RESULTS OF
2020
INSECTICIDE AND ACARICIDE
STUDIES IN EASTERN NEW YORK

Pub. # HV2020

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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. FMC Agricultural Solutions; Bayer CropScience, Corteva Agriscience, Gowan Co, Loveland Products, Inc, Marrone Bio Innovations, Nichino, Summit Agro USA, Syngenta, United Phosphorus Limited, Valent USA. Additional support for both research and operations was received from Sustainable Ag. Research Initiative (SARE) the New York State Apple Research and Development Program (ARDP), NYS Specialty Crops Research Initiative (SCRI) through New York State Ag. & Markets, Federal HATCH Program, Federal Multi-State USDA-NIFA SCRI #2016-51181-25409 for BMSB Research.

Formulation of Insecticides	Materials Tested	Company
	Apple & Pear	
Actara 25WDG	.....	Syngenta LLC
Altacor WG35	.....	FMC Agricultural Solutions
Admire Pro	.....	Bayer CropScience
Agri-Mek 0.15EC	.....	Syngenta LLC
Assail 30WG	.....	United Phosphorus Inc.
Avaunt eVo	.....	FMC Agricultural Solutions
Beleaf 50SG	.....	FMC Agricultural Solutions
Bifenture EC	.....	UPI
BioCover Oil	.....	Loveland Products, Inc.
Brigade 2EC	.....	FMC Agricultural Solutions
Captan 4L	.....	Loveland Products, Inc.
COMPOUND A	.....	NA
COMPOUND B	.....	NA
Delegate 25 WG	.....	Corteva Agriscience™
Envidor 2SC	.....	Bayer CropScience
Esteem 35 WP	.....	Valent USA
Exirel	.....	FMC Agricultural Solutions
Fujimite SC	.....	Nichino
Harvanta 50SL	.....	Summit Agro USA
Imidan 70W	.....	Gowan Co. USA
Lorsban 4EC	.....	Corteva Agriscience™
Movento 240SC	.....	Bayer CropScience
Sivanto Prime	.....	Bayer CropScience
Sivanto HL	.....	Bayer CropScience
Venerate XC	.....	Marrone Bio Innovations
Zeal 72WG	.....	Valent USA

Factors Contributing to the 2020

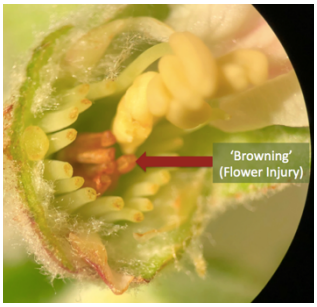
Hudson Valley Insect Pest Management Anomalies

Rainfall accumulations & temperature events: The start of the 2020 season began relatively mild in March with near average rainfall through April with rainfall accumulations of 3.14" in March (3.6" Ave.), and above average with 4.13" of rainfall in April (3.8" Ave.), above also above average of 5.52" in May (4.4" Ave.). June saw a below average rain events totaling 3.00" (4.4" Ave.), yet with ample rain to produce moderate levels of apple scab and significant fire blight infection in tree fruit blocks. July had relatively low weekly levels of rain providing lower than normal rainfall with accumulations of 2.44" (4.2" Ave.) with 10 days above 90°F, requiring weekly irrigation and sunburn protection in UV sensitive fruiting varieties. August and September also experienced lower than normal rainfall with accumulations of 3.91" (4.2" Ave.) and 3.38" () respectively. Total rainfall for the March 1st through October 1sh growing season totaled 24.80", lower than 2018 (26.74") and significantly higher than 2019 (19.21 "), slightly below the seasonal average of 25.1". Heavy rain in combination with wind events over the region were relatively lackluster in lower Ulster and Dutchess County, with no visible impact on fruit or tree architecture support systems, however, freeze events across the region on 17th-18th and 22nd-23rd May produced significant injury to the king flower during bloom and causing frost injury to developing fruitlets.

Tree phenology: Warm temperatures in early March supported early onset of bud development yet was hampered in 2020 by lingering cold temperatures beginning in late March and on-through May. The season began 7-days earlier than average, however, by petal-fall, the season was 12-days later than the 38-year phenology mid-range, 5 days earlier then the latest recorded date.

McIntosh green tip (23 March) occurred 7 days later than the 38-year historical earliest recorded date for GT at the HVRL (see McIntosh phenology). King bloom on McIntosh began on the 9th of May. Day length and predominately cool temperatures prevailed, ranging between 39.0°F and 81.2°F, setting the stage for a moderate bloom period lasting 10 days, on average with the mean of 9.4 days with ≥ 80% **PF in McIntosh occurring on 19th May,** 12 days beyond the May 5th historical mid-range date.

Degree-day accumulations of 535.1_{43BE} and 245.7_{50BE} were near mid-range relative to the 38-year average up to PF. A moderate temperature range of 39.0°F to 81.2°F followed 10-days after PF.



There was ample sunlight and temperature (11th-14th May) for pollinators yielding strong pollination in viable flowers of mid-late varieties showing strong fruit set of lateral flowers. Trees required targeted yet prudent thinning for a marketable crop. Across the Hudson Valley early flowering varieties in sites with well-drained soil and eastern slope suffered from flower bud April 17th. indicated significant loss of viability in farms experienced ample fruit set from May, 80% of McIntosh were at petal fall, sized ≥ 5 mm by 26th May.
Low levels of bitter pit were observed at honey crisp with higher crop load showing

significant cold temperature injury on the morning of Assessment of flower parts King flower buds, yet most lateral fruitlets. By 19th fruit had set with king fruit

harvest in mid-late pick lower levels of BP.

Heavy losses from wind driven hail were experienced along the central and western slope of Marlboro ridge and valley toward the Shawangunk Ridge on 29th June at 4 PM, causing near complete loss on a number of commercial tree fruit orchards within the narrow band of the storm.

Ample water was available during the early season, with near drought conditions during June and July requiring irrigation in light soils.

Tarnished Plant Bug (TPB) *Lygus lineolaris* presence in combination with other members of the plant bug complex including Mullein Plant Bug were observed in abundance causing significant fruit injury, found to be well above the seasonal average. Orchards with historical fruit damage from TPB required timely applications for management in orchards shortly after petal fall. Significant injury occurred during the post bloom period this season as cool temperatures prior to bloom were not conducive to TPB activity. Injury from this pest was observed to be at 20.0% by the 26st of May in the UTC Ginger Gold this season with small smooth raised protuberances (MPB) and more typical inverted punctures (TPB) found on sampled fruit. Observed TPB injury during harvest fruit evaluations in Ginger Gold on 7th September in untreated plot ranged between 3.4-12.0%.

Plum Curculio (PC) *Conotrachelus nenuphar* damage levels were moderately high with first observation of ovipositional injury delayed due to cool temperature until the 26th June, at which time 8.0% was observed at 7 days post PF in Ginger Gold, an early commercial variety. PC ovipositional injury to fruit increased later into the season to 41.3% by the 31st May. The predictive model using $308DD_{50BE}$ calculated the completion of PC migration and need for residual insecticide until 4th June using the HVRL NEWA station.

This season PC management required two applications in most orchards beginning at 80% PF based on reapplications using a 10d interval. Significant rain events occurred at the end of PF—1st cover for most mid- to late varieties. Rains after PF through 29th May (1.24" @ 10 days post PF), meant that reapplication was required on the 30th of May. A 2C June application was not required with PC hot spots addressed using board / perimeter applications in historically challenged blocks. Very light PC migration likely began during bloom when temperatures exceeded 80°F on consecutive days from 18th – 19th May. In early harvest assessments prior to 'June Drop', damage was assessed at near 50% in untreated Ginger Gold and Red Delicious.

European apple sawfly (EAS) *Hoplocampa testudinea* (Klug) activity occurred in very low numbers again this season with early varieties showing a range from 0.0% to 0.5% injury in Ginger Gold cluster fruit evaluations with early harvest assessments at < 1.0%. This was the sixth year in which EAS populations were at very low fruit damage levels.

Spotted Tentiform Leafminer (STLM) *Phyllonorycter blancardella* populations remain at very high levels in seasonal pheromone trapping with two distinct flights. Since the planting of our semi-dwarf test plots that correlate with the onset and use of the neonicotinoid class of insecticides employed in apple and reduced broad spectrum OP use, the STLM has not been observed to cause injury to foliage to a degree requiring insecticide management. Seasonal parasitism of early larval stages continues to be observed in trees with 'soft' insecticide programs.

San Jose scale (SJS) crawler emergence was predicted to occur during the second week of June (10th – 14th June), biofix based on the 1st adult pheromone capture on the 26th of May using a 260-360 DD_{50BE} model. Nymphs were observed in Vaseline petroleum jelly on black electrical tape on the 11th of June, 1 day after the predicted emergence date. In general, SJS scale levels were low in infested trees. The infestation means ranged from 0.5% to 3.0% injury observed in HVRL research plots on 8th July representing 1st generation infestation levels. In conventionally treated orchards, the SJS has become a major insect pest to manage in apple, requiring targeted applications for multiple generations. In 2015 we observed a 3rd generation in late September.

Lepidopteran complex: Overwintering larvae of the spotted green fruit worm (SGFW), red banded leafroller (RBLR), and obliquebanded leafroller (OBLR) during the pre-bloom period through fruit set remain a concern for most Hudson Valley and Lake Champlain pome fruit growers. The tools for use against the lepidoptera complex are diverse in mode of action, effective, and have excellent residual activity. Relatively low levels of infestation were observed in the pre-bloom and early season leafroller complex with harvest ratings for LR injury ranging between 0.3-1.5% injury to fruit on 5th June and 4.3-6.9% injury at harvest of Ginger Gold on 7th August.

Codling Moth (CM) *1st* generation sustained adult flight occurred on 15th May with first hatch / larval emergence predicted for 30th May using 220 DD_{50BE} from CM biofix. Complete hatch of *1st* generation was predicted by 22nd June with frass from CM observed on 13th July at 16% in Ginger Gold UTC. The internal lepidopteran complex, lesser apple worm (LAW), oriental fruit moth (OFM), and codling moth (CM), showed relatively low levels of damage to apple, with frass produced by the internal lepidopteran complex appearing during mid-late July. The 2nd generation adult emergence followed by sustained catch for the CM biofix occurred on 29th of June with management for larval emergence prediction using 250 DD_{50BE} to occur on July 8th. Damage from 1st and 2nd generation CM evaluated at harvest on untreated Ginger Gold showed 8.3% injured fruit.

Obliquebanded leafroller (OBLR) monitoring and management by tree fruit growers continues to be a high priority, albeit significantly lower levels of fruit injury is attributed to the leafroller complex in fruit pack-out assessments. By targeting up to three seasonal application windows while employing a single mode of action for each period, growers can achieve successful management of OBLR larvae. Recommended application windows include the pre-bloom through petal fall period for the overwintering generation, often using Bt during bloom, IGR's such as Proclaim and Intrepid at petal fall, the summer generation using either Harvanta, Altacor or Delegate, and later in August applying either Delegate or Altacor in rotation for resistance management. Recommendations for applications were made using insect phenology predictions for early emergence, using 340 DD_{50BE} from biofix to manage emergence of larvae, predicted to occur on mid-June. In general, low levels of leafroller feeding were observed on developing foliage and fruitlets in spring 2020. Trap captures began on 8th June and were moderate for 1st generation OBLR averaging 4.9 moths / day during the peak periods (week of 22nd June). The 340 DD_{43BE} emergence date of 1st summer OBLR generation was 21nd June. The 2nd generation flight began on the 27nd of July with larval emergence predicted for the 16th of August. OBLR trap numbers were very low during August at < 0.1 adults per day.

We are seeing a trend of increasingly high levels of **red banded leafroller** (RBLR) with mixed populations of **tufted apple bud moth** (TABM) and ***sparganothis fruitworm*** (SFW) during the season, likely contributing to overall leafroller leaf and fruit damage.

Apple maggot (AM) emergence was very early this season (22th June) compared with first emergence on 2nd July in 2018. The threshold of 5 flies per trap per block was observed on the 29th of June. Yet AM density continued to increase throughout the season and across the region with very high emergence and subsequent trap captures peaking on 27th

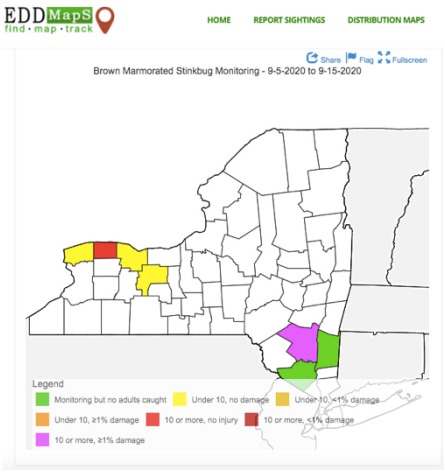
July at 6.0 AM flies / trap / week on through the end of August. High populations also occurred late in the season on 17th August under ideal emergence conditions with high soil moisture for the adult fly.

Black Stem Borer (BSB) *Xylosandrus germanus* (Blandford) caused significant tree loss in commercial orchards during the 2019 and 2020 growing season. Fuji and Honey Crisp on dwarfing M9 rootstock in locations with well drained ripped shale outcroppings in Hudson Valley sites in Marlboro and Walden under drought conditions were found to contain BSB entry sites and rapid apple decline (RAD). These sites were under irrigation both seasons, yet proved insufficient during drought to maintain low levels of stress induced ETOH. Few sites with BSB induced RAD were observed in low lying situations with seasonal standing water. Invariably, young trees coming from nurseries appear to have insufficient root systems on M9 & often B9, to withstand extreme wet or dry soil conditions during the first few years after planting.

European Red Mite (ERM) and **Two Spotted Spider Mite** (TSSM) caused considerable early season bronzing in commercial orchards during the 2020 growing season. Varieties most impacted included Red Delicious, Fuji and Honey Crisp. Repeated applications of conventional miticides made during the summer were insufficient to maintain levels of population below threshold to reduce foliar damage as sever bronzing was observed in early June. High temperatures exceeding 90°F beginning in late June exacerbated egg production while providing ideal conditions for rapid generational times.

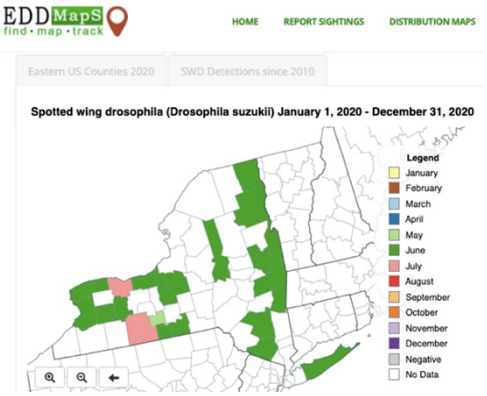
The **brown marmorated stink bug** (BMSB), *Halyomorpha halys,* has been observed throughout the southern Hudson Valley for the past 8 years with the first BMSB confirmation in NYS on December 2008. Since that time increasing populations have been documented in urban environments and present on many farms throughout the season throughout the lower to mid-Hudson Valley region. We have observed a **second generation** over the past few years, developing in mid-late August in HVRL voltinism studies. In 2020 we again found oviposition and newly emerging nymphs from mid-August through September.

There appears to be high levels of stink bug feeding in apple this season from both BMSB and the **green stink bug**, *Acrosternum hilare*. Both species being arboreal insects, they have been found from mid-season through harvest on pome fruit in lower to mid-Hudson Valley with increasing northern observations and fruit injury of BMSB observed in traps and higher incidence of fruit injury in WNY along the Lake Ontario fruit growing region.



It has been found reproducing along the woodland edge of agricultural production in deciduous trees such as Sugar Maple, *Acer saccharum*; White Ash, *Fraxinus Americana*; Tree of Heaven, *Ailanthus altissima*; and eastern black walnut *Juglans nigra* in high numbers with lower numbers observed in Staghorn Sumac, *Rhus typhina,* and wild grape, *V. vinifera.*

Nymph and adult trap captures of BMSB using Tedders traps employing the USDA #10 lure, and the *Plaudi stali* aggregation pheromone lure, *methyl (E,E,Z)-2,4,6-decatrienoate,* were observed along orchard edges in Wayne, Niagara, Monroe, Ontario, Orange, Ulster, Dutchess, and Columbia Counties throughout the season. In 2020 we monitored the population throughout NYS in 12 tree fruit orchard sites, employing a trap threshold of 10 total BMSB adults per trap to recommend management timing for tree fruit production. We are presently recommending that grower's access https://www.eddmaps.org/bmsbny/ for weekly updates on BMSB monitoring of adults and fruit injury requiring management.



Spotted wing drosophila (SWD), *Drosophila suzukii*, (Matsumura) (Diptera: Drosophilae) were first observed in NY late August of 2011. As in years past, EDDMaps was used to record trapping data. Schuyler County caught the first SWD on 21st May, which is the earliest recorded capture date in NYS. In 2020 SWD were monitored in four counties throughout the lower to mid-Hudson Valley using baited Trece Pherocon traps across small fruit, grape, and tree fruit. SWD trap captures were found in Columbia County on the 22nd June, 11th June in Ulster County, on the 10th June in Suffolk County and at the HVRL on the week of the 14th of June. Populations were generally slow to build in commercial berry crops. Growers who harvested frequently and kept to a 3 to 7-day program in brambles and 10 day program in blueberry and cherry are able to maintain low infestations levels. We are presently recommending that growers access http://www.eddmaps.org/project/project.cfm?proj=9 for weekly updates on SWD monitoring of adults and fruit injury for early season management.

Major Problems/Successes this Year: Samurai wasp, *Trissolcus japonicus*, continues to be redistributed throughout the state, yet few sites of the 155 redistribution sites have shown recapture of individuals during efforts to confirm establishment. Urban citizen scientists have stated generally that home infestation of BMSB have been on the decline over the past 5-years. Codling moth fruit infestation continues to be a severe problem in orchards. Contributing factors include rain events reducing insecticide efficacy, lax re-application spray schedules, delayed timing during the early emergence, reduced rates, or use of less effective insecticides. Increasingly, wooly apple aphid, *Eriosoma lanigerum,* requires management in many more commercial orchards beginning in late June through harvest.

Unusual entomological events: The plant bug complex caused significant injury to fruit during the early post bloom period with high levels of the plant bug complex easily observed in commercial orchards this season. Fall Webworm, (Lepidoptera: Erebidae) *Hyphantria cunea* Drury, was again observed for a second season in both research and commercial orchards beginning early August. Locust leaf miner, *Odontota dorsalis* (Thunberg), beetle was again observed feeding on developing foliage in mid-spring.

EVALUATION OF INSECTICIDES FOR CONTROLLING INSECT COMPLEX ON APPLE
Hudson Valley Research Laboratory 2020 WEST BLOCK
Apple: *Malus domestica*, cv. 'Ginger Gold', 'Red Delicious', 'McIntosh', 'Golden Delicious'

Codling moth (CM): *Cydia pomonella* (Linnaeus)
European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)
Mullein plant bug & apple red bug; (MPB): *Campylomma verbasci* (Meyer), (ARB) *Lygidea mendax* (Reuter)
Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris)
Oriental fruit moth (OFM): *Grapholitha molesta* (Busck)
Plum curculio (PC): *Conotrachelus nenuphar* (Herbst)
Potato leafhopper (PLH): *Empoasca fabae* (Harris)
Redbanded leafroller (RBLR): *Argyrotaenia velutinana* (Walker)
Rose leafhopper (RLH): *Edwardsiana rosae* (Linnaeus)
San Jose scale (SJS): *Quadraspidiotus perniciosus* (Comstock)
Stink Bug: Green and Brown Marmorated Stink Bug (SB): *Chinavia hilaris* (Say), *Halyomorpha halys* (Stål)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)
White apple leafhopper (WALH): *Typhlocyba* pomaria (McAtee)
Apple rust mite (ARM): *Aculus schlechtendali* (Nalepa)
European red mite (ERM): *Panonychus ulmi* (Koch)
Two spotted spider mite (TSM): *Tetranychus urticae* (Koch)
Stigmaeid (ZM): *Zetzellia mali* (Ewing)
Acarina: Phytoseiidae (AMB): *Neoseiulus (=Amblyseius) fallacies* (Garman), or *Galendromus (=Typhlodromus) pyri*

Trees on the M.26 rootstock, 25 yr.-old, maintained 10' ft., planted on research spacing of 10' x 30'. Calculations for applications based on 16' tree row spacing as found in conventional production. Alternate unsprayed rows adjacent to treated plots are maintained for drift reduction, increased insect distribution, and population pressure in yearly plot rotation. Treatments applied to four-tree varietal plots, replicated four times in a randomized complete block design (RCBD). Treatment applications were made dilute using a tractor mounted 3-point hitch Rears Pak-Tank and pecan handgun at 300 psi. averaging 0.56 – 0.7 gal. per tree. Insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A. Maintenance applications made using Slimline Tower Sprayer delivering 74 GPA at 100 psi. traveling at an average of 2.5 mph.

Maintenance applications for disease management began with Champ Ion at 8.2 lb./A on 18 March; Manzate Pro-Stick at 3 lb./A and and Vangard WG at 4 oz./A on 31 March; Manzate Pro-Stick at 3 lb./A and Captan Gold 80 WG at 3 lb./A on 7 April; Manzate Pro-Stick at 3 lb./A and Captan Gold 80 WG at 3 lb./A on 11 April; Manzate Pro-Stick at 3 lb./A, Captan Gold 80 WG at 3 lb./A, and Rally 40WSP at 2 oz./A on 25 April; Manzate Pro-Stick at 3 lb./A, Captan Gold 80 WG at 3 lb./A, and Inspire Super at 12 fl.oz./A on 5 May; Manzate Pro-Stick at 3 lb./A, Captan Gold 80 WG at 3 lb./A, and Inspire Super at 12 fl.oz./A on 13 May; Rally 40 WSP at 4 oz./A and Manzate Pro-Stick at 3 lb./A on 19 May; Captan Gold 80WDG at 5 lb./A and Inspire Super at 12 oz./A on 29 May; Merivon Xemium at 5.5 fl.oz./A and Rally 40WSP at 5 oz./A on 11 June; Merivon at 5.5 fl. oz./A on 18 June; and Inspire Super at 12 fl. oz./A on 1 July. Maintenance applications for weed management were Alion at 6 fl. oz./A and Credit 41 Extra at 1 qt./A on 20 May and Sandea at 1 oz./A on 29 July. Thinning was achieved with Amid-Thin W (NAD) at 8 fl.oz./A and Carbaryl 4L at 32 fl. oz./A (also for Plum Curculio) on 19 May and Amid-Thin at 4 fl.oz./A and Carbaryl 4L at 1 qt./A on 25 May. Amid-Thin at 6 fl.oz./A was applied on 18 June for return bloom. To manage Plum Curculio, Actara 25 WG at 5.5 oz./A and Harvanta 50 SL at 22 fl.oz./A were applied on 20 May and 1 June. Admire Pro at 2.8 fl. oz./A and Aza-Guard at 32 fl.oz./A were applied to manage the aphid complex on 23 June.

Insecticide programs (Table 8) applied to manage San Jose Scale were assessed by rating fruit for SJS infestation levels on 8 July and by evaluating two varieties of fruit at harvest by scoring fruit with 'red haloed' markings as damaged. 'Ginger Gold' fruit was harvested on August 7, and 'Red Max' was harvested on 27 August. Arthropod damage was assessed by examining 100 fruitlets per tree in 'Ginger Gold' on 28 May and 'Smoothie' on 5 June. Fruit at harvest was assessed from 100 fruit per tree 25% interior, 75% exterior,

examined for external and quartered for internal insect presence and injury. For assessments on 28 May and 5 June, damage from PC, TPB, EAS, MPB, and External Lepidopteran was recorded. At harvest, damage from PC, EAS, TPB, Leafrollers, CM, AMP, AMT, SB, Internal and External Lepidopteran was recorded along with SJS damage. Codling Moth damage was recorded as “Int. Lep.” and as “CM” if carpel and seed feeding were observed. If carpel and seed feeding were not observed, damage was recorded as “Int. Lep.”, but not attributed specifically to CM. Arithmetic means reported. Mean separation by Tukey-Kramer HSD ($P \leq 0.05$) unless noted.

Table 1 Treatment Schedule for Seasonal Apple Insecticide Screen Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Timing	Application Dates
1. Actara	5.5 oz./A	PF, 1C	20 May, 1 June
Sivanto Prime	14.0 oz./A	Pink	23 April
2. Actara	5.5 oz./A	PF, 1C	20 May, 1 June
Sivanto HL	7.0 oz./A	Pink	23 April
3. Actara	5.5 oz./A	PF, 1C	20 May, 1 June
4. Actara	5.5 oz./A	PF	20 May, 1 June
Lorsban	4.0 pt./A	TC	15 April
5. Harvanta 50SL	22.0 fl.oz./A	Pink, PF-1C	25 April, 20 May, 1 June
6. Actara	4.0 oz./A	PF, 1C	20 May, 1 June
Venerate**	3.0 qt./A	Pink	25 April
7. Actara	4.0 oz./A	PF, 1C	20 May, 1 June
Esteem	128.0 fl.oz. /100	1st gen SJS Emg.	26 June
8. Actara	4.0 oz./A	PF, 1C	20 May, 1 June
9. UTC			

Applications specifically timed for emergence of SJS crawlers. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Applications made using an airblast Slimline Tower sprayer mounted to a John Deere 5525 traveling 2.27 mph, delivering 53 GPA at 150 psi.
* LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 2 Early Season Insect Damage from Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

			Incidence (%) of insect damaged fruitlets					
Trmt. / Formulation		Rate	PC	TPB	EAS	MPB	Ext. Lep	Clean
1.	Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	14.3	3.7	0.0	1.7	0.7	77.3
2.	Actara Sivanto SL	5.5 oz./A 7.0 oz./A	18.7	2.0	0.3	2.0	0.3	75.3
3.	Actara	5.5 oz./A	14.0	5.3	1.0	0.7	1.0	76.0
4.	Actara Lorsban	5.5 oz./A 4.0 pts./A	19.0	1.3	0.0	0.3	0.0	79.7
5.	Harvanta	22.0 fl.oz./A	9.0	3.3	1.0	0.3	0.3	84.3
6.	Actara Venerate**	4.0 oz./A 3.0 qt./A	17.3	3.0	0.7	0.7	0.7	76.3
7.	Actara Esteem	4.0 oz./A	21.0	1.3	1.0	0.7	0.3	76.3
8.	Actara	4.0 oz./A	16.3	4.3	0.0	0.7	2.7	76.3
9.	UTC		23.3	2.7	1.0	0.3	0.0	73.7
P value			0.9588	0.7358	0.6292	0.3122	0.7139	0.9965

[a] Evaluation made on 'Ginger Gold' cultivar cluster fruit on 28 May. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed with ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means (percentages) reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 3 Early Season Insect Damage from Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of insect damaged fruitlets					
Trmt. / Formulation	Rate	PC	TPB	EAS	MPB	Ext. Lep	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	4.8	3.1	0.0	0.3	0.3	91.9
2. Actara Sivanto SL	5.5 oz./A 7.0 oz./A	4.3	1.5	0.0	0.3	1.5	92.5
3. Actara	5.5 oz./A	8.7	2.6	0.0	0.0	0.8	89.5
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	5.1	2.7	0.5	0.8	0.3	91.5
5. Harvanta	22.0 fl.oz./A	9.3	2.0	0.5	0.3	0.8	87.0
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	6.3	0.8	0.0	0.0	0.8	90.3
7. Actara Esteem	4.0 oz./A	8.0	0.5	0.3	1.5	0.8	91.0
8. Actara	4.0 oz./A	7.3	2.5	0.5	1.3	0.3	86.3
9. UTC		14.0	2.5	0.3	0.8	0.0	82.8
P value		0.3656	0.4142	0.7018	0.6915	0.7370	0.6118

[a] Evaluation made on 'Smoothie' cultivar cluster fruit on 5 June. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed with ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means are not significantly different. Arithmetic means (percentages) reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 4 Early Season Insect Damage from Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of SJS infested fruit			
Trmt. / Formulation	Rate	1-3 SJS	4-10 SJS	>10 SJS	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	0.25	0.0	0.0	99.75
2. Actara Sivanto SL	5.5 oz./A 7.0 oz./A	0.0	0.0	0.0	100.0
3. Actara	5.5 oz./A	0.0	0.0	0.0	100.0
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	0.0	0.0	0.0	100.0
5. Harvanta	22.0 fl.oz./A	0.5	0.0	0.0	99.5
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	0.0	0.0	0.0	100.0
7. Actara Esteem	4.0 oz./A	0.0	0.0	0.0	100.0
8. Actara	4.0 oz./A	0.25	0.0	0.0	99.75
9. UTC		0.25	0.0	0.0	99.75
P value		0.7061	NA	NA	0.7061

[a] Evaluation made on 'Ginger Gold' cultivar cluster fruit on 8 July. Applications specifically timed for emergence of SJS nymph. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed with ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means (percentages) reported. LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 5a Evaluation of Insecticides for Controlling Insect Complex on Apple [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Trmt. / Formulation	Rate	Incidence (%) of insect damaged fruit PC	EAS	TPB	AMP	AMT	SB	SJS	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	15.8 b	0.5	12.0	39.5	34.3	2.0	0.0	28.5
2. Actara Sivanto HL	5.5 oz./A 7.0 oz./A	21.8 ab	0.0	10.8	55.3	52.8	3.0	0.3	26.5
3. Actara	5.5 oz./A	13.5 b	0.0	11.5	52.3	51.3	2.3	0.0	21.5
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	11.8 b	0.0	8.5	49.8	47.0	2.5	0.0	29.5
5. Harvanta 50 SL	4.0 qt./A	23.8 ab	0.3	10.5	50.0	47.3	8.0	1.3	22.3
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	14.3 b	0.0	9.3	52.0	48.3	4.8	0.3	21.5
7. Actara Esteem	4.0 oz./A	21.0 ab	0.3	10.8	42.0	39.5	1.3	0.3	26.5
8. Actara	4.0 oz./A	26.5 ab	0.0	10.3	62.3	59.3	4.8	0.8	13.8
9. UTC		47.3 a	0.0	3.4	77.3	79.5	5.5	0.0	6.1
P value		0.0093	0.6145	0.8640	0.4068	0.1047	0.5388	0.3036	0.4114

[a] Evaluation made on 'Ginger Gold' cultivar on 7 August. Applications specifically timed for emergence of SJS nymph. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. All insecticide dilutions based on 300 GPA. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 5b Evaluation of Insecticides for Controlling Insect Complex on Apple [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Trmt. / Formulation	Rate	Incidence (%) of insect damaged fruit				
		Lf. Roller	Int. Lep	Ext. Lep	CM	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	5.3	10.5	12.0	8.3	28.5
2. Actara Sivanto HL	5.5 oz./A 7.0 oz./A	6.5	6.8	14.3	5.8	26.5
3. Actara	5.5 oz./A	5.8	11.8	13.8	8.0	21.5
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	4.3	7.8	12.3	5.5	29.5
5. Harvanta 50 SL	4.0 qt./A	4.3	3.3	15.8	2.8	22.3
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	5.8	8.8	15.5	7.3	21.5
7. Actara Esteem	4.0 oz./A	8.3	8.5	15.0	7.5	26.5
8. Actara	4.0 oz./A	6.3	7.5	15.5	5.0	13.8
9. UTC		6.9	6.1	17.2	3.8	6.1
P value		0.6698	0.3445	0.8896	0.6019	0.4114

[a] Evaluation made on 'Ginger Gold' cultivar on 7 August. Applications specifically timed for emergence of SJS nymph. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. All insecticide dilutions based on 300 GPA. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 6a Evaluation of Insecticides for Controlling Insect Complex on Apple [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Trmt. / Formulation	Rate	Incidence (%) of insect damaged fruit PC	EAS	TPB	AMP	AMT	SB	SJS	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	18.3 b	0.3	2.8	15.8 ab	12.5 ab	2.0	14.0 ab	35.0
2. Actara Sivanto HL	5.5 oz./A 7.0 oz./A	16.3 b	0.3	1.3	16.3 b	10.8 b	1.0	15.5 ab	36.3
3. Actara	5.5 oz./A	12.0 b	0.3	4.3	27.0 ab	19.0 ab	0.3	23.0 ab	29.3
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	18.5 b	0.3	2.8	26.3 ab	18.3 ab	1.5	1.0 b	38.5
5. Harvanta 50 SL	4.0 qt./A	33.5 ab	0.0	2.3	17.0 ab	12.5 ab	0.8	33.3 a	29.5
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	16.6 b	0.3	5.0	23.3 ab	14.6 ab	1.3	12.1 ab	37.2
7. Actara Esteem	4.0 oz./A	15.8 b	0.0	5.5	13.3 b	9.0 b	0.5	7.0 ab	40.8
8. Actara	4.0 oz./A	22.8 ab	0.0	4.0	26.0 ab	17.8 ab	1.5	20.3 ab	27.3
9. UTC		54.3 a	0.5	0.5	51.0 a	39.1 a	1.3	15.3 ab	9.1
P value for transformed data		0.0036	0.7442	0.4356	0.0325	0.0267	0.9199	0.0270	0.0960

[a] Evaluation made on 'Red Max' cultivar on 27 August. Applications specifically timed for emergence of SJS nymph. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. All insecticide dilutions based on 300 GPA. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

Table 6b Evaluation of Insecticides for Controlling Insect Complex on Apple [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Trmt. / Formulation	Rate	Incidence (%) of insect damaged fruit				
		Lf. Roller	Int. Lep	Ext. Lep	CM	Clean
1. Actara Sivanto Prime	5.5 oz./A 14.0 oz./A	6.5	20.8	14.3	13.8 a	35.0
2. Actara Sivanto HL	5.5 oz./A 7.0 oz./A	3.5	17.5	14.5	9.3 ab	36.3
3. Actara	5.5 oz./A	4.5	20.8	16.5	13.8 a	29.3
4. Actara Lorsban	5.5 oz./A 4.0 pts./A	2.3	15.3	12.3	6.3 ab	38.5
5. Harvanta 50 SL	4.0 qt./A	2.3	5.3	8.8	2.5 b	29.5
6. Actara Venerate**	4.0 oz./A 3.0 qt./A	3.6	16.3	12.6	7.8 ab	37.2
7. Actara Esteem	4.0 oz./A	5.3	17.3	13.3	8.0 ab	40.8
8. Actara	4.0 oz./A	6.5	14.8	18.3	9.3 ab	27.3
9. UTC		5.6	18.0	15.7	10.0 ab	9.1
P value of transformed data		0.5857	0.3011	0.5882	0.0115	0.0960

[a] Evaluation made on 'Red Max' cultivar on 27 August. Applications specifically timed for emergence of SJS nymph. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. All insecticide dilutions based on 300 GPA. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%. ** Nu-Film @ 0.25%

EVALUATION OF ACARICIDES FOR CONTROLLING MITE COMPLEX ON APPLE
Hudson Valley Research Laboratory 2020 EAST BLOCK
Apple: *Malus domestica*, cv. 'Ginger Gold', 'Red Delicious', 'McIntosh', 'Golden Delicious'

Apple rust mite (ARM): *Aculus schlechtendali* (Nalepa)
European red mite (ERM): *Panonychus ulmi* (Koch)
Two spotted spider mite (TSSM): *Tetranychus urticae* (Koch)
Stigmaeid (ZM): *Zetzellia mali* (Ewing), predatory mite
Acarina: Phytoseiidae (AMB): *Neoseiulus (=Amblyseius) fallacies* (Garman), or *Galendromus (=Typhlodromus) pyri*, predatory mite

Trees on the M.26 rootstock, 25 yr.-old, maintained 10' ft., planted on research spacing of 10' x 30'. Calculations for applications based on 16' tree row spacing as found in conventional production utilizing M.26. Alternate unsprayed rows adjacent to treated plots are maintained for drift reduction, increased insect distribution, and population pressure in yearly plot rotation. Treatments applied to four-tree varietal plots, replicated four times in a randomized complete block design (RCBD). Insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A. Experimental and maintenance applications made using Slimline Tower Sprayer delivering 53 GPA at 150 psi. traveling at an average of 2.27 mph.

Maintenance applications for disease management began with Champ WG at 8.0 lbs./A on 18 March; Manzate Pro Stick at 3 lb./A and Vangard WG at 4.0 oz./A on 1 April; Captan Gold 80WDG at 3 lb./A and Manzate Pro-Stick at 3 lb./A on 7 April; Captan Gold 80WDG at 3 lb./A and Manzate Pro-Stick at 3 lb./A on 11 April; Captan Gold 80WDG at 3 lb./A, Manzate Pro-Stick at 3 lb./A, and Rally 40WSP at 2 oz./A on 25 April;, Manzate Pro-Stick at 3 lb./A, and Inspire Super at 12 fl. oz./A on 5 May; Captan Gold 80WDG at 3 lb./A, Manzate Pro-Stick at 3 lb./A, and 13 May; Manzate Pro-Stick at 3 lb./A, and Rally 40WSP at 4 oz./A on 19 May; Captan Gold 80WDG at 5 lb./A and Inspire Super at 12 fl. oz./A on 29 May; Rally 40 WSP at 10 oz/A and Merivon Xemium at 5.5 fl.oz./A on 11 June; Merivon at 5.5 fl.oz./A on 18 June; and Inspire Super at 12 fl.oz./A on 1 July.

Maintenance applications for thinning began with Amid-Thin W (NAD) at 8 fl.oz./A on 19 May; Amid Thin at 4fl.oz./A and Carbaryl at 1 qt./A on 25 May; and Amid Thin at 15 ppm on 2 June. Amid Thin was applied at 6 fl.oz./A for return bloom on 18 June. Alion at 5 fl.oz./A and Credit 41 Extra at 1 qt./A on 23 April provided weed management in trial plots.

Non-mite arthropod pests were managed with Lannate LV at 48 fl.oz./A, Endigo ZC at 20 fl.oz./A, Carbaryl 4L at 32 fl.oz./A, and Exirel at 6 fl.oz./A for Plum Curculio on 19 May and Admire Pro at 2.8 fl.oz./A and Aza-Guard at 32 fl.oz./A for the aphid complex on 23 June. On May 19, Lannate and Carbaryl were used in part to flare mites in order to achieve populations needed for the acaricide trial.

Acaricide programs (Tables 7-12) applied to manage mites were assessed by sampling 25 leaves from 'Red Delicious' in each plot and counting phytophagous and predacious mite populations. Leaves were removed to the laboratory, brushed onto glass plates using a mite-brushing machine, and examined using a binocular scope (>18X) for eggs, motiles, and adults. Mite populations are expressed as the number of mites per leaf. Mean separation by Tukey-Kramer HSD ($P \leq 0.05$) unless noted.

Table 7 Treatment Schedule for Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Timing	Application Dates
1. COMPOUND A	1.37 fl. oz./A	Mite threshold	26 June
2. COMPOUND A*	1.37 fl. oz./A	Mite threshold	26 June
3. COMPOUND A*	2.74 fl. oz./A	Mite threshold	26 June
4. COMPOUND A*	4.11 fl. oz./A	Mite threshold	26 June
5. Envidor 2 SC*	17.0 fl. oz./A	Mite threshold	26 June
6. Zeal 72 WG*	2.5 fl. oz./A	Mite threshold	26 June
7. Fujimite SC*	32.0 fl. oz.//A	Mite threshold	26 June
8. UTC			

Applications specifically timed for mite threshold (2.5 mites/leaf). All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A. Applications made using an airblast Slimline Tower sprayer mounted to a John Deere 5525 traveling 2.27 mph, delivering 53 GPA at 150 psi.
* LI-700 @ 0.125%.

Table 8 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. COMPOUND A*	1.37 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. COMPOUND A*	2.74 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. COMPOUND A*	4.11 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Envidor 2 SC*	17.0 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. Zeal 72 WG*	2.5 fl. oz./A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Fujimite SC*	32.0 fl. oz. /A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. UTC		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P value		NA	NA	NA	NA	NA	NA	NA	NA	NA

[a] Evaluation made on 'Red Delicious' cultivar on 4th June prior to acaricide applications. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Means separation by Tukey-Kramer HSD ($P \leq 0.05$); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v).

Table 9 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	42.1	1.6	0.3	0.1	0.1	0.1	0.0	2.9	3.6
2. COMPOUND A*	1.37 fl. oz./A	23.2	2.6	0.2	0.0	0.0	0.6	0.1	0.4	3.5
3. COMPOUND A*	2.74 fl. oz./A	13.4	1.7	0.9	0.1	0.1	0.4	0.0	1.1	4.8
4. COMPOUND A*	4.11 fl. oz./A	5.1	0.9	1.2	0.0	0.0	0.4	0.1	2.2	3.2
5. Envidor 2 SC*	17.0 fl. oz./A	17.3	1.4	0.6	0.0	0.0	0.3	0.1	1.3	3.0
6. Zeal 72 WG*	2.5 fl. oz./A	0.2	0.5	0.6	0.1	0.0	0.5	0.0	0.5	2.3
7. Fujimite SC*	32.0 fl. oz. /A	1.4	0.4	0.3	0.1	0.2	0.5	0.1	1.7	4.1
8. UTC		4.6	2.7	1.0	0.0	0.1	0.5	0.1	1.6	10.4
P value		0.3995	0.8655	0.3271	0.2729	0.5062	0.3497	0.5945	0.8315	0.7804

[a] Evaluation made on 'Red Delicious' cultivar on 25th June prior to acaricide applications. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v).

Table 10 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	10.7	1.1	0.1	0.0	0.0	0.0 b	0.0 b	0.4	2.0
2. COMPOUND A*	1.37 fl. oz./A	12.3	0.7	0.0	0.0	0.0	0.0 b	0.0 b	0.3	0.7
3. COMPOUND A*	2.74 fl. oz./A	28.2	1.4	0.0	0.0	0.1	0.1 b	0.0 b	0.4	1.6
4. COMPOUND A*	4.11 fl. oz./A	3.7	0.9	0.0	0.0	0.0	0.0 b	0.0 b	0.2	1.4
5. Envidor 2 SC*	17.0 fl. oz./A	5.8	0.3	0.1	0.0	0.0	0.1 b	0.0 b	0.5	2.4
6. Zeal 72 WG*	2.5 fl. oz./A	2.9	0.3	0.1	0.0	0.1	0.1 b	0.0 ab	0.3	4.1
7. Fujimite SC*	32.0 fl. oz. /A	2.9	0.5	0.1	0.0	0.0	0.1 b	0.0 b	0.2	4.7
8. UTC		2.4	1.5	0.2	0.0	0.0	0.3 a	0.1 a	1.7	10.5
P value		0.5653	0.5712	0.6654	0.7718	0.6345	0.0004	0.0091	0.4083	0.4671

[a] Evaluation made on 'Red Delicious' cultivar on 2nd July. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v).

Table 11 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	9.0	1.7	0.5	0.0	0.0	0.0 b	0.0 b	2.8 a	25.4
2. COMPOUND A*	1.37 fl. oz./A	13.3	0.7	0.6	0.0	0.0	0.0 b	0.0 b	2.1 ab	20.7
3. COMPOUND A*	2.74 fl. oz./A	17.4	0.4	0.3	0.0	0.0	0.0 b	0.0 b	1.0 ab	11.0
4. COMPOUND A*	4.11 fl. oz./A	2.9	0.6	0.2	0.0	0.0	0.0 b	0.0 b	1.3 ab	10.2
5. Envidor 2 SC*	17.0 fl. oz./A	20.5	0.3	0.2	0.0	0.0	0.0 b	0.0 b	0.2 b	4.2
6. Zeal 72 WG*	2.5 fl. oz./A	7.0	0.3	0.8	0.0	0.0	0.1 b	0.0 ab	0.3 b	7.4
7. Fujimite SC*	32.0 fl. oz. /A	4.0	0.7	0.4	0.0	0.0	0.3 b	0.0 b	0.3 b	5.2
8. UTC		4.2	2.1	0.6	0.0	0.1	0.7 a	0.2 a	1.3 ab	18.4
P value		0.7019	0.5387	0.8677	0.1242	0.1625	0.0001	0.0170	0.0070	0.1371

[a] Evaluation made on 'Red Delicious' cultivar on 9th July. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v).

Table 12 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	11.4	3.0 a	0.3	0.0	0.0	0.0 b	0.0 b	1.4 a	6.3
2. COMPOUND A*	1.37 fl. oz./A	7.5	2.7 ab	0.2	0.0	0.0	0.0 b	0.0 b	0.9 ab	9.0
3. COMPOUND A*	2.74 fl. oz./A	7.2	2.1 abc	0.2	0.0	0.0	0.0 b	0.0 b	0.4 ab	4.2
4. COMPOUND A*	4.11 fl. oz./A	3.0	1.5 abc	0.3	0.0	0.0	0.0 b	0.0 b	0.3 ab	3.0
5. Envidor 2 SC*	17.0 fl. oz./A	3.8	0.1 c	0.1	0.0	0.0	0.0 b	0.0 b	0.0 b	1.8
6. Zeal 72 WG*	2.5 fl. oz./A	1.3	0.6 abc	0.1	0.0	0.0	0.1 b	0.0 b	0.2 ab	4.6
7. Fujimite SC*	32.0 fl. oz. /A	1.6	0.1 c	0.1	0.0	0.0	0.2 ab	0.0 b	0.0 b	1.5
8. UTC		1.9	0.3 bc	0.0	0.0	0.1	0.4 a	0.2 a	0.2 ab	4.0
P value		0.1459	0.0011	0.6346	0.2463	0.2540	0.0004	0.0046	0.0141	0.2824

[a] Evaluation made on 'Red Delicious' cultivar on 16th July. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v).

Table 13 Mite Incidence from Apple Acaricide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence of mites per leaf								
Trmt. / Formulation	Rate	ARM	TSSM	TSSME	Z.mali	ZME	AMB	AMBE	ERM	ERME
1. COMPOUND A	1.37 fl. oz./A	8.2 ab	1.6	0.7	0.0	0.0	0.0 c	0.0	1.4 ab	10.6
2. COMPOUND A*	1.37 fl. oz./A	1.8 b	3.0	0.2	0.0	0.0	0.0 c	0.0	2.3 a	12.5
3. COMPOUND A*	2.74 fl. oz./A	2.7 b	2.0	0.2	0.0	0.0	0.0 c	0.0	1.4 ab	8.6
4. COMPOUND A*	4.11 fl. oz./A	0.8 b	1.8	0.1	0.0	0.0	0.0 c	0.0	1.6 ab	6.6
5. Envidor 2 SC*	17.0 fl. oz./A	0.3 b	0.3	0.1	0.0	0.0	0.1 abc	0.0	0.1 ab	2.4
6. Zeal 72 WG*	2.5 fl. oz./A	20.2 a	0.5	0.0	0.0	0.0	0.1 bc	0.0	0.4 ab	8.5
7. Fujimite SC*	32.0 fl. oz. /A	2.2 b	0.4	0.1	0.0	0.1	0.2 ab	0.0	0.4 ab	4.0
8. UTC		0.8 b	0.0	0.0	0.0	0.0	0.2 a	0.0	0.0 b	1.3
P value		0.0638	0.0671	0.1664	0.2295	0.5847	0.0001	0.7718	0.0194	0.1927

[a] Evaluation made on 'Red Delicious' cultivar on 3rd August. Applications specifically timed for treatment of mites. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.125% (v/v)

EFFICACY OF INSECTICIDES AGAINST PEAR PSYLLA EGGS AND NYMPHS, 2020:
Hudson Valley Research Laboratory 2020
Pear: *Pyrus communis* L. 'Bartlett', 'Bosc'

Pear psylla: *Cacopsylla pyricola* (Foerster)
Pear rust mite (PRM): *Epitrimerus pyri*
Fabraea Leaf Spot (FLS) *Fabraea maculata*

Treatments were applied to four-tree plots replicated four times, randomized across the block. Each plot contained two trees each of 'Bartlett' and 'Bosc' cultivars, spaced 12 x 18 ft., 12 ft. in height, and 39 years old. All dilutions are based on 400 gallons/A with plot requirements ranging from 20 to 50 gallons increasing seasonally with developing canopy. Treatments were applied dilute to runoff using a tractor mounted high-pressure handgun sprayer operated at 300 psi delivering approximately 350 GPA. Nozzle size ranged from size 5-10, increasing nozzle size with foliage density to achieve full coverage.

Maintenance applications included fireblight management using C-O-C-S WDG at 12.0lbs/A on 18 March at swollen bud; fabraea leaf spot (*Fabraea maculate*) management using Manzate Pro-Stick at 3.0lbs/A on 20 April at white bud; Imidan 70WP for pear midge on 23 April at white bud, Manzate Pro-Stick on 4 May for fabraea leaf spot, Manzate Pro-Stick at 3 lb./A and Avaunt at 3 lb./A on May 12 for fabraea leaf spot, the lepidopteran complex, and plum curculio; and Topsin M WSB at 1 lb/A on 11 June for fabraea.

Experimental treatments were applied on various schedules as shown in Table 14. 1st psylla egg observed on 30 March, bud burst (BB) on 6 April, first nymph on 19 April, white bud (WB) on 20 April; full bloom on 4 May, PF on 11 May, fruit set on 18 May. Application dates of BioCover Oil for the 1st egg application (DD) on 18 March and 12 April.

Insecticide applications were made against the pear insect complex with early BioCover Oil applications targeting overwintering adults and first eggs. Experimental applications (Table 14) began after first nymph hatch, which occurred on 19 April. Biweekly evaluations were made to determine treatment effects on adult, egg, and nymph populations. Evaluations were made in which 25 fruiting buds or leaves per treatment were removed to the laboratory where a binocular scope was used to determine the presence of pear psylla eggs and nymphs. Three-minute vacuum samples to determine presence of pear psylla adults were taken on 21 April, 19 May, 10 June, 18 June, and 2 July. Sooty mold fungi (Capnodium sp.) caused by pear psylla excrement was assessed at harvest.

Data were analyzed with ANOVA and Tukey-Kramer HSD ($P=<0.05$) was performed on all data; untransformed data are presented in each table.

Table 14 Treatment Schedule for Seasonal Pear Insecticide Screen Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Timing	Application Dates
1. BioCover Oil	256.0 fl.oz./100	SB	18 March
BioCover Oil	128.0 fl.oz./100	GC	12 April
COMPOUND B	6.5 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
2. BioCover Oil	256.0 fl.oz./100	SB	18 March
BioCover Oil	128.0 fl.oz./100	GC	12 April
COMPOUND B	9.7 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
3. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
COMPOUND B	12.7 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
4. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
COMPOUND B*	6.5 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
5. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
COMPOUND B*	9.7 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
6. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
Movento*	9.0 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
7. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
Exirel*	20.5 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
8. Biocover Oil	256.0 fl.oz./100	SB	18 March
Biocover Oil	128.0 fl.oz./100	GC	12 April
Harvanta 50SL*	22.0 fl.oz./A	WB, 1-5C	23 April, 15 May, 1 Jun, 12 Jun, 24 Jun, 8 Jul
9. UTC			
10. Biocover Oil	256.0 fl.oz./100	SB	31 March
Biocover Oil	128.0 fl.oz./100	GC	12 April

All applications calculated using 400 GPA dilute, made using a three-point hitch tractor mounted ‘Pack Tank’ sprayer and pecan handgun applied at 300 psi. dilute to runoff. All treatments received a WB application of Imidan 70WP on 23 April for pear midge. * LI-700 @ 0.25%.

Table 15 Evaluations of Insecticide Schedules for Controlling Pear Psylla Eggs on Pear [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Pear psylla eggs per leaf					
		7 May	21 May	9 Jun	19 Jun	2 Jul	16 Jul
1 BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	0.3	0.2	1.9	4.6	3.3	1.1
2. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	0.9	0.2	2.7	5.8	5.0	1.4
3. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 12.7 fl.oz./A	0.0	0.0	1.5	3.9	4.1	0.4
4. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	0.3	0.3	1.1	4.4	3.9	0.8
5. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	0.3	0.2	1.3	1.9	2.5	0.4
6. BioCover Oil BioCover Oil Movento*	256.0 fl.oz./100 128.0 fl.oz./100 9.0 fl.oz./A	0.0	0.0	1.3	3.5	2.6	0.6
7. BioCover Oil BioCover Oil Exirel*	256.0 fl.oz./100 128.0 fl.oz./100 20.5 fl.oz./A	0.0	0.0	1.3	4.6	3.6	1.4
8. BioCover Oil BioCover Oil Harvanta 50SL*	256.0 fl.oz./100 128.0 fl.oz./100 22.0 fl.oz./A	1.0	0.0	1.2	3.5	5.0	1.8
9. UTC		0.7	0.4	2.6	2.9	2.2	0.5
10. BioCover Oil BioCover Oil	256.0 fl.oz./100 128.0 fl.oz./100	0.5	0.1	2.3	2.7	4.9	0.5
P value		0.6705	0.6367	0.4595	0.5193	0.2348	0.2901

[a] Seasonal evaluations made on 'Bartlett'.
Mean separation by Tukey-Kramer HSD (P ≤ 0.05). Treatment means followed by the same letter are not significantly different. Arithmetic means reported. All applications made using a three-point hitch tractor mounted 'Pack Tank' sprayer and pecan handgun applied at 300 psi. dilute to runoff. * LI-700 @ 0.25%.

Table 16 Evaluations of Insecticide Schedules for Controlling Pear Psylla Nymphs on Pear [a] Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Pear psylla nymphs per leaf 7 May	21 May	9 Jun	19 Jun	2 Jul	16 Jul
1 BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	0.0 b	0.2	0.5ab	2.9	4.0	1.3
2. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	0.1ab	0.1	0.3ab	4.9	6.3	2.0
3. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 12.7 fl.oz./A	0.0 b	0.3	0.4ab	2.0	4.6	1.5
4. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	0.1ab	0.4	0.5ab	3.2	6.0	1.2
5. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	0.0 b	0.1	0.3 b	2.0	5.0	1.0
6. BioCover Oil BioCover Oil Movento*	256.0 fl.oz./100 128.0 fl.oz./100 9.0 fl.oz./A	0.0 b	0.0	0.3 b	1.8	3.0	0.6
7. BioCover Oil BioCover Oil Exirel*	256.0 fl.oz./100 128.0 fl.oz./100 20.5 fl.oz./A	0.1 b	0.1	0.3 b	3.0	6.3	2.3
8. BioCover Oil BioCover Oil Harvanta 50SL*	256.0 fl.oz./100 128.0 fl.oz./100 22.0 fl.oz./A	0.0 b	0.0	0.4ab	3.1	5.5	1.7
9. UTC		0.2a	0.3	1.1a	3.2	3.2	1.2
10. BioCover Oil BioCover Oil	256.0 fl.oz./100 128.0 fl.oz./100	0.0 b	0.2	1.0ab	3.2	3.7	1.5
P value		0.0041	0.4357	0.0046	0.1729	0.0896	0.2456

[a] Seasonal evaluations made on 'Bartlett'.

Mean separation by Tukey-Kramer HSD (P ≤ 0.05). Treatment means followed by the same letter are not significantly different. Arithmetic means reported. All applications made using a three-point hitch tractor mounted 'Pack Tank' sprayer and pecan handgun applied at 300 psi. dilute to runoff. * LI-700 @ 0.25

Table 17 Evaluations of Insecticide Schedules for Controlling Pear Psylla Adults on Pear [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Pear psylla adults/3 min vacuum sample 19 May	10 June	18 June	2 July
1 BioCover Oil	256.0 fl.oz./100	0.3	18.8	36.0	3.0
BioCover Oil	128.0 fl.oz./100				
COMPOUND B	6.5 fl.oz./A				
2. BioCover Oil	256.0 fl.oz./100	0.8	37.8	47.5	6.5
BioCover Oil	128.0 fl.oz./100				
COMPOUND B	9.7 fl.oz./A				
3. BioCover Oil	256.0 fl.oz./100	0.0	17.0	46.3	4.8
BioCover Oil	128.0 fl.oz./100				
COMPOUND B	12.7 fl.oz./A				
4. BioCover Oil	256.0 fl.oz./100	0.0	25.8	61.0	2.8
BioCover Oil	128.0 fl.oz./100				
COMPOUND B*	6.5 fl.oz./A				
5. BioCover Oil	256.0 fl.oz./100	0.3	12.3	25.3	3.3
BioCover Oil	128.0 fl.oz./100				
COMPOUND B*	9.7 fl.oz./A				
6. BioCover Oil	256.0 fl.oz./100	0.0	15.0	43.3	3.0
BioCover Oil	128.0 fl.oz./100				
Movento*	9.0 fl.oz./A				
7. BioCover Oil	256.0 fl.oz./100	0.0	21.3	50.0	8.0
BioCover Oil	128.0 fl.oz./100				
Exirel*	20.5 fl.oz./A				
8. BioCover Oil	256.0 fl.oz./100	0.3	21.5	44.5	5.0
BioCover Oil	128.0 fl.oz./100				
Harvanta 50SL*	22.0 fl.oz./A				
9. UTC		0.3	33.5	24.0	5.3
10. BioCover Oil	256.0 fl.oz./100	0.0	14.0	38.3	3.5
BioCover Oil	128.0 fl.oz./100				
P value		0.3463	0.5953	0.5487	0.2584

[a] Seasonal evaluations made on 'Bartlett'.
Mean separation by Tukey-Kramer HSD (P ≤ 0.05). Treatment means followed by the same letter are not significantly different. Arithmetic means reported. All applications made using a three-point hitch tractor mounted 'Pack Tank' sprayer and pecan handgun applied at 300 psi. dilute to runoff. * LI-700 @ 0.25%

Table 18 Evaluations of Insecticide Schedules on Foliar Injury on Pear [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	Sooty Mold Leaf Ratings (% leaf area) Leaves 1-3 Basal Leaves	Leaves 4-7 Mid-Shoot Leaves	Leaves 8-10 Young Leaves
1 BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	15.8 a	17.0 a	11.4 a
2. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	16.8 a	13.0 abc	6.5 abcd
3. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 12.7 fl.oz./A	7.4 ab	10.4 abcd	7.9 abc
4. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	3.6 b	5.5 cd	5.8 bcd
5. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	2.9 b	4.7 cd	4.3 cd
6. BioCover Oil BioCover Oil Movento*	256.0 fl.oz./100 128.0 fl.oz./100 9.0 fl.oz./A	2.1 b	2.1 d	2.0 d
7. BioCover Oil BioCover Oil Exirel*	256.0 fl.oz./100 128.0 fl.oz./100 20.5 fl.oz./A	6.7 b	7.2 bcd	5.7 bcd
8. BioCover Oil BioCover Oil Harvanta 50SL*	256.0 fl.oz./100 128.0 fl.oz./100 22.0 fl.oz./A	16.7 a	15.3 ab	9.5 ab
P value		0.0001	0.0001	0.0001

[a] Seasonal evaluations made on 'Bartlett'.
Mean separation by Tukey HSD (P ≤ 0.05). Treatment means followed by the same letter are not significantly different. Arithmetic means reported as percent of leaf area with each rating. All applications made using a three-point hitch tractor mounted 'Pack Tank' sprayer and pecan handgun applied at 300 psi. dilute to runoff. * LI-700 @ 0.25%. ** Leaf rating obtained by calculating the means of each leaf grouping within a treatment, then running ANOVA to compare treatment means.

Table 19 Evaluations of Insecticide Schedules on Sooty Mold on Pear [a]
Hudson Valley Research Laboratory, Highland, NY - 2020

Treatment / Formulation	Rate	% Fruit with Sooty Mold				Sooty Mold Score**
		0: No Sooty Mold	1: 0-10% Sooty Mold	2: 11-50% Sooty Mold	3: >51% Sooty Mold	
1 BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	33.0	26.8	32.1	8.1	115.3
2. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	34.0	26.1	33.8	5.8	111.2
3. BioCover Oil BioCover Oil COMPOUND B	256.0 fl.oz./100 128.0 fl.oz./100 12.7 fl.oz./A	31.3	25.0	38.0	5.8	118.3
4. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 6.5 fl.oz./A	46.5	28.5	23.5	1.8	80.8
5. BioCover Oil BioCover Oil COMPOUND B*	256.0 fl.oz./100 128.0 fl.oz./100 9.7 fl.oz./A	47.8	22.3	28.5	2.8	87.5
6. BioCover Oil BioCover Oil Movento*	256.0 fl.oz./100 128.0 fl.oz./100 9.0 fl.oz./A	60.3	18.5	18.8	2.8	64.3
7. BioCover Oil BioCover Oil Exirel*	256.0 fl.oz./100 128.0 fl.oz./100 20.5 fl.oz./A	29.4	15.6	43.0	12.0	137.6
8. BioCover Oil BioCover Oil Harvanta 50SL*	256.0 fl.oz./100 128.0 fl.oz./100 22.0 fl.oz./A	30.3	29.5	35.8	4.5	114.5
9. UTC		54.5	18.3	26.8	0.8	74.0
10. BioCover Oil BioCover Oil	256.0 fl.oz./100 128.0 fl.oz./100	27.3	23.3	42.0	7.5	129.8
P value		0.6162	0.2532	0.9202	0.3751	0.7261

[a] Seasonal evaluations made on 'Bartlett'.
Mean separation by Student's t ($P \leq 0.05$). Treatment means followed by the same letter are not significantly different. Arithmetic means reported as percent of fruit with each rating. All applications made using a three-point hitch tractor mounted 'Pack Tank' sprayer and pecan handgun applied at 300 psi. dilute to runoff. * LI-700 @ 0.25%. ** Sooty mold score obtained by multiplying number of fruit in each rating category by the category rating number: 0=no sooty mold, 1=1-10% of fruit surface with sooty mold, 2=11-50% of fruit surface with sooty mold, 3=>51% of fruit surface with sooty mold and adding the products of the four categories.

EVALUATION OF INSECTICIDES & DRAPENET FOR CONTROLLING INSECT COMPLEX ON APPLE
Hudson Valley Research Laboratory 2020
Apple: *Malus domestica*, cv. 'Honeycrisp', 'Crimson Crisp', 'Liberty', 'Nova Easygrow'

Codling moth (CM): *Cydia pomonella* (Linnaeus)
European apple sawfly (EAS): *Hoplocampa testudinea* (Klug)
Mullein plant bug & apple red bug; (MPB): *Campylomma verbasci* (Meyer), (ARB) *Lygidea mendax* (Reuter)
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)
San Jose scale (SJS): *Quadraspidiotus perniciosus* (Comstock)
Stink Bug: Green and Brown Marmorated Stink Bug (SB): *Chinavia hilaris* (Say), *Halyomorpha halys* (Stål)
Tarnished plant bug (TPB): *Lygus lineolaris* (P. de B.)
Wooly apple aphid (WAA): *Eriosoma lanigerum* (Hausmann)

This trial was conducted in a 12 yr.-old, orchard block of 11-tree varietal panels comprised of apple scab resistant varieties on G11 rootstock using high-density spacing of 11' x 3' to produce yields exceeding 1100 bu./A. Alternate rows were netted and unnetted used as control plots. Insecticide treatments were applied in replicated plots across the split block. Calculations for applications were based on tree row volume as in conventional production. Exclusion systems using Drape net* was applied using a 'Net Wizz' applicator on two dates: 29 April and 21 May to three plots in each of the two split blocks and secured with either zip-ties or garment gun ¼" ties to complete exclusion. Garment ties showed a 20-35% time reduction compared to zip ties with comparable retention of exclusion during fruit drop. Insecticides and fungicide applications were made using Slimline Tower Sprayer delivering 74 GPA at 100 psi. traveling at an average of 2.5 mph.

Maintenance applications for disease management included Champ Ion at 8.0 lb./A on 18 March; Vangard WG at 4 oz./A on 31 March; Manzate Pro-Stick at 3 lb./A on 31 March, 7, 20, 28 April; Manzate Pro-Stick at 3 lb./A, Captan Gold 80 WG at 3 lb./A; Rally 40 WSP at 4 oz./A, Manzate Pro-Stick at 3 lb./A on 19 May; Captan Gold 80WDG at 3 lb./A on 4 May; Manzate Pro-Stick at 3 lb./A, Captan Gold 80WG at 3 lb./A, and Inspire Super at 12 fl.oz./A on 13 May; Rally 40WSP at 4 oz./A and Manzate Pro-Stick at 3 lb./A on 19 May; Captan Gold 80 WDG at 5 lb./A and Inspire Super at 12 fl. oz./A on 29 May; Merivon Xemium at 5.5 fl.oz./A on 11 June; Merivon at 5.5 fl.oz./A on 18 June; Inspire Super at 12 fl.oz./A on 1 July; and Pristine at 20 oz./A on 29 July. Maintenance applications for weed management were Alion at 6.5 fl. oz./A and Credit 41 Extra at 1 qt./A on 23 April and Gramoxone SL2.0 at 4 pt./A on 29 July. Thinning employed Amid-Thin W (NAD) at 8 fl.oz./A and Carbaryl 4L at 32 fl. oz./A on 19 May and Amid-Thin at 4 fl.oz./A, Carbaryl 4L at 1 qt./A on 25 May, Amid-Thin at 6 fl.oz./A was applied on 2, 18 June for return bloom.

Management of insects included Esteem 35WP at 5 oz./A on 7 April, Harvanta 50SL at 22 fl.oz./A 20 April, Exiril at 22 fl.oz./A on 19 May, Harvanta 50SL at 22 fl.oz./A on 1 June, Admire Pro at 2.8 fl. oz./A and Aza-Guard at 32 fl.oz./A on 23 June.

Nets were opened and closed for fruit rating on 16 June. Harvest fruit assessments were taken from 3 trees in center of plots of 'Honeycrisp', 'Crimson Crisp', and 'Liberty' on 9 and 11 September. Observations of WAA presence within the canopy found in all drape net treatments with foliar ratings for WAA on 9 October finding 30% defoliation, 5%of limb infestation on 'Nova EasyGrow' compared to un-netted trees.

* Drape Net North America, East Coast sales, 8957 Route 9, Chazy, NY




Table 20 Evaluation of Drape Net for Controlling Insect Complex on Apple
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of insect damaged fruit					
Trmt.	Net App. Date	PC	EAS	TPB	MPB	Ext. Lep	Clean
1. Drape Net	29 April	4.0	0.0	0.0	0.0	1.3	94.7
2. Drape Net	21 May	5.8	0.3	0.3	0.0	1.0	92.8
3. Unnetted		2.5	0.0	0.0	0.0	2.5	95.0
P value		0.5273	0.5283	0.5283	NA	0.4924	0.6175

Rating of insect damage taken on 16 June on 'Crimson Crisp'.

Table 21 Evaluation of Drape Net for Controlling Insect Complex on Apple
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of insect damaged fruit							
Trmt.	Net App. Date	PC	EAS	TPB	AMP	AMT	SB	SJS	Clean
1. Drape Net	29 April	24.1	0.0	0.6	1.9 b	0.6 b	11.3	1.1	61.5 a
2. Drape Net	21 May	14.0	0.0	4.2	5.4 b	5.5 b	11.5	0.0	67.1 a
3. Unnetted		35.0	0.0	3.9	46.7 a	51.7 a	29.4	1.1	20.6 b
P value		0.2279	NA	0.2829	0.0001	0.0001	0.1529	0.3361	0.0004

Assessments from apples harvested 9 and 11 September from 'Honeycrisp', 'Crimson Crisp', and 'Liberty'.
Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported.

Table 22 Evaluation of Drape Net for Controlling Insect Complex on Apple
Hudson Valley Research Laboratory, Highland, NY - 2020

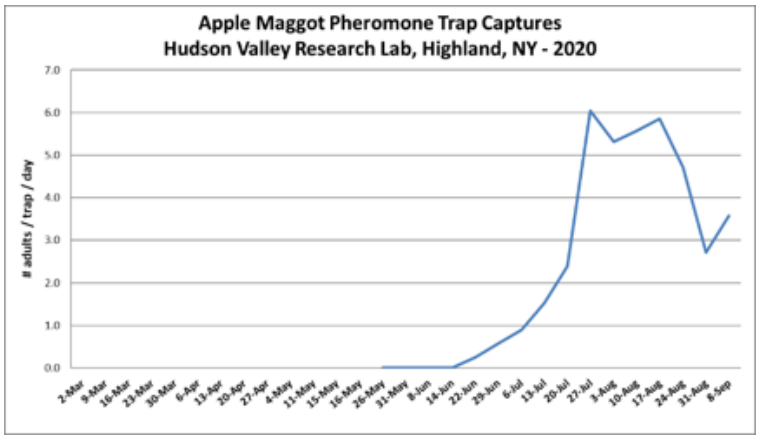
		Incidence (%) of insect or sooty mold damaged fruit					
Trmt.	Net App. Date	Lf. Roller	Int. Lep	Ext. Lep	CM	Sooty Mold	Clean
1. Drape Net	29 April	4.7	0.3 b	11.1 a	0.0 b	0.6	61.5 a
2. Drape Net	21 May	1.3	0.8 b	2.4 b	0.0 b	3.9	67.1 a
3. Unnetted		5.0	15.6 a	8.9 ab	3.3 a	3.9	20.6 b
P value		0.2848	0.0001	0.0334	0.0001	0.2572	0.0004

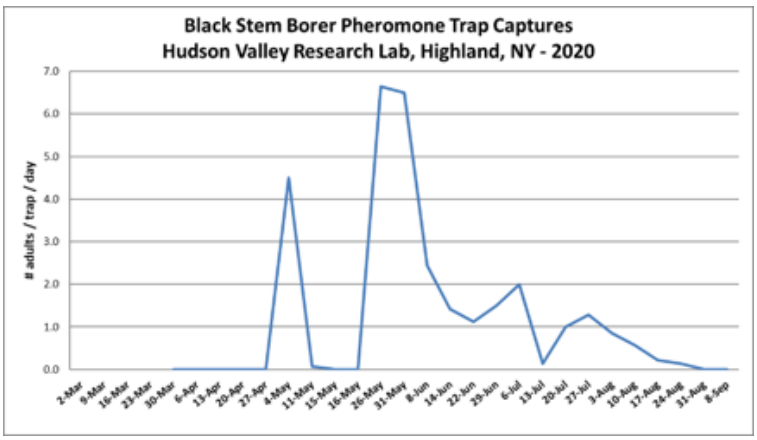
Assessments from apples harvested 9 and 11 September from ‘Honeycrisp’, ‘Crimson Crisp’, and ‘Liberty’. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported.

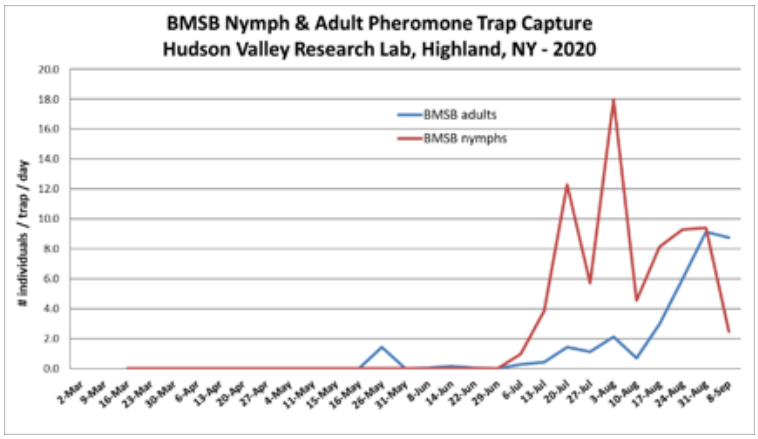
Table 23 Evaluation of Drape Net Impact on Pollination and Fruit Development on Apple
Hudson Valley Research Laboratory, Highland, NY - 2020

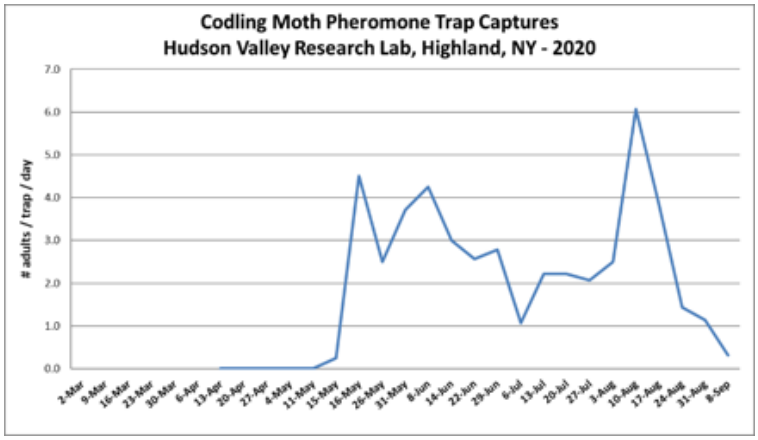
Trmt.	Net App. Date	Total Fruit on Tree
1. Drape Net	29 April (P)	35.7 b
2. Drape Net	21 May (PF)	75.2 a
3. Unnetted		74.8 ab
P value		0.0216

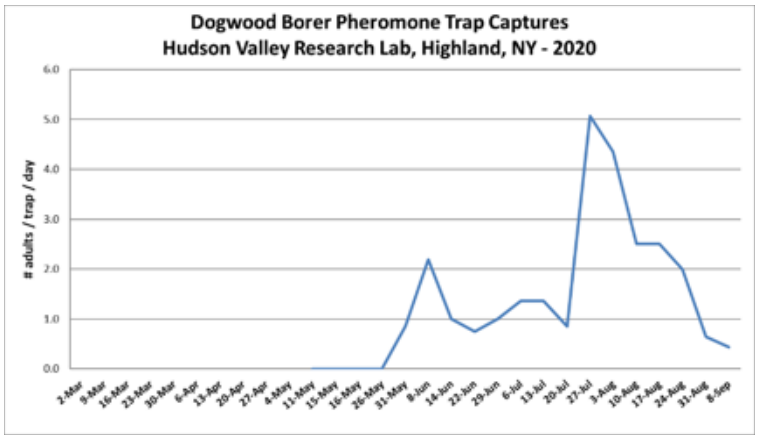
Counts of fruit at harvest on 9 and 11 September from ‘Honeycrisp’, ‘Crimson Crisp’, and ‘Liberty’. One outlier tree excluded from treatment 1 ‘Liberty’. Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported.

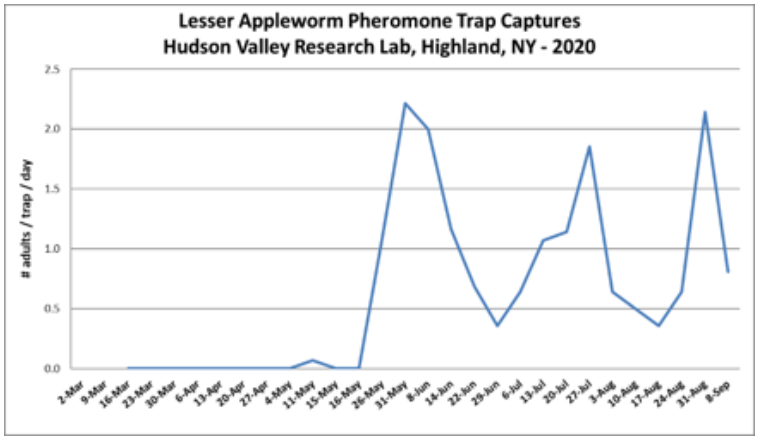

Apple Maggot Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

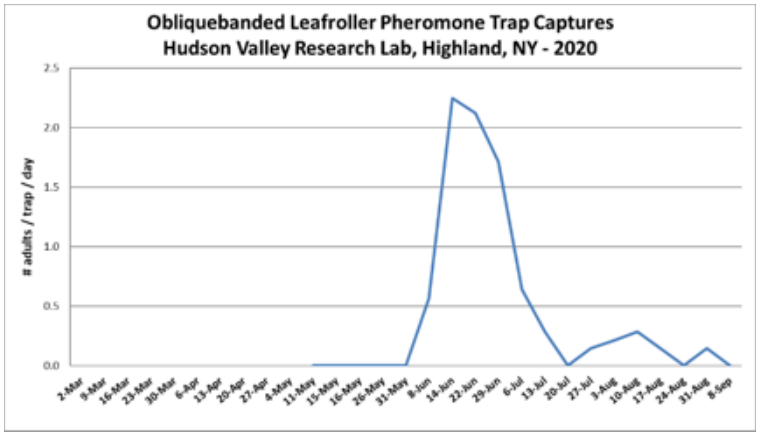

Black Stem Borer Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

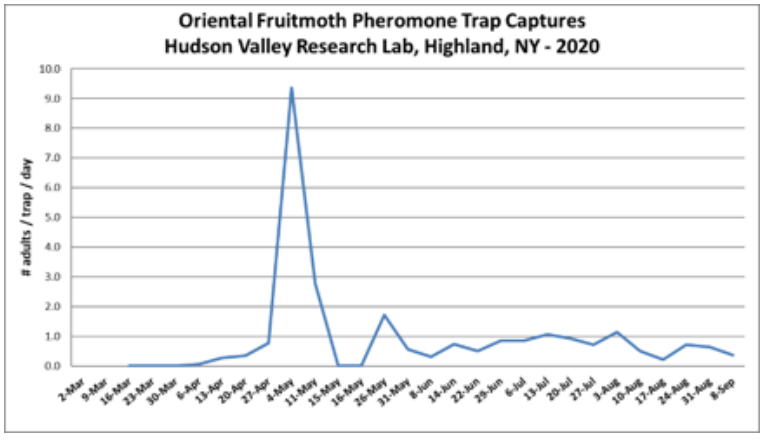

BMSB Nymph & Adult Pheromone Trap Capture
Hudson Valley Research Lab, Highland, NY - 2020
BMSB adults
BMSB nymphs
individuals / trap / day

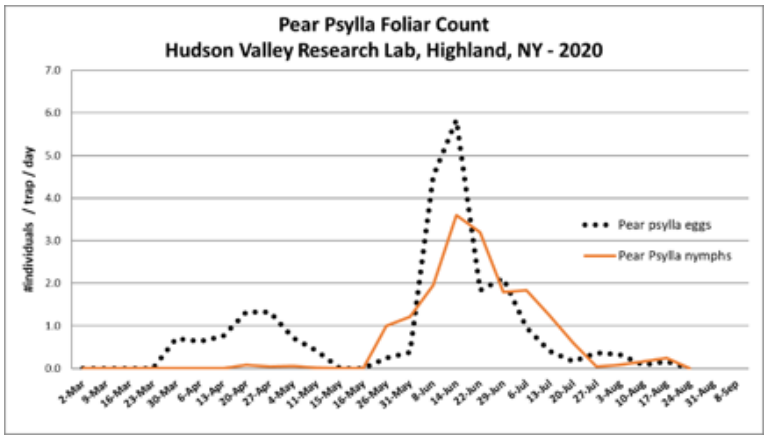

Codling Moth Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

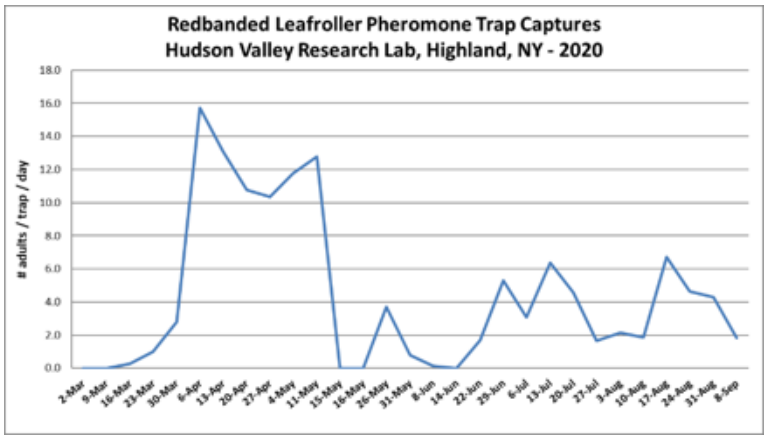

Dogwood Borer Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

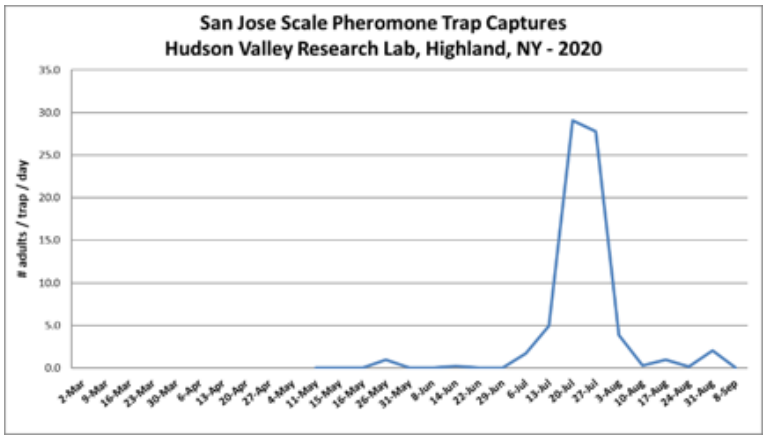

Lesser Appleworm Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

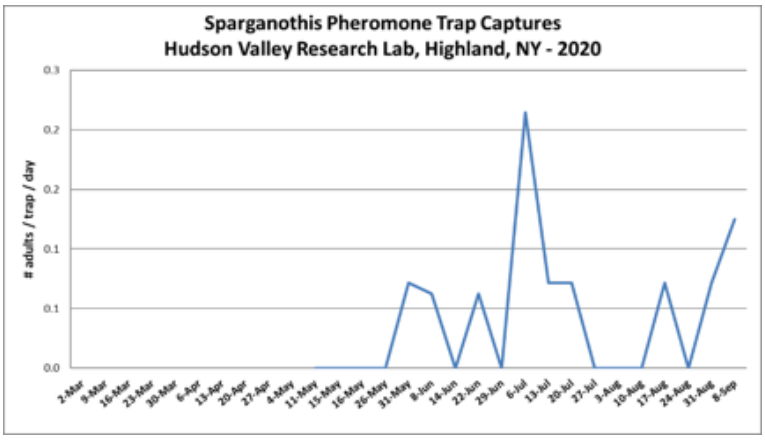

Obliquebanded Leafroller Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

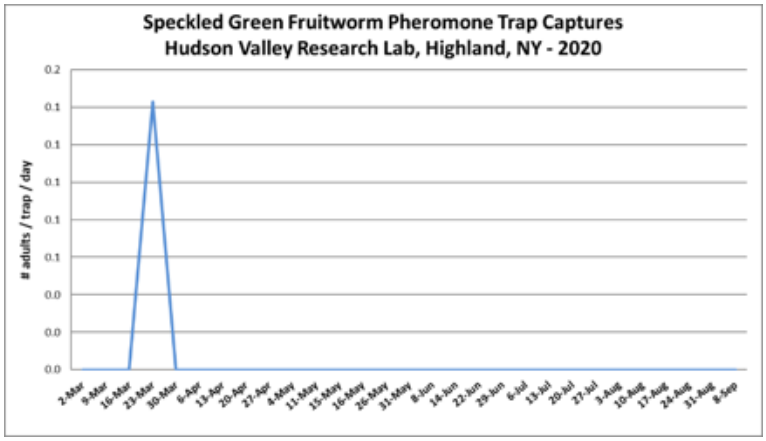

Oriental Fruitmoth Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

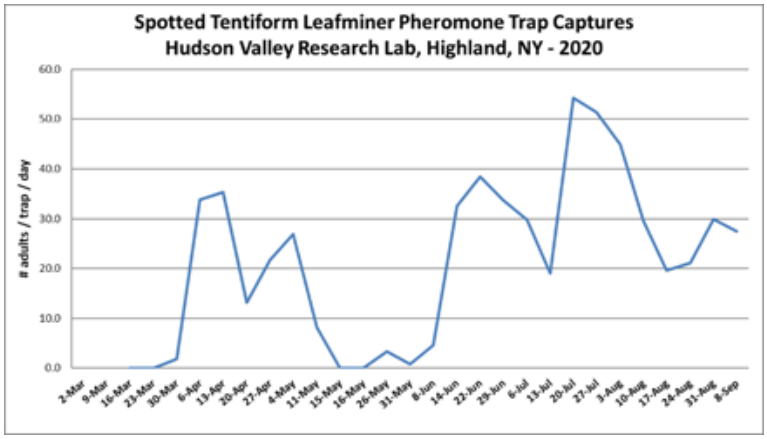

Pear Psylla Foliar Count
Hudson Valley Research Lab, Highland, NY - 2020
#individuals / trap / day
Pear psylla eggs
Pear Psylla nymphs

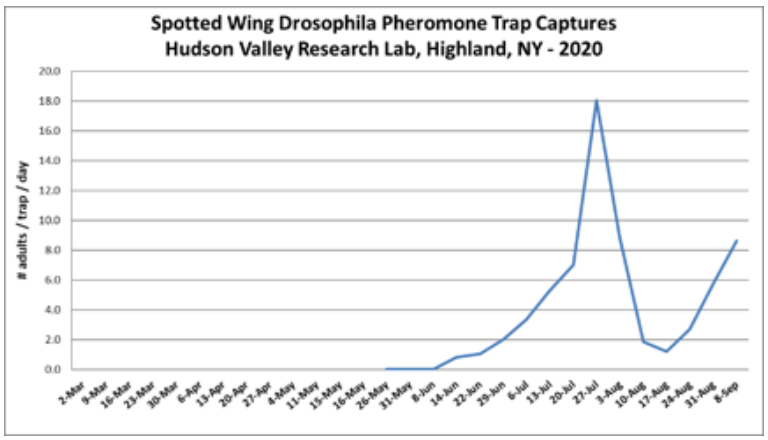

Redbanded Leafroller Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

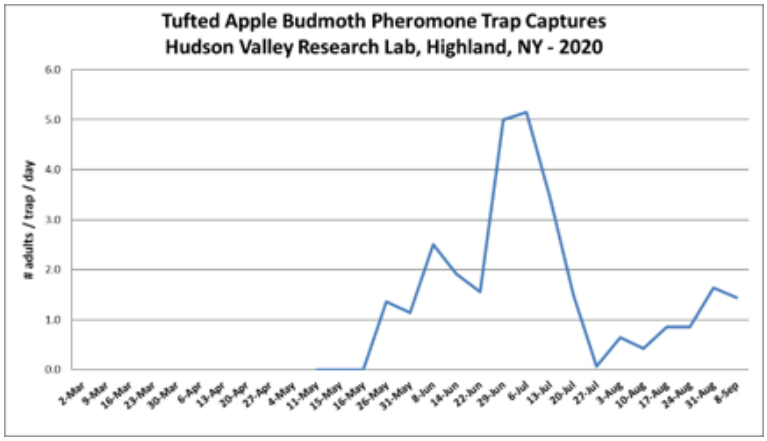

San Jose Scale Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day


Sparganothis Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day


Speckled Green Fruitworm Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day


Spotted Tentiform Leafminer Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day


Spotted Wing Drosophila Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day


Tufted Apple Budmoth Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020
adults / trap / day

Departments of Entomology and Plant Pathology
Hudson Valley Research Laboratory

Cornell University
College of Agriculture and Life Sciences

McIntosh Phenology

Year	GT	HIG	T.C.	Pink	Bloom	P.F.	PF DD_{43}	PF DD_{50}
2020	3/23	4/6	4/13	4/26	5/9	5/19	535.1	245.7
2019	4/10	4/15	4/19	4/22	5/8	5/15	533.1	257.2
2018	4/18	4/28	4/30	5/4	5/9	5/14	514.5	274.6
2017	4/2	4/11	4/17	4/24	4/27	5/8	603.0	312.0
2016	3/17	4/04	4/11	4/18	4/25	5/12	597.8	186.0
2015	4/13	4/20	4/27	5/4	5/6	5/12	527.8	304.5
2014	4/14	4/18	4/28	5/6	5/12	5/19	594.9	321.5
2013	4/13	4/18	4/24	4/30	5/7	5/13	510.6	262.2
2012	3/16	3/18	3/25	4/8	4/16	4/21	506.5	267.5
2011	4/4	4/11	4/25	5/1	5/9	5/16	526.0	268.3
2010	3/20	4/2	4/6	4/10	4/20	4/28	305.0	168.5
2009	4/6	4/13	4/20	4/24	4/29	5/7	452.0	219.6
2008	4/10	4/14	4/21	4/24	4/29	5/7	404.5	207.4
2007	4/2	4/21	4/24	5/2	5/7	5/14	397.0	228.3
2006	4/3	4/10	4/17	4/22	4/26	5/8	419.2	220.0
2005	4/7	4/11	4/18	4/26	5/8	5/16	493.7	258.6
2004	4/12	4/19	4/22	4/27	5/3	5/13	558.5	304.7
2003	4/7	4/16	4/24	4/28	5/1	5/19	595.0	324.7
2002	3/25	4/10	4/14	4/15	4/16	5/7	498.0	283.2
2001	4/11	4/17	4/25	4/28	5/2	5/10	481.3	288.0
2000	3/27	4/2	4/14	4/24	5/1	5/8	488.3	346.0
1999	4/2	4/7	4/12	4/26	5/2	5/13	530.1	174.4
1998	3/27	3/29	4/1	4/10	4/23	5/4	498.1	382.0
1997	4/4	4/11	4/21	4/28	5/1	5/14	422.7	250.0
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	**3/16**	**3/18**	**3/25**	**4/8**	**4/16**	**4/21**	305.0	168.5
Latest day	**4/18**	**4/28**	**5/4**	**5/7**	**5/16**	**5/24**	603.0	382.0

Midrange: **3/31** (+/-14D)
4/7 (+/-20.5D)
4/14 (+/-20D)
4/22 (+/-14D)
5/1 (+/-15D)
5/7 (+/-16.5D)

Mean days in bloom 9.4 days

2020 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Research Laboratory, Highland, NY

All readings were taken from daily Max and Min on the dates indicated from NEWA-HVRL. Numbers in *italics* are interpreted

March

Date	Ave. Air Temp (°F)	Max. Air Temp (°F)	Min. Air Temp (°F)	Rain (inches)	Lf.Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	*29.1*	*39.6*	*17.9*	*0.0*	*0*	*0*	*2.4*	*3959*
02	*42.9*	*60.5*	*28.8*	*0.0*	*0*	*0*	*2.5*	*2882*
03	*51.0*	*59.6*	*46.5*	*0.22*	*7*	*2*	*2.8*	*2141*
04	44.0	51.4	36.7	*0.0*	*0*	0	*4.8*	*3604*
05	*40.7*	*50.5*	*33.5*	*0.0*	*0*	*0*	*2.7*	*3890*
06	*37.2*	*43.5*	*29.3*	*0.0*	*8*	*0*	*3.5*	*1757*
07	34.6	41.3	29.3	0.01	3	0	7.8	3894
08	*42.6*	*59.6*	*24.9*	0.00i	*0*	*0*	*2.5*	*3652*
09	57.3	72.4	42.9	0.0	0	0	3.9	3847
10	57.1	63.4	49.7	0.0	0	0	3.7	1677
11	42.8	50.3	35.9	0.0	0	0	4.1	2752
12	41.7	47.0	36.4	0.04	2	0	2.0	1201
13	49.4	63.4	40.9	0.38	13	0	2.9	1959
14	42.8	50.4	35.7	0.0	0	0	3.0	3252
15	39.6	47.1	32.5	0.0	0	0	4.9	4089
16	33.8	46.2	22.9	0.0	0	0	4.8	4193
17	39.4	49.2	32.1	0.06	12	0	1.6	1279
18	44.0	52.9	33.9	0.0	0	0	2.8	4054
19	41.3	47.0	35.6	0.62	12	0	2.6	1121
20	53.0	69.5	42.7	0.13	13	0	2.6	1303
21	40.5	49.4	33.7	0.0	0	0	6.9	4510
22	32.7	42.7	23.3	0.0	0	0	5.2	4812
23	*31.8*	*32.7*	*29.3*	*0.16*	*13*	*0*	*4.4*	*571*
24	36.9	44.9	31.0	0.65	9	0	4.3	4256
25	37.0	43.0	32.1	0.0	0	0	3.2	1087
26	45.5	59.6	30.6	0.0	0	0	3.0	4785
27	52.1	59.9	46.3	0.0	0	0	4.1	4962
28	41.3	46.8	36.5	0.44	12	0	2.3	881
29	44.3	47.7	40.9	0.31	22	0	2.8	494
30	42.6	47.0	39.1	0.08	10	0	2.4	1242
31	41.5	47.1	36.5	0.04	7	0	3.4	23731
	42.3	72.4	17.9	3.14	143	2	3.5	8636

April

Date	Ave. Air Temp (°F)	Max. Air Temp (°F)	Min. Air Temp (°F)	Rain (inches)	Lf. Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	42.7	50.6	34.3	0.00	0	0	5.4	500
02	45.2	53.9	36.1	0.00	0	0	8.0	389
03	45.7	50.3	40.6	0.14	5	0	6.4	178
04	52.2	60.3	44.6	0.00	0	0	3.9	447
05	54.9	62.9	47.0	0.00	0	0	1.6	204
06	51.9	61.8	42.0	0.00	0	0	4.6	560
07	56.1	67.5	45.3	0.00	1	0	2.5	480
08	48.6	56.3	44.8	0.15	9	0	3.1	193
09	44.4	51.4	39.0	0.57	7	0	2.9	140
10	40.7	43.7	36.7	0.00	0	0	4.5	284
11	42.9	51.5	35.5	0.00	0	0	2.9	514
12	49.3	62.6	32.2	0.00	0	0	2.6	408
13	57.5	62.2	52.2	0.88	12	0	5.1	81
14	47.8	55.3	41.4	*0.00*	*0*	0	*2.0*	*389*
15	42.8	49.1	36.5	0.00	0	0	3.3	523
16	39.0	45.0	32.8	0.00	0	0	3.3	472
17	37.8	47.4	29.7	0.10	4	0	2.8	377
18	36.4	43.8	31.9	0.57	12	0	3.5	240
19	48.4	61.5	33.1	0.00	0	0	3.9	554
20	46.3	53.0	41.0	0.00	0	0	5.0	383
21	42.1	50.0	33.0	0.13	3	0	3.0	190
22	37.7	45.3	31.0	0.00	0	0	3.6	506
23	38.5	44.2	29.9	0.00	0	0	1.5	184
24	41.2	48.0	37.1	0.29	16	0	4.5	182
25	51.1	64.8	38.2	0.00	0	0	2.1	458
26	43.7	49.5	36.0	0.51	14	0	5.4	82
27	40.2	44.5	36.3	0.07	14	0	7.3	152
28	49.5	62.0	38.3	*0.00*	*0*	0	*4.0*	*609*
29	49.6	56.6	40.7	0.00	0	0	2.2	186
30	49.9	55.7	43.2	0.72	16	0	3.4	27
	45.8	67.5	29.7	4.13	113	0	3.8	9892

2020 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Research Laboratory, Highland, NY

All readings were taken from daily Max and Min on the dates indicated from NEWA-HVRL. Numbers in *italics* are interpreted

May

Date	Ave. Air Temp (°F)	Min. Air Temp (°F)	Max. Air Temp (°F)	Rain (inches)	Lf.Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	49.3	54.9	45.0	0.00	8	6	0.0	165
02	56.7	70.1	47.3	0.01	12	10	0.0	282
03	51.4	54.0	48.2	0.07	7	17	0.0	117
04	57.3	64.6	52.2	0.18	14	15	0.0	235
05	53.8	58.5	51.3	0.60	22	24	0.0	100
06	58.4	70.2	48.5	0.01i	2i	10	0.6	413
07	57.0	72.1	48.9	0.34i	5i	14	2.0	328
08	56.8	65.8	48.5	0.00	0	3	0.0	636
09	52.9	60.2	46.2	0.00	0	0	0.0	303
10	58.8	73.5	50.6	0.92	12	12	0.0	171
11	55.9	63.3	49.5	0.00	3	2	0.0	612
12	42.6	53.4	39.0	1.33	23	17	0.0	65
13	42.4	44.9	39.7	0.50	15	21	0.1	82
14	43.8	49.0	40.3	0.05i	16i	16	0.6	139
15	53.2	65.7	39.0	0.00i	6i	5	0.9	515
16	59.3	69.3	48.2	0.00i	0i	0	0.3	564
17	61.0	69.8	50.0	0.05i	5i	0	0.8	208
18	60.4	71.8	47.1	0.00i	0i	0	0.8	669
19	68.0	81.2	53.6	0.10i	3i	2	0.2	596
20	71.4	81.0	63.5	0.05	10	10	0.0	348
21	59.0	67.6	51.1	0.00	0	0	0.0	693
22	58.6	68.7	47.4	0.00	0	0	0.0	625
23	62.3	69.8	52.8	0.18	9	5	0.0	348
24	64.0	69.4	57.8	0.01	2	4	0.0	587
25	61.7	70.7	51.3	0.00	0	1	0.0	482
26	69.5	84.7	55.9	0.02	8	5	0.0	587
27	67.9	77.9	57.3	0.00i	0i	0	0.2	701
28	58.4	61.2	55.3	0.53i	12i	12	0.6	85
29	57.5	65.1	50.8	0.45	17	18	0.0	280
30	60.8	69.2	55.9	0.10	16	20	0.0	245
31	67.9	79.3	59.2	0.02	8	9	0.0	577
	58.0	84.7	39.0	5.52	235	258	0.2	11758

June

Date	Ave. Air Temp (°F)	Min. Air Temp (°F)	Max. Air Temp (°F)	Rain (inches)	Lf. Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	67.0	79.6	53.8	0.00	0	4	0.0	569
02	66.5	74.6	55.8	0.11	4	8	0.0	423
03	57.0	66.3	48.4	0.00	0	5	0.0	689
04	58.9	68.6	43.8	0.00	0	0	0.0	641
05	69.7	80.0	59.7	0.00	0	0	0.0	445
06	70.5	74.5	63.6	0.07	6	6	0.0	526
07	68.6	78.7	58.7	0.00	0	6	0.0	572
08	69.1	79.9	57.6	0.00	0	2	0.0	703
09	66.8	79.2	54.7	0.00	0	0	0.0	661
10	62.8	71.3	49.3	0.39	9	7	0.0	269
11	66.5	72.9	56.1	0.12	9	9	0.0	548
12	63.5	75.0	48.9	0.00	0	0	0.0	690
13	58.7	65.3	54.6	0.47i	6i	3	0.2	289
14	62.2	73.2	55.0	0.04	7	7	0.0	424
15	67.7	78.8	52.4	0.00i	0i	0	1.0	620
16	65.4	68.6	61.6	0.20	21	20	0.0	116
17	67.7	75.4	60.7	0.01i	6	7	0.0	424
18	66.8	70.9	63.8	0.27i	8i	23	0.3	157
19	67.3	74.9	61.0	0.00	0	16	0.0	259
20	69.7	75.7	64.7	0.00	16	17	0.0	197
21	66.5	73.6	61.8	0.23	11	11	0.0	347
22	68.0	77.7	57.3	0.00	0	0	0.0	653
23	70.9	83.7	54.8	0.00	0	0	0.0	675
24	70.9	82.0	58.5	0.00	2	0	0.0	534
25	72.6	84.2	65.2	0.60	11	11	0.3	310
26	73.7	86.2	64.1	0.48	6	8	1.3	669
27	73.7	85.2	60.4	0.00	8	9	1.3	659
28	75.5	90.0	60.0	0.00	0	1	0.8	617
29	76.0	85.9	70.4	0.01	4	0	0.9	381
30	70.2	77.7	64.4	0.00	4	1	2.5	541
	67.7	90.0	43.8	3.00	138	181	0.3	14608

2020 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Research Laboratory, Highland, NY

All readings were taken from daily Max and Min on the dates indicated from NEWA-HVRL. Numbers in *italics* are interpreted

	July									August							
Date	Ave. Air Temp (°F)	Min.	Max.	Rain (inches)	Lf.Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)	Date	Ave. Air Temp (°F)	Min.	Max.	Rain (inches)	Lf. Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	69.7	81.7	62.4	0.00	4	0	1.5	480		77.9	93.3	62.3	0.0	0	0	0.9	568
02	73.2	90.5	60.9	0.57	14	0	1.0	591		77.5	87.1	71.4	0.08	10	0	0.6	225
03	71.9	82.5	66.9	0.13	15	0	0.6	297		79.8	90.1	70.1	0.07	3	0	0.8	560
04	74.6	85.9	65.8	0.00	0	0	1.9	616		69.6	72.4	67	1.7	20	0	1.9	47
05	77.8	90.3	64.4	0.00	0	0	0.8	655		74.3	85.6	64.4	0.01	8	0	0.1	578
06	77.1	88.2	66.1	0.00	0	0	1.9	647		70.7	83.1	59.7	0.0	0	0	1.0	465
07	72.1	80.3	65.1	0.00	0	0	0.9	311		70.6	79.2	64.4	0.01	2	0	2.0	414
08	72.9	81.0	69.4	0.28	4	0	0.8	179		75.5	88	64.8	0.0	0	0	0.4	503
09	77.8	90.6	68.1	0.01	0	0	0.9	523		78.0	89.3	67.9	0.0	0	0	0.5	487
10	73.1	78.6	69.1	0.31	9	0	2.9	150		77.6	92.7	67.8	0.02	5	0	0.9	564
11	76.0	87.3	69.7	0.63	13	0	2.0	462		79.1	91.6	67.3	0.01	8	0	1.0	511
12	76.9	87.6	68.5	0.00	0	0	1.6	549		78.1	88.1	69.3	0.24	7	0	1.3	553
13	75.6	86.6	65.2	0.00	0	0	1.2	592		73.7	81.4	66	0.0	0	0	1.5	343
14	73.4	85.0	62.1	0.00	2	0	1.6	596		74.3	84.3	62.1	0.0	0	0	2.5	526
15	72.6	85.6	63.3	0.00	0	0	0.9	464		73.1	82.3	67.4	0.0	0	0	3.2	415
16	71.1	78.8	66.3	0.00	0	0	1.6	302		65.8	69.4	62.2	0.16	6	0	2.5	113
17	71.2	83.4	62.8	0.02	9	0	0.6	280		68.8	81.1	57.7	0.0	0	0	0.4	385
18	78.2	91.6	62.8	0.00	0	0	0.7	652		70.4	82.4	59.5	0.18	7	0	0.5	509
19	81.8	95.6	69.0	0.27	4	0	1.1	601		65.4	78.8	56	0.13	2	0	0.7	350
20	80.2	93.3	71.7	0.03	5	0	0.6	573		66.3	80.6	52.5	0.0	0	0	0.5	563
21	78.6	91.1	66.3	0.00	0	0	0.7	558		72.4	*88*	*57.3*	*0.0*	*0*	*0*	*0.5*	*459*
22	78.6	91.6	70.7	0.08	2	0	1.0	501		74.8	*94.1*	*59.6*	*0.2*	*2*	*4*	*0.7*	*519*
23	76.3	86.8	69.4	0.07	4	0	0.6	345		76.9	90.7	64.6	0.0	0	0	0.5	482
24	74.5	84.0	69.1	0.01	10	0	1.4	402		78.8	92.7	68.1	0.02	1	0	0.5	447
25	77.2	89.8	65.2	0.00	0	0	0.3	457		75.4	88.1	67.9	0.23	3	0	1.3	403
26	80.9	92.6	68.6	0.00	0	0	0.4	584		67.8	76.4	58.7	0.0	0	0	1.9	530
27	83.2	96.3	67.5	0.00	0	0	0.8	609		68.7	88.1	59.9	0.69	19	0	0.7	309
28	81.2	90.9	70.2	0.00	0	0	0.8	412		72.3	83.6	64.2	0.01	8	0	0.6	395
29	79.1	93.1	64.0	0.00	0	0	0.7	610		71.7	82.3	64.6	0.14	10	0	0.8	201
30	77.1	86.2	67.7	0.03	8	0	0.5	405		66.3	75.3	58.9	0.01	1	0	2.3	457
31	75.7	86.4	66.9	0.00	0	0	2.2	557		74.1	74.9	50.4	0.0	0	0	0.6	401
	76.1	96.3	60.9	2.44	103	0	1.1	14960	0		94.1	50.4	3.91	122	4	1.1	13282

2020 MAXIMUM AND MINIMUM TEMPERATURES AND PRECIPITATION

Hudson Valley Research Laboratory, Highland, NY

All readings were taken from daily Max and Min on the dates indicated from NEWA-HVRL. Numbers in *italics* are interpreted

September

Date	Ave. Air Temp (°F)	Min. Air Temp (°F)	Max. Air Temp (°F)	Rain (inches)	Lf.Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	67.4	73.4	61.5	0.0	0	0	0.2	140
02	68.7	74.6	63.7	0.48	8	0	0.5	100
03	72.3	77.9	64.5	0.43	4	0	0.8	327
04	71.6	82.4	61.4	0.0	0	0	0.9	452
05	66.3	79	53.7	0.0	0	0	0.3	470
06	68	77.2	60.0	0.0	0	0	0.6	438
07	69.4	79.4	60.6	0.0	0	0	1.0	381
08	72.3	84.7	61.0	0.0	0	0	0.4	439
09	72.2	83.3	62.2	0.0	0	0	0.3	357
10	71.9	76.9	67.6	0.09	5	0	0.3	139
11	64.1	69.8	56.8	0.01	3	0	5.1	392
12	60.4	73.1	49.7	0.0	0	0	2.2	429
13	65.4	75.8	53.3	0.0	0	0	1.1	271
14	64.6	71.9	55.3	0.0	0	0	3.2	324
15	54.2	64.8	46.2	0.0	0	0	2.2	375
16	59.5	71.6	48.3	0.0	0	0	1.5	369
17	62.4	75.1	51.1	0.0	0	0	1.4	288
18	58	65.4	49.7	0.0	0	0	6.2	335
19	49.6	59.1	41.2	0.0	0	0	3.7	434
20	49.7	59.5	41.6	0.0	0	0	3.4	389
21	48.9	62.5	36.5	0.0	0	0	2.1	390
22	53	67.4	36.6	0.0	0	0	2.5	385
23	63.9	78.3	48.8	0.0	0	0	2.0	230
24	63.4	78.7	50.3	0.0	0	0	0.8	265
25	66.2	80.8	54.5	0.0	0	0	0.8	325
26	66.4	77.6	58.6	0.0	4	0	0.9	230
27	70.3	77.2	64.5	0.01	1	0	0.5	160
28	70.9	79.1	64.5	0.06	10	0	1.4	226
29	66	70.1	59.1	0.86	11	0	0.9	76
30	61.7	67.9	56.1	1.44	9	0	1.5	317
	64	84.7	36.5	3.38	55	0	1.6	9553

October

Date	Ave. Air Temp (°F)	Min. Air Temp (°F)	Max. Air Temp (°F)	Rain (inches)	Lf. Wet Hrs.	rH ≥ 90%	Wind Spd (mph)	Solar Rad (L)
01	61	72.5	54.1	0.0	0	0	0.9	332
02	54.3	65.5	47.3	0.1	9	0	0.3	211
03	51.3	62.3	42.3	0.0	0	0	1.2	276
04	50.2	65	37.8	0.0	3	0	0.8	295
05	55.1	67.1	44.3	0.0	0	0	0.8	288
06	*56.8*	*68.2*	*47.7*	*0.00*	*0*	*1*	*1.3*	*295*
07	*57.2*	*68.4*	*50.1*	*0.08*	*4*	*6*	*1.1*	*163*
08	53.5	60.5	43.5	0.0	0	0	3.2	327
09	52.9	67	41.3	0.0	*0*	0	1.1	313
10	62.8	76.2	51.5	0.0	*0*	0	2.0	289
11	56.1	62.3	49.5	0.0	*0*	0	4.0	273
	48.5i	52.2i	45.1i	0.17i	*9i*	0i	3.3i	127i