**20.5**	j
13	Mundial	fipronil	Kamterter	**19.7**	i j
14	Poncho	clothianidin	Kamterter	**2.0**	a b c
15	Entrust	spinosad	Nunhems	**3.9**	b c d e
16	Mundial	fipronil	Nunhems	**6.5**	e f
17	Poncho	clothianidin	Nunhems	**6.1**	d e f
18	Entrust	spinosad	Seed Dynamics	**4.3**	b c d e
19	Mundial	fipronil	Seed Dynamics	**5.2**	c d e f
20	Poncho	clothianidin	Seed Dynamics	**3.3**	a b c d
21	Entrust	spinosad	Seminis	**6.5**	e f
22	Mundial	fipronil	Seminis	**5.6**	c d e f
23	Poncho	clothianidin	Seminis	**6.5**	e f
24	Entrust	spinosad	Skagit Seed Services	**9.1**	f g h
25	Mundial	fipronil	Skagit Seed Services	**14.3**	g h i
26	Poncho	clothianidin	Skagit Seed Services	**1.4**	a b
27	Entrust	spinosad	Seteco	**4.1**	a b c d e
28	Mundial	fipronil	Seteco	**7.2**	e f
29	Poncho	clothianidin	Seteco	**3.0**	a b c d e
30	Entrust	spinosad	Agricoat	**3.2**	a b c d e
31	Mundial	fipronil	Agricoat	**3.8**	a b c d e
32	Poncho	clothianidin	Agricoat	**1.4**	a

[1] Means followed by the same letter are not significantly different ($P > 0.05$; Fisher's Protected LSD; n = 5). F=13.5, df=31, P= .0001

Table 3. Mean percent of onion plants killed by onion maggot in the Hudson Valley in New York in 2008. Data are pooled across all commercial seed enhancement companies.

Product	Chemical name	Mean % onion plants killed by onion maggot[1,2] Pine Island
Non-treated[3]	-	40.6
Trigard[3]	cyromazine	9.9
Mundial 500	fipronil	11.1 c
Entrust	spinosad	8.2 b
Poncho 600	clothianidin	4.5 a
		F= 37.6; df=4; P= 0.0001

Table 4. Percent of onion plants killed by first-generation onion maggot in the Hudson Valley in New York in 2008. Data are pooled across the 3 seed treatments.

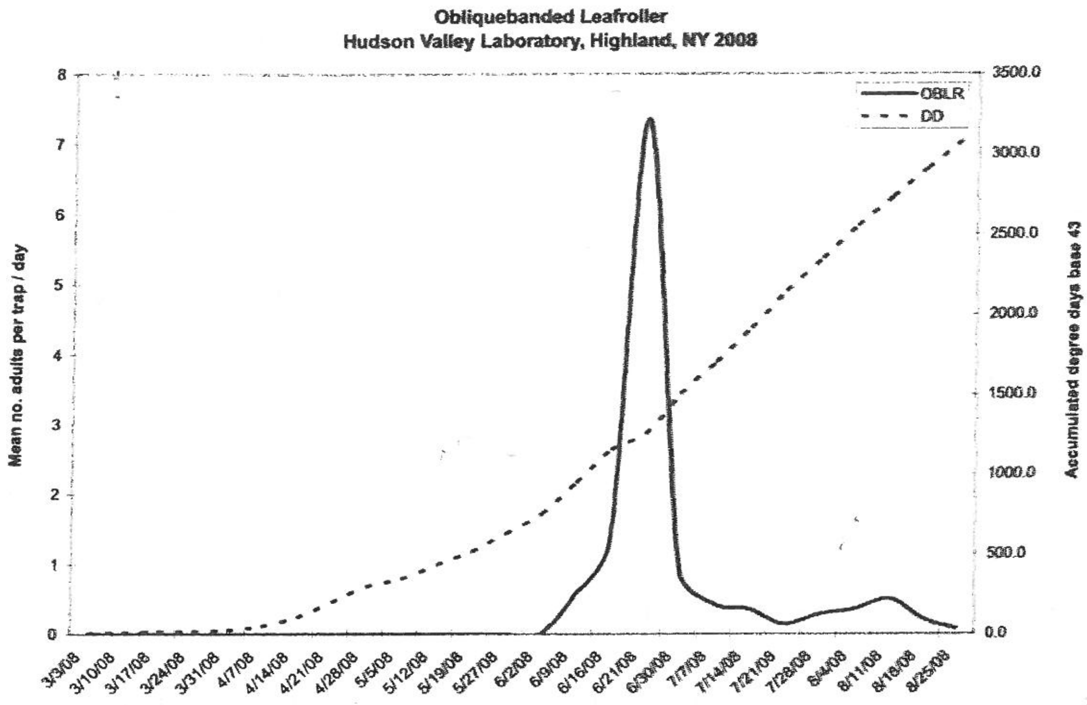
Commercial Seed Company	Mean % onion plants killed by onion maggot[1,2] Pine Island
Untreated[3]	40.6
Agricoat	2.7 a
Eastern Seed Services	9.7 cd
GTG	9.3 cd
Incotec	13.3 de
Kamterter	15.1 e
Nunhems	5.5 abc
Seed Dynamics	4.3 ab
Seminis	6.3 abc
Seteco	4.7 ab
Skagit Seed Services	8.4 bc
	F= 7.9; df= 9 P= 0.0001

[1] Means followed by the same letter are not significantly different ($P > 0.05$; Fisher's Protected LSD; n = 5 in all locations). Data were transformed using a $\log_{10}(x+1)$ function to stabilize variance before analysis, but untransformed means are presented.

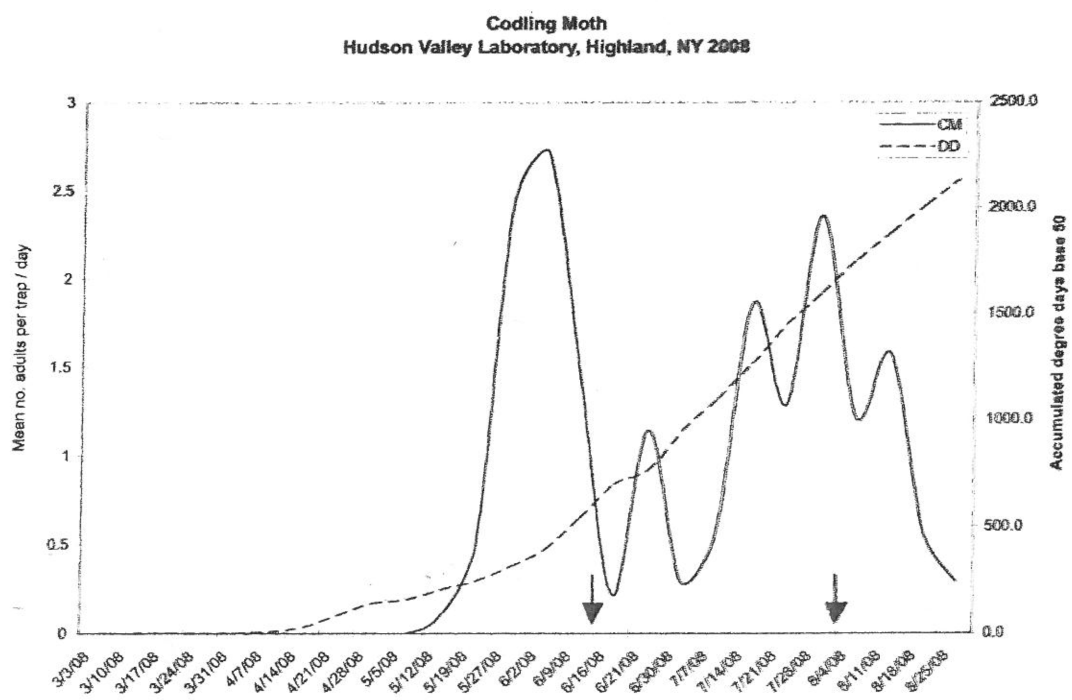
[2] The letters following these means are correct, despite the fact that the mean for Poncho 600 is significantly lower than the mean for Mundial (0.4), whereas the mean for Entrust is not (0.3). The reason for this is that statistics were conducted on transformed data, but untransformed data are presented.

[3] Not included in the statistical analyses; provided only for reference.

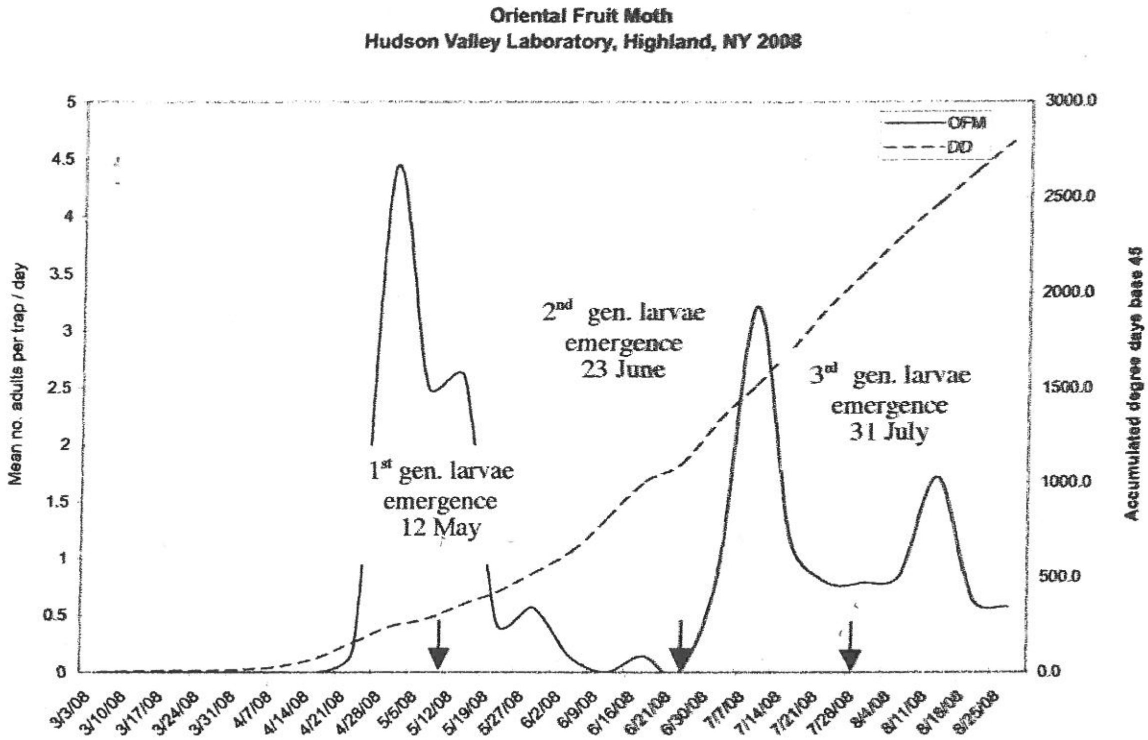
Degree-day accumulations for insect pest developmental phenology were derived using Thermochron iButton (Embedded Data Systems), Hobo data logger (Onset Computer Corp.) and E-Weather service (Skybit Inc.).



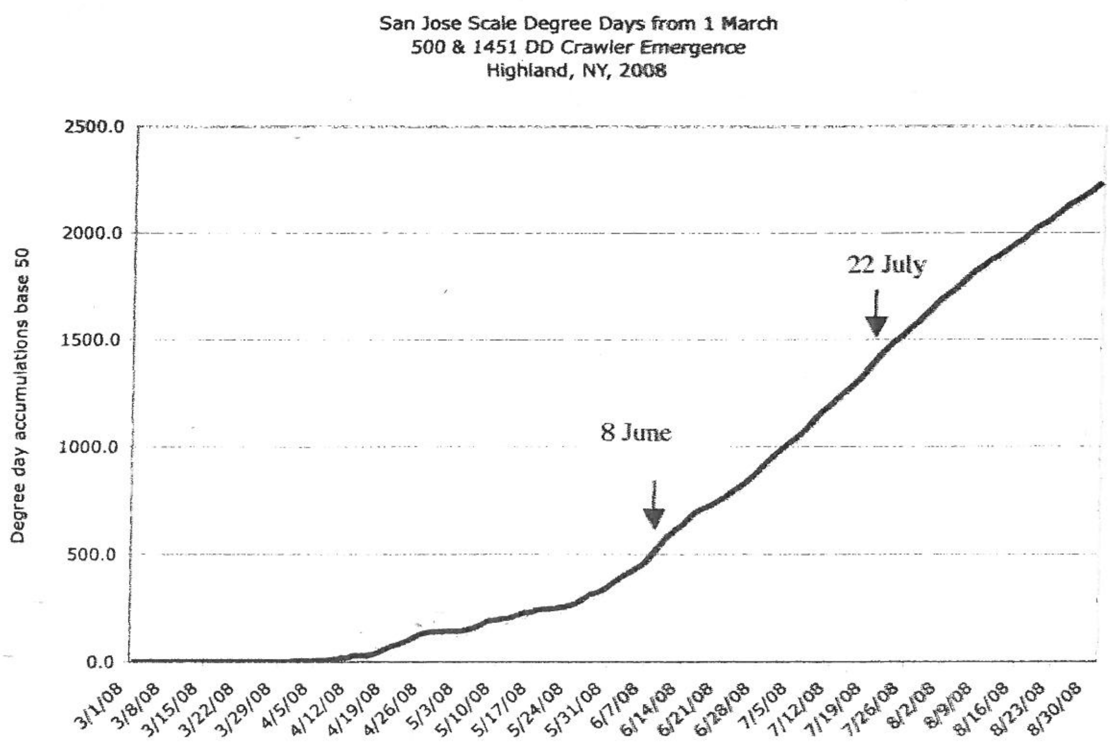
Applications timed for 1st emergence of the obliquebanded leafroller 1st generation emergence at 340 DD (18 June) from 1st adult flight biofix and 2nd gen. at 340 DD (22 July) from 2nd adult flight biofix base 43.



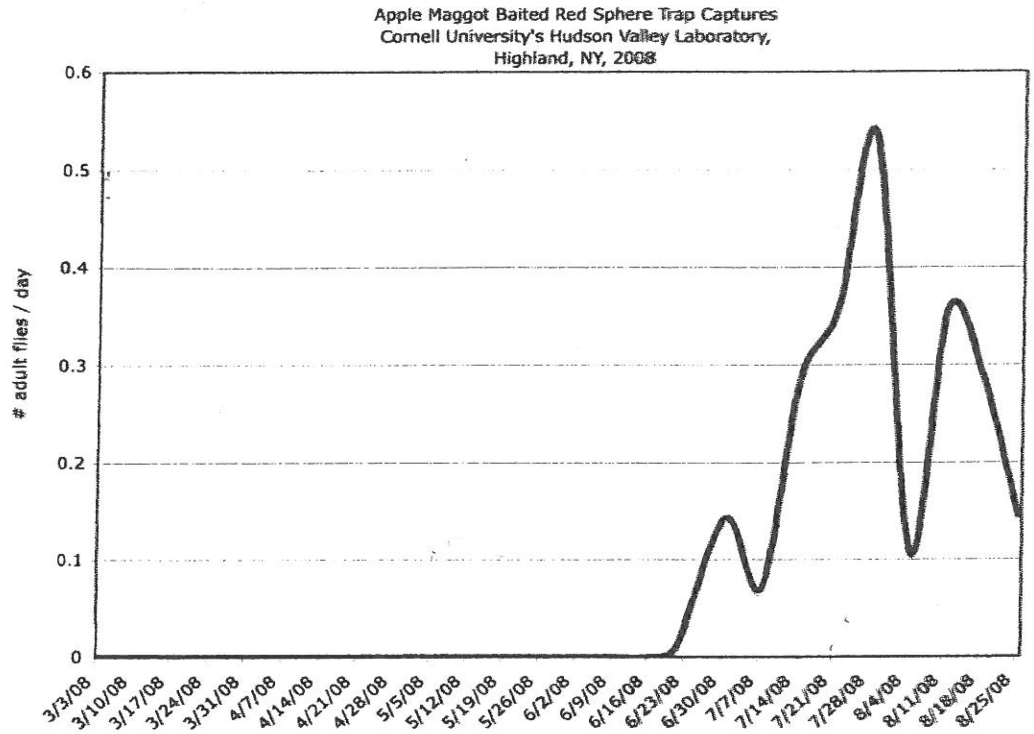
Applications timed for 1st emergence of the codling moth 1st generation emergence at 250 DD (6 June) and 2nd gen. at 1260 DD (22 July) base 50.



Oriental fruit moth 1st generation emergence at 350 DD, 2nd gen. at 1125 DD, 3rd gen. at 2200 DD base 45.



San Jose scale crawler emergence timed using 500 and 1451 DD base 50 for 1st and 2nd generations respectively.


Apple Maggot Baited Red Sphere Trap Captures
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008
adult flies / day
0.6
0.5
0.4
0.3
0.2
0.1
0
3/3/08
3/10/08
3/17/08
3/24/08
3/31/08
4/7/08
4/14/08
4/21/08
4/28/08
5/5/08
5/12/08
5/19/08
5/26/08
6/2/08
6/9/08
6/16/08
6/23/08
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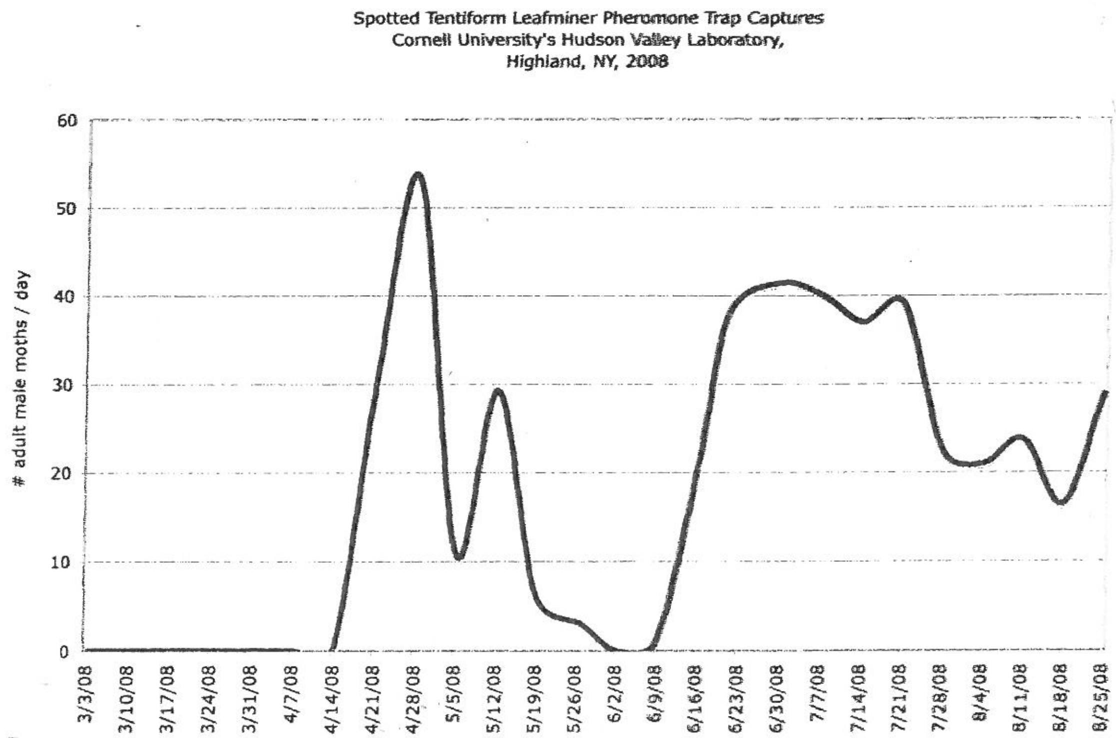
8/18/08
8/25/08


Spotted Tentiform Leafminer Pheromone Trap Captures
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008
adult male moths / day
60
50
40
30
20
10
0
3/3/08
3/10/08
3/17/08
3/24/08
3/31/08
4/7/08
4/14/08
4/21/08
4/28/08
5/5/08
5/12/08
5/19/08
5/26/08
6/2/08
6/9/08
6/16/08
6/23/08
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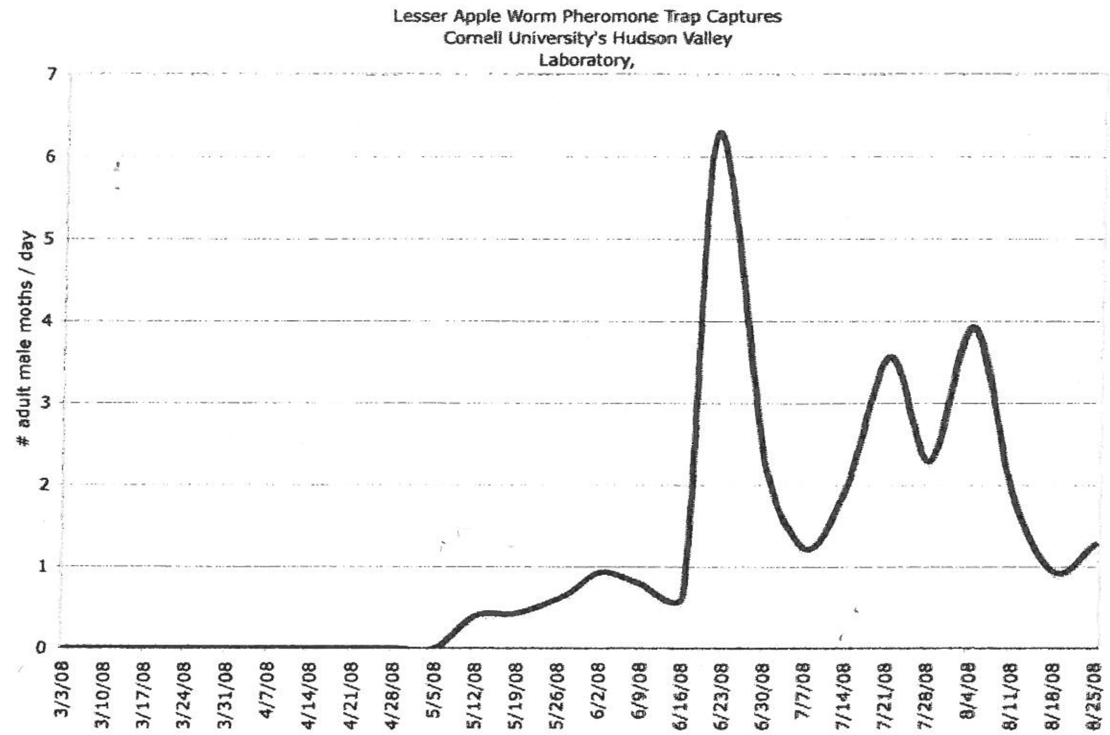
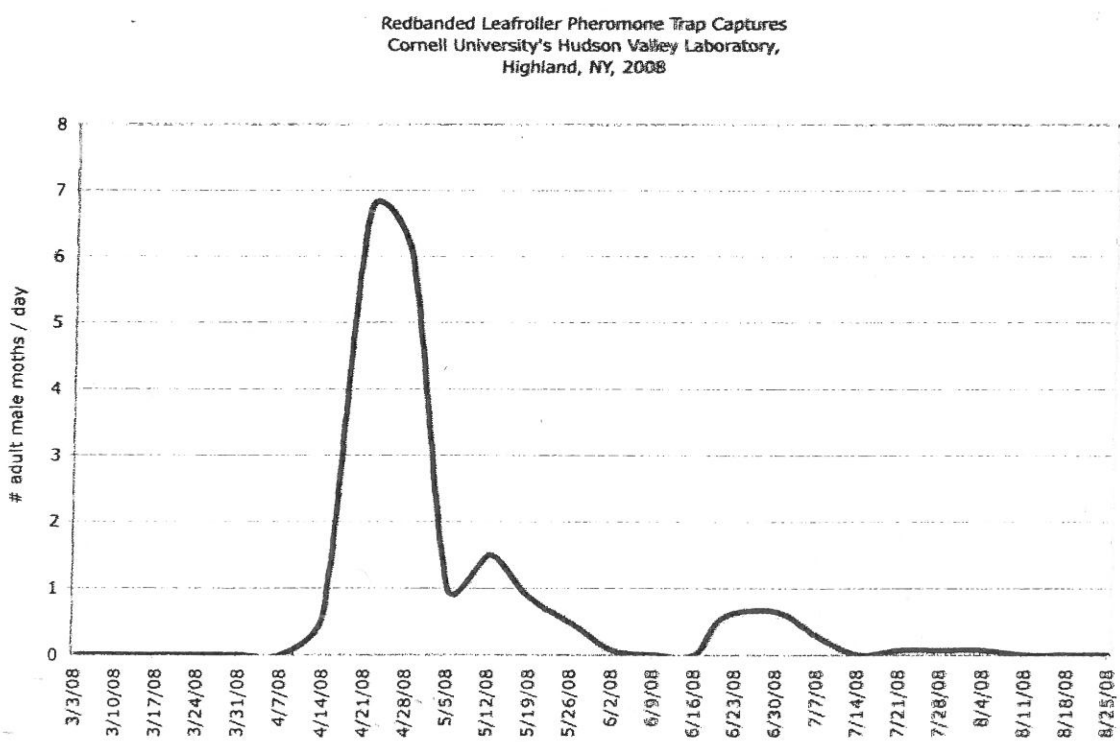
8/18/08
8/25/08

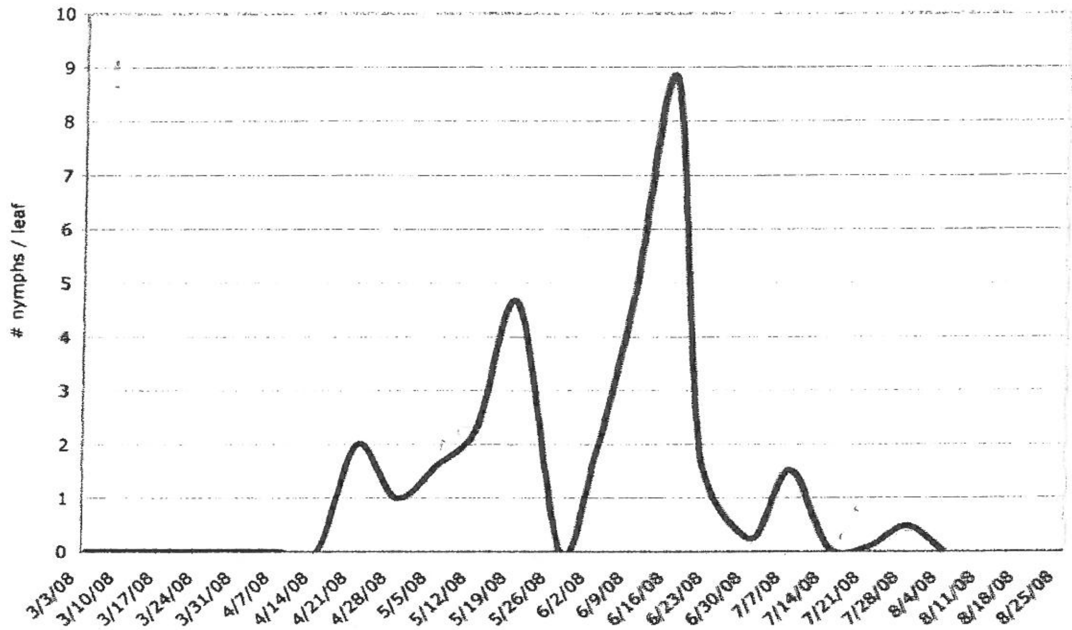


Lesser Apple Worm Pheromone Trap Captures
Cornell University's Hudson Valley
Laboratory,
adult male moths / day
0
1
2
3
4
5
6
7
3/3/08
3/10/08
3/17/08
3/24/08
3/31/08
4/7/08
4/14/08
4/21/08
4/28/08
5/5/08
5/12/08
5/19/08
5/26/08
6/2/08
6/9/08
6/16/08
6/23/08
6/30/08
7/7/08
7/14/08
7/21/08
7/28/08
8/4/08
8/11/08
8/18/08
8/25/08

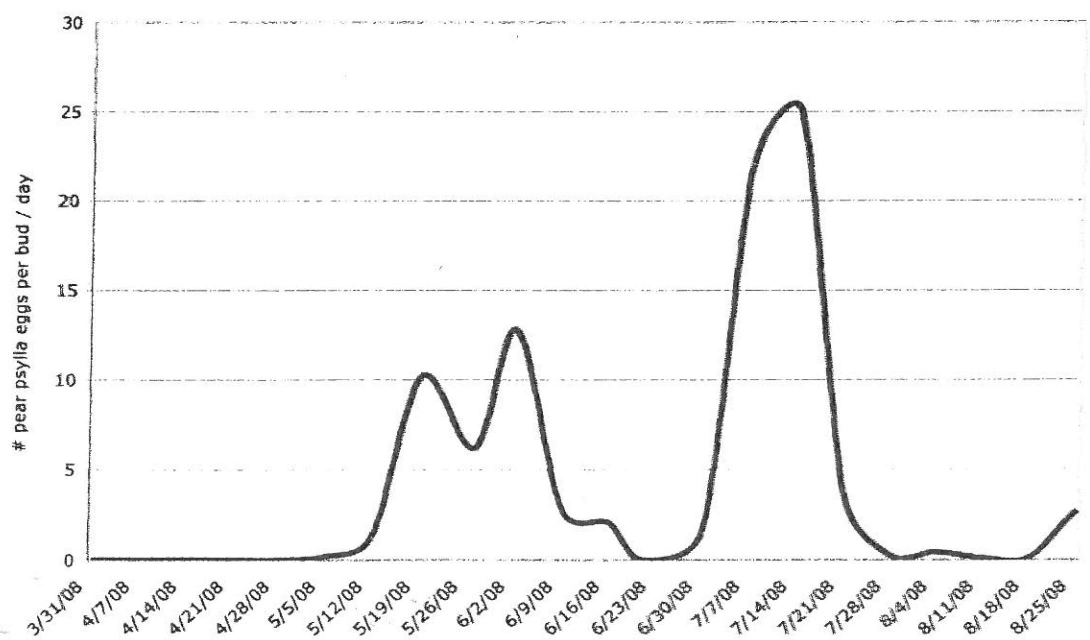


Redbanded Leafroller Pheromone Trap Captures
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008
adult male moths / day
0
1
2
3
4
5
6
7
8
3/3/08
3/10/08
3/17/08
3/24/08
3/31/08
4/7/08
4/14/08
4/21/08
4/28/08
5/5/08
5/12/08
5/19/08
5/26/08
6/2/08
6/9/08
6/16/08
6/23/08
6/30/08
7/7/08
7/14/08
7/21/08
7/28/08
8/4/08
8/11/08
8/18/08
8/25/08

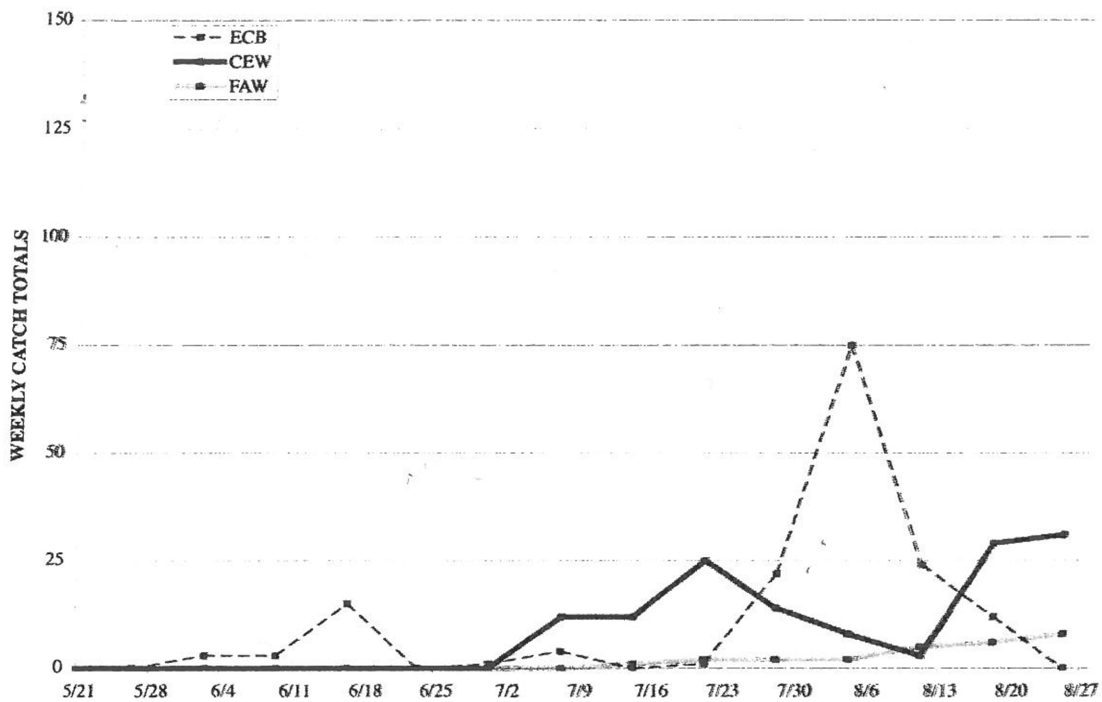
Pear Psylla Nymphs on Foliage Unsprayed Bartlett Trees
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008



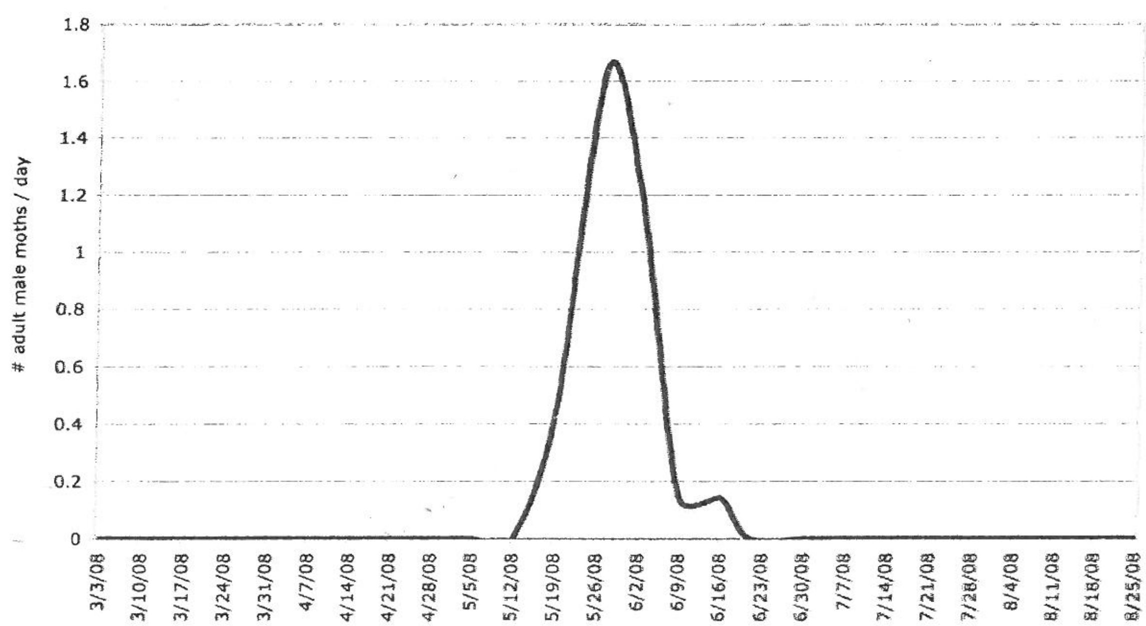
Pear Psylla Egg Counts of 100 Buds of Unsprayed Bartlett Trees
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008



SWEET CORN INSECT TRAP CATCH, NEW PALTZ, NY - 2008



Grape Berry Moth Pheromone Trap Captures
Cornell University's Hudson Valley Laboratory,
Highland, NY, 2008



McIntosh Phenology 1980 - 2008

Year	GT	HIG	T.C.	Pink	Bloom	P.F.
2008	4/10	4/14	4/21	4/24	4/29	5/7
2007	4/2	4/21	4/24	5/2	5/7	5/14
2006	4/3	4/10	4/17	4/22	4/26	5/8
2005	4/7	4/11	4/18	4/26	5/8	5/16
2004	4/12	4/19	4/22	4/27	5/3	5/13
2003	4/7	4/16	4/24	4/28	5/1	5/19
2002	3/25	4/10	4/14	4/15	4/16	5/7
2001	4/11	4/17	4/25	4/28	5/2	5/10
2000	3/27	4/2	4/14	4/24	5/1	5/8
1999	4/2	4/7	4/12	4/26	5/2	5/13
1998	3/27	3/29	4/1	4/10	4/23	5/4
1997	4/4	4/11	4/21	4/28	5/1	5/14
1996	4/15	4/19	4/22	4/29	5/6	5/20
1995	4/11	4/19	4/24	4/29	5/8	5/19
1994	4/11	4/14	4/20	4/29	5/5	5/12
1993	4/12	4/19	4/24	5/1	5/3	5/10
1992	4/13	4/21	5/4	5/7	5/12	5/18
1991	4/5	4/8	4/11	4/17	4/27	5/7
1990	3/21	4/16	4/23	4/26	4/29	5/11
1989	3/29	4/17	4/28	5/3	5/9	5/19
1988	4/4	4/9	4/28	5/5	5/8	5/19
1987	3/29	4/10	4/18	4/22	4/29	5/16
1986	3/31	4/7	4/19	4/27	5/3	5/8
1985	3/30	4/12	4/15	4/22	5/4	5/12
1984	4/10	4/26	4/30	5/6	5/16	5/24
1983	4/12	4/27	4/30	5/2	5/5	5/18
1982	4/15	4/22	4/30	5/4	5/13	5/17
1981		4/8	4/16	4/22	5/5	5/14
1980	4/15		4/24	5/2	5/5	5/10
Earliest day	**3/21**	**3/29**	**4/1**	**4/10**	**4/16**	**5/4**
Latest day	**4/15**	**4/27**	**5/4**	**5/7**	**5/16**	**5/24**
Mean	6 April	14 April	22 April	28 April	3 May	13 May
Appox. Midrange	**4/2** (+/-13D)	**4/12** (+/-14D)	**4/17** (+/-16D)	**4/23** (+/-13D)	**5/1** (+/-15D)	**5/14** (+/-10D)

Data was taken from McIntosh on a variety of research blocks on M.26 rootstock at Cornell University's Hudson Valley Laboratory in Highland, NY. Undoubtedly the replanting of these orchards during the period of data collection imposed age variability on tree phenology events

2008 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Laboratory, Highland, NY

All readings were taken at 0800 EST on the dates indicated

	MARCH			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	Max	Min	Precip
1	28	12		57	36	0.40	52	28		78	57	0.10	83	61		88	64		82	52	
2	43	24	0.26	66	34	0.25	59	45	0.11	77	54		82	62	0.10	86	64		82	57	
3	54	28		47	21		53	48		80	50		83	64		76	57	0.51	86	65	
4	47	33	1.29	52	35	0.57	53	46	0.16	83	58	0.19	87	62	0.35	79	60		85	63	
5	46	33		48	36	0.45	64	39		65	59	0.02	75	63	0.80	82	61		91	64	
6	50	24	0.10	55	40		69	41		75	59	0.27	79	66		84	69	0.36	88	70	0.35
7	48	26		48	39		74	44		75	59	0.01	82	69		86	61		78	66	1.52
8	50	33	0.94	57	38		75	59		94	68		85	71		82	61	0.85	79	55	
9	46	26	1.33	61	35		77	48	0.10	92	70		89	71	0.16	75	57	0.13	79	60	0.04
10	29	18		61	44		53	45	0.40	98	70		85	66		79	56		70	50	1.22
11	42	23		68	46		67	41		95	64	0.14	84	57		79	59	0.63	69	50	
12	45	28		58	46	0.39	68	46		86	59		82	66		68	57	0.79	71	55	
13	47	26		77	40		58	39		81	53		87	65		79	55		67	63	0.32
14	45	28		53	30	0.04	70	39		84	64		84	68	0.32	79	62	0.15	76	66	0.62
15	52	35	0.28	53	28		77	51	0.01	87	68	0.47	81	59		77	62		86	70	
16	50	36	0.06	58	30		67	50	0.04	84	65		86	59		77	58	0.05	81	53	
17	45	26		66	36		57	44	0.72	80	56	0.45	87	64		78	55	0.67	67	48	
18	42	25		77	42		72	48		75	51		89	66		83	60		72	50	
19	45	28	0.27	81	50		61	39	0.22	70	51	0.25	93	69		86	63		67	45	
20	48	38	0.46	82	50		57	38	0.01	74	53		93	71		77	48	0.01	66	41	
21	45	29		69	45		59	39		75	55		93	69	0.01	73	52		68	44	
22	42	24		74	40		65	43	0.17	82	60		89	66		79	56		79	53	0.15
23*	48	23		77	49		60	47	0.02	78	64	0.83	86	69	0.44	83	55		69	46	
24	44	20		81	58		68	45		77	62	0.02	77	68	1.21	80	63		69	45	
25	45	23		73	42		69	42		77	55	0.03	81	57	0.10	81	66		73	45	
26	46	30		76	53		75	50		82	62	0.01	84	60		80	50	0.01	66	52	0.68
27	58	28		66	46	0.05	82	67		77	65		85	67	0.02	74	50		61	55	0.33
28	48	35	0.17	62	47	0.26	84	48		79	65	0.01	78	64	0.46	77	53		71	61	0.04
29	38	26	0.09	52	44	1.27	67	36		87	70		85	63		81	59		71	62	0.35
30	41	16		55	32		78	44		84	63	0.23	86	63		74	64	0.07	69	53	
31	47	29					80	61					84	69		80	55				
Avg/ Total	45.3	26.9	5.25	63.7	40.4	3.68	66.8	45.2	1.96	81.0	60.3	3.03	84.6	65.0	3.97	79.4	58.5	4.23	74.6	55.3	5.62

* snow melt