Fruit Notes

Volume 86, Number 2, Spring, 2021

Fruit Notes

Editors: Wesley R. Autio & Winfred P. Cowgill, Jr.

Fruit Notes (ISSN 0427-6906) is published four times per year by the Stockbridge School of Agriculture, University of Massachusetts Amherst. **The cost of a 1-year hard-copy subscription is $50. The cost of a 1-year electronic subscription is $25.** Each 1-year subscription begins January 1 and ends December 31. Some back issues are available for $15 each. Payments via check must be in United States currency and should be payable to the **University of Massachusetts Amherst**. Payments by credit card must be made through our website: http://extension.umass.edu/fruitadvisor/. Correspondence should be sent to: Fruit Notes, Stockbridge School of Agriculture, 205 Paige Laboratory, University of Massachusetts Amherst, Amherst, MA 01003.

All chemical uses suggested in this publication are contingent upon continued registration, and should be used in accordance with federal and state laws and regulations. Where trade names are used for identification, no company endorsement or product discrimination is intended. The University of Massachusetts makes no warranty or guarantee of any kind, expressed or implied, concerning the use of these products.

Table of Contents

Evaluation of Entomopathogenic Nematodes Against Plum Curculio: Effects of Nematode Species, Application Rates, and Persistence in the Soil
Jaime C. Piñero, Prabina Regmi, Dorna Saadat, Ajay Giri, Tracy C. Leskey, and David Shapiro-Ilan 1

Evaluation of CIDETRAK® CMDA + LR DUAL MESO™ as a Mating Disruption Tool for the Management of Codling Moth and Obliquebanded Leafroller in Apple Orchards
Ajay P. Giri and Jaime C. Piñero 7

2021 Periodical Cicada in New Jersey and Pennsylvania
Win Cowgill 12

2020 Update on NC-140 Fuji and Honeycrisp Apple Rootstock Trials in New Jersey
Megan Muehlbauer, Rebecca Magron, and Win Cowgill 17

Cover: Black Pearl Sweet Cherry in Oregon at Professor Lynn Long's, Oregon State University variety trial. Black Pearl is a release from International Plant Management: http://intplant.com/index.php/cultivars/cherries/blackpearl. Black Pearl was bred at the New York State Agricultural Experiment Station in Geneva, NY. See also the article on the Pearl Series: http://umassfruitnotes.com/v77n1/a1.pdf. Photo Credit: Win Cowgill.

Thanks to the generous sponsors of the UMass Fruit Program:

TRÉCÉ® INCORPORATED
PHEROMONE AND KAIROMONE BASED INSECT MONITORING AND CONTROL SYSTEMS

FRUIT GROWERS' MASSACHUSETTS ASSOCIATION

Supplying Growers, Gardeners
OESCO, INC.™
and Groundskeeping Professionals. Since 1954.

NEW ENGLAND VEGETABLE & BERRY GROWER'S ASSOC.

NOURSE

Evaluation of Entomopathogenic Nematodes Against Plum Curculio: Effects of Nematode Species, Application Rates, and Persistence in the Soil

Jaime C. Piñero, Prabina Regmi, Dorna Saadat, and Ajay Giri
Stockbridge School of Agriculture, University of Massachusetts

Tracy C. Leskey
USDA ARS Appalachian Fruit Research Laboratory, Kearneysville, WV

David Shapiro-Ilan
USDA ARS SE Fruit and Tree Nut Research Unit, Byron, GA

The use of biological control agents such as entomopathogenic (= insect-killing) nematodes for insect pest control is gaining interest among fruit growers. EPNs are very small, soft bodied, non-segmented roundworms that are parasites of insects. EPNs are commercially available and are used to kill a wide variety of economically important insect pests. EPNs occur naturally in soil environments and locate their prey in response to carbon dioxide, vibration, and other chemical cues. In general terms, EPNs are considered environmentally friendly non-chemical alternatives to controlling pests. For example, they are safe for humans and the environment and are not considered threats to beneficial insects or other non-target organisms. EPNs can be used in organic production systems. In addition, they can be applied using standard pesticide equipment (for a short video showing EPN application at the UMass Cold Spring Orchard, click HERE), and there is no need for personal protective equipment and re-entry restrictions.

In New England, EPNs have been evaluated against plum curculio larvae in multiple farms for nearly a decade. Combined results from multiple published studies indicate that (1) *Steinernema riobrave* and *S. carpocapsae* have emerged as the EPNs species that are most effective at killing the immature stages of plum curculio in the soil, and (2) EPNs can be applied to the soil in areas underneath the canopies of odor-baited trap trees (see Piñero et al., 2020), areas that are expected to hold greater densities of plum curculio compared to any other trees in the orchard. The economic feasibility of using EPNs applied underneath the canopies of trap trees is very promising because, even if high rates of nematodes are applied, such applications would only need to be made to a small proportion of the acreage.

Here, we compared the performance of the EPNs *S. riobrave* and *S. carpocapsae*, evaluated at various application rates, at killing plum curculio larvae in the soil. A secondary objective was to estimate EPN persistence by exposing EPN-treated soil to wax moth larvae (*Galleria mellonella*) about 8 weeks after initial EPN application in the field.

Materials & Methods

Field study. The field component of this study took place at the University of Massachusetts Cold Spring Orchard (Belchertown, MA) from 16 July to 30 September, 2020. In early July 2020, we collected apple fruitlets presumably infested with plum curculio from unmanaged trees in the Amherst/Belchertown areas. Upon collection, the fruit was stored at ambient

Table 1. Entomopathogenic nematode (EPN) treatments applied to the soil at the UMass Cold Spring Orchard (Belchertown, MA) against the immature stages of plum curculio.

Treatments	Nematode application rate
Steinernema riobrave (low rate)	500,000 IJ/m^2
S. riobrave (high rate)	2 million IJ/ m^2
S. carpocapsae (low rate)	500,000 IJ/m^2
S. carpocapsae (high rate)	2 million IJ/ m^2
S. riobrave +*S. carpocapsae* (low rate)	250,000 IJ S.r. + 250,000 IJ S.c.) /m^2
S. riobrave +*S. carpocapsae* (high rate)	1 million IJ S.r. + 1 million IJ S.c.)/ m^2
Control	Water only

temperature for about 10 days to allow plum curculio larvae to continue developing. On 16 July, the fruit was transported to an unsprayed section of the orchard.

View of the experimental site showing the pyramidal emergence traps used for the quantification of adult plum curculio emergence after the application of the EPNs *Steinernema riobrave* and *S. carpocapsae*, at various application rates, or water (control). Trap dimensions: 1 m x 1 m at the base.

EPN treatments. *Steinernema riobrave* and *S. carpocapsae*, were evaluated alone and in combination, at two application rates (low and high; Table 1). Water was used as a control. Sixty fruitlets and 33 plum curculio larvae were placed underneath the canopies of each of 28 apple trees, within a 1 m^2 area. EPNs were applied at the rates described in Table 1, using 3.78 L of water, and the same amount of water alone was applied to the control. After treatment application, the emergence cages were placed on the ground, covering the fruit, and the edges of the cages were buried in the soil to ensure the emerged adults would not escape. To preserve soil moisture, we added 3.78 L of water to each experimental area three days after initial EPN application. As soon as the first adult plum curculio was captured in the topping device of the cages, small pieces of apple were placed inside the device as an attractant. The emergence of adult plum curculios from the experimental cages was recorded twice a week for 5 weeks starting on 3 August,

2020. Total weevil emergence from each of the 28 experimental cages (7 treatments * 4 replications) over a 5-week period was used for the statistical analyses.

Evaluation of EPN persistence in the soil. A follow-up evaluation was conducted at UMass campus. Greater wax moth, *Galleria mellonella*, a highly susceptible host, was used to evaluate the virulence of the EPN treatments approximately 8 weeks after original application in the field. The moth larvae were purchased online from Bestbait. On September 15, 2020, 2 lb-samples of soil were retrieved from each of the 28 experimental units at the Cold Spring Orchard field site. The soil was transported to the lab in 1 quart plastic containers with lid. Upon arrival to the laboratory, each container received 15 ml of distilled water and 15 wax moth larvae were placed inside each container,

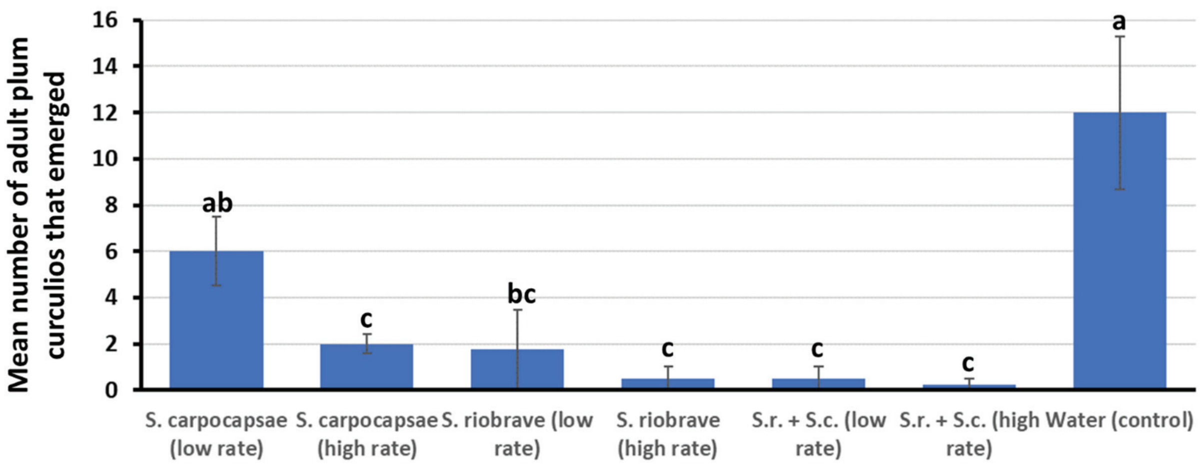


Figure 1. Number (mean ± standard error of the mean, a measure of how precise the estimate is) of adult plum curculios that were recovered from emergence cages following application of EPN treatments or water (control). Different letters above bars denote statistically significant differences between treatments at odds of 19:1.

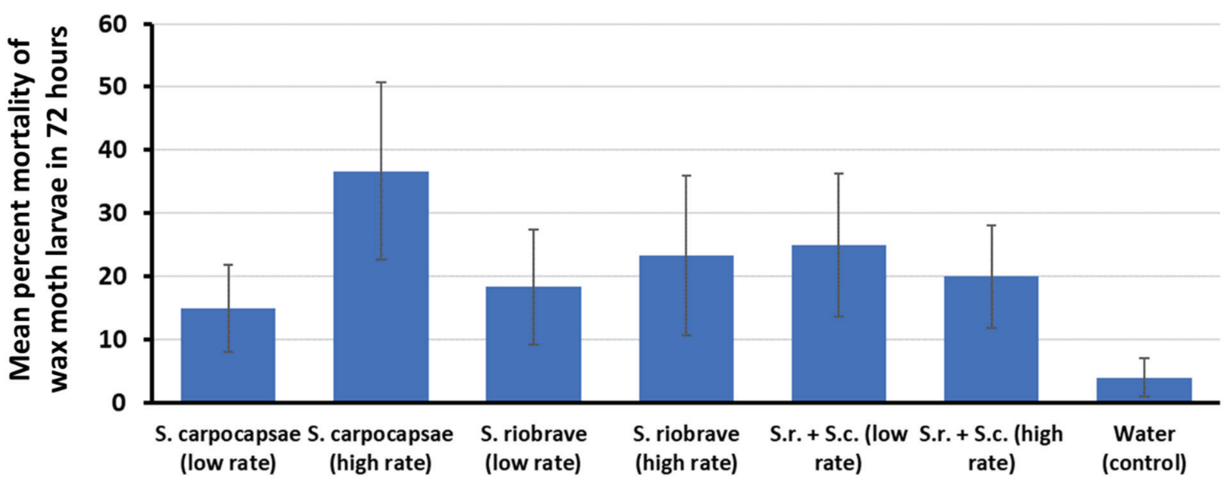


Figure 2. Mortality values (mean ± standard error of the mean) of wax moth (*Galleria mellonella*) larvae that were exposed to soil samples collected (on 15 September, 2020) from each of the 28 experimental units at Cold Spring Orchard (Belchertown, MA). Soil samples corresponded to the EPN treatments or water (control) that were applied against plum curculio on 16 July, 2020.

on top of the soil. Mortality of wax moth larvae was recorded at 24, 48, and 72 hours after exposure.

Results

Field study. Overall, 92 adult plum curculios were recovered from the 28 emergence cages. As shown in Figure 1, the most effective EPN treatments (the ones that resulted in the lowest levels of plum curculio emergence) were *S. carpocapsae* and *S. riobrave* (both at the high rates) and the two rates of *S.r.* + *S.c.* When compared to the control, *S.r.* + *S.c.* (high rate) resulted in a 48-fold reduction in the number of adult PCs that emerged from the soil whereas *S. riobrave* (high rate) and *S.r.* + *S.c.* (low rate), showed a 24-fold reduction. *Steinernema riobrave* at the high and at the low rates and *S. carpocapsae* at the high rate performed similarly well.

Evaluation of EPN persistence. Mortality levels of wax moth larvae caused by EPN treatments ranged from 15% (*S. carpocapsae*, low rate) to 38% (*S. carpocapsae*, high rate) when soil was taken from Cold Spring Orchard in mid-September, from the same areas where EPNs were applied in mid-July. However, the statistical analyses showed no significant differences in the levels of mortality of wax moth larvae among EPN treatments and the control (Figure 2).

Conclusions

The results from this study indicated that *Steinernema carpocapsae* and *S. riobrave* (both at the high application rates evaluated) and the two rates of both EPN species combined performed best at killing plum curculio larvae in the soil. The follow-up study that sought to assess the persistence of EPNs in the soil showed some positive results, but variability among samples likely prevented us from detecting statistical differences when compared to water control. This investigation will be conducted again in 2021 to confirm our results. Overall, this study shows, once more, than EPNs are effective at killing plum curculio larvae in the soil. Biological control involving the application of EPNs targeting the soil-dwelling stages of plum curculio has the potential to manage this pest more sustainably in a reduced-spray environment, including organic systems.

Acknowledgments

Funding for this research was provided by the USDA National Institute for Food and Agriculture and by the UMass Stockbridge School of Agriculture.

References

Piñero, J.C., Shapiro-Ilan, D., Cooley, D.R., Tuttle, A.F., Eaton, Drohan, P., Leahy, K., Zhang, Hancock, T., Wallingford, A.K., and Leskey, T.C. 2020. Toward the integration of an attract-and-kill approach with entomopathogenic nematodes to control multiple life stages of plum curculio (Coleoptera: Curculionidae) Insects 11(6), 375. Available at: https://www.mdpi.com/2075-4450/11/6/375/htm

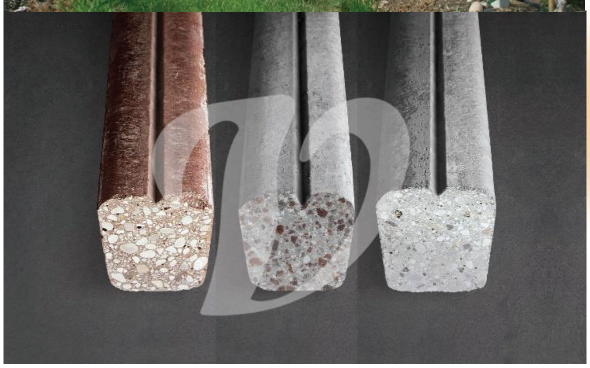
Shapiro-Ilan, D.I., Wright, S.E., Tuttle, A.F., Cooley, D.R., and Leskey, T.C. 2013. Using entomopathogenic nematodes for biological control of plum curculio, *Conotrachelus nenuphar*: Effects of irrigation and species in apple orchards. Biological Control 67, 123–129.

Shapiro-Ilan, D.I., Leskey, T.C., and Wright, S.E. 2011. Virulence of entomopathogenic nematodes to plum curculio, *Conotrachelus nenuphar*: Effects of strain, temperature, and soil type. Journal of Nematology 43, 187–195.

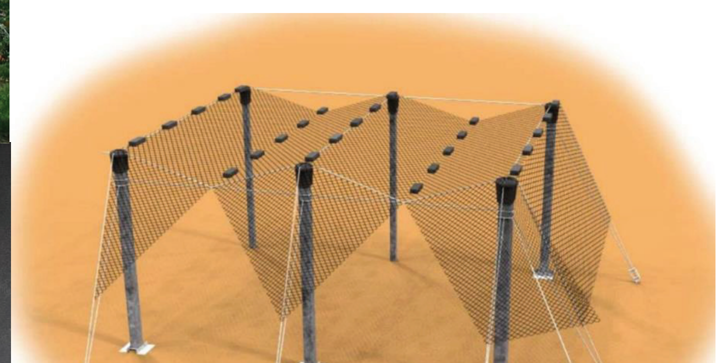
Brookdale Farm Supplies is pleased to announce distribution agreement with Valente corporation in the United States for apple and grape trellising systems

A competitive alternative to wood trellis systems

VALENTE
TECHNICAL SOLUTIONS FOR VINEYARDS AND ORCHARDS



Valente's concrete posts are prestressed reinforced posts that are trapezoidal shape with four smooth sides and no edges. This prevents wear on hail netting or other coverings. The Valente trellis system can be done three different ways; standard trellis support, tall trellis support for future installation of netting or the tall trellis with hail netting included. Many different types and colors of hail netting, as well as bird netting, available. 2.5 acres of apples at 12' row spacing fits in an overseas container. Container loads are delivered directly to your farm. Note: posts need to be vibrated in. Please contact us for information and a free estimate with trellis model.



Many different types and colors of bird and hail netting available

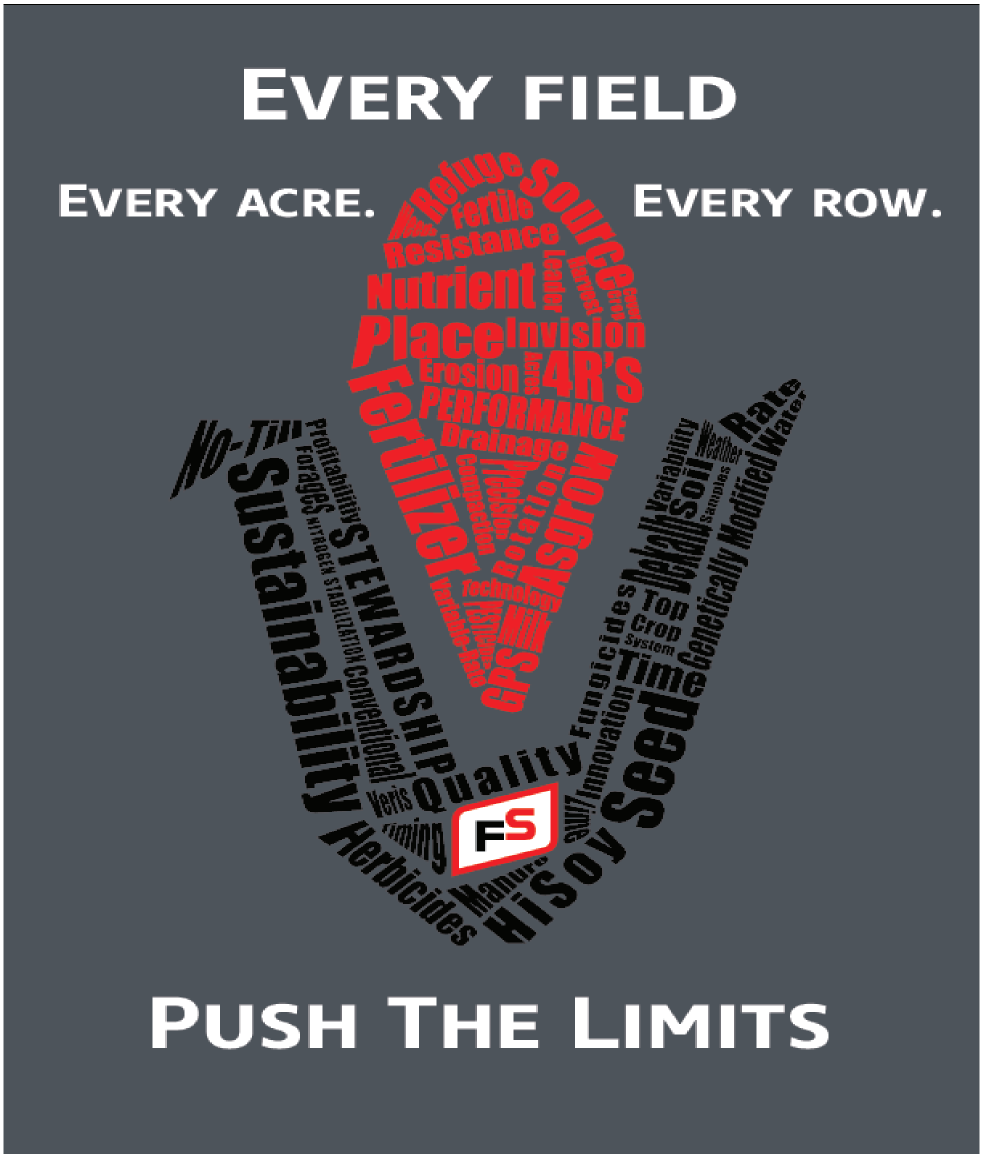
TORO Ag Irrigation

Toro's Blueline PC is a heavy wall drip tubing with pressure compensating integrated drippers that lasts 25 plus years. Designed for perennial crops such as apples, peaches, and blueberries; Blueline PC has an emitter built inside the tube. The flow path technology in the PC dripper uses a shark tooth design providing a turbulent flow path that is independent from the wall of the tubing. That flow path, along with the self-flushing diaphragm allows for a dripper system that is very resistant to clogging. This produces a uniformly watered field for a long duration of time.

BlueLine® PC
Premium Pressure Compensating Dripline

Brookdale Farm Supplies

38 Broad Street
Hollis, NH 03049
603-465-2240
tractortrv@aol.com
www.brookdalefruitfarm.com



Servicing the New Jersey Horticulture Industry with expertise in fertility and micronutrient programs and crop protection recommendations

Bloomsbury, NJ
908-479-4500

GROWMARK FS

Evaluation of CIDETRAK® CMDA + LR DUAL MESO™ as a Mating Disruption Tool for the Management of Codling Moth and Obliquebanded Leafroller in Apple Orchards

Ajay P. Giri and Jaime C. Piñero
Stockbridge School of Agriculture, University of Massachusetts

In eastern North America, apple orchards are often attacked by several insect pest species in the Lepidopteran family Tortricidae. Some common fruit pests of economic importance from this family are codling moth (*Cydia pomonella*) (CM) and obliquebanded leafroller (*Choristoneura rosaceana*) (OBLR). Two common management options used by growers to control tortricid pests are insecticide-based control and mating disruption. However, the application of synthetic insecticides is detrimental to the environment and to non-target species and there is a growing evidence of pest resistance to various types of insecticides. Mating disruption is a species- specific and environment friendly option for apple growers. Mating disruption utilizes sex pheromone dispensers deployed at high densities to confuse male moths so that they will not find females. The main idea is that the female will remain unmated so that the population levels are reduced, and crop damage diminishes. The goal of this study was to evaluate the field performance of a dual mating disruption tool targeting CM and OBLR.

Materials & Methods

This field study was conducted from May 6 to September 7, 2020, in three commercial apple orchards ("A", "B" and "C") in Massachusetts. The performance of the mating disruption system was compared against the grower standard approach (hereafter referred to as control). The mating disruption system evaluated was the commercial formulation CIDETRAK® CMDA + LR DUAL MESO™ targeting CM and OBLR. All mating disruption materials were provided by Trécé Inc. (Adair, OK). On May 6, 2020, two pheromone dispensers (one for each moth species) were deployed at the rate of 32 dispensers per acre and were hanged on the branches by the hook at upper 3rd of the tree canopy (Figure 1). This way mating disruption block in orchard "A" (area: 7.35 acres) received 230 dispensers, orchard "B" (area: 6.26 acres) received 200 dispensers, and orchard "C" (area: 9.89 acres) received 310 dispensers. The distance between pheromone dispensers were 10 yards on the perimeter and 15 yards in the interior. The grower control blocks were similar in size and they received standard grower CM and OBLR controls and did not receive any pheromone dispensers.

To monitor the moth populations various novel lures were used. Both the mating disruption and the control blocks received one CML2 lure and one CML2-P lure (improved Trécé lure formulation) for CM and one OBLR lure and one LR Combo lure for OBLR. All lures were installed at the central part of the mating disruption block and the grower control block in each orchard. The monitoring lures were placed

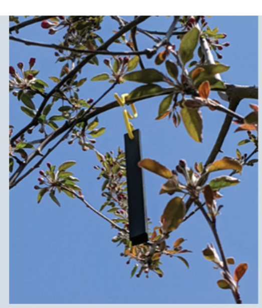


Figure 1. Trécé pheromone dispenser

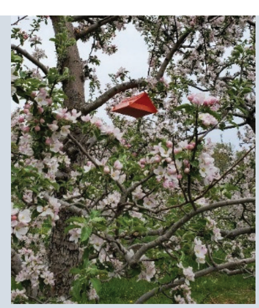


Figure 2. Monitoring delta trap

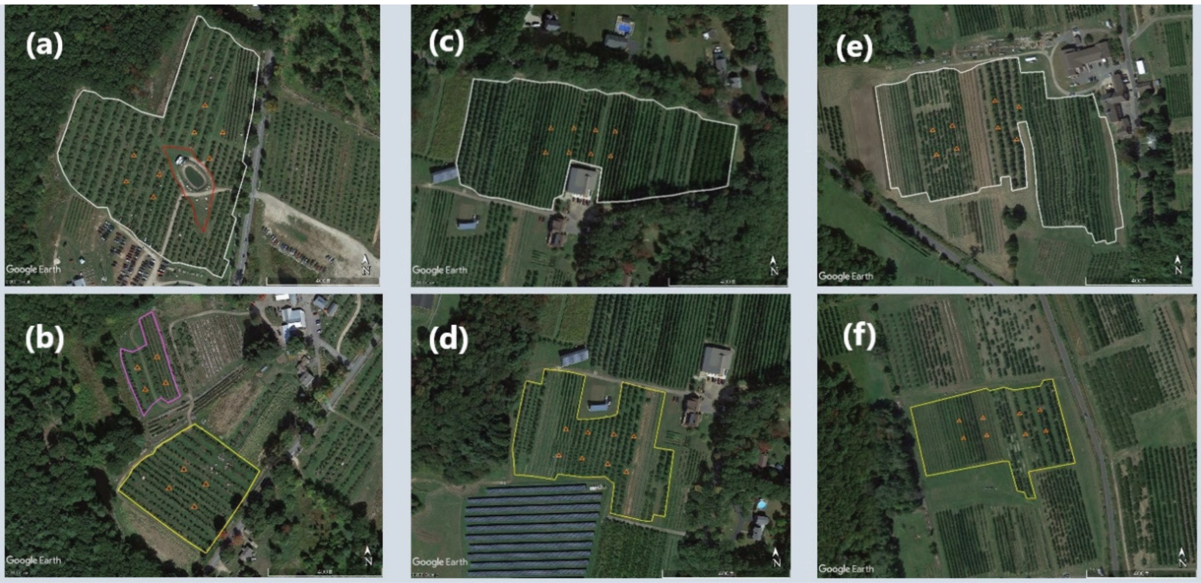


Figure 3. Mating disruption block (a) and control block (b) of orchard "A", mating disruption block (c) and control block (d) of orchard "B", and mating disruption (e) and control block (f) of orchard "C".

inside orange delta-shaped trap (Pherocon® VI, Trécé Inc., Adair, OK) and were kept at 6 feet high and at least 50 yards apart from each other (Figure 2). These traps were monitored on weekly basis for 18 weeks. All captured adult moths were identified according to the species and dissected under microscope to identify their respective sex.

At the end of the experiment, we conducted a harvest injury assessment. This was accomplished by by visual inspection of 100 fruits per tree from 20 trees (=2,000 fruits per block) from both mating disruption and control block. Figure 3 shows, for each orchard, the mating disruption and control blocks used for the study.

Results

Obliquebanded leafroller (OBLR): The first flight of OBLR was observed around June 15th and the second flight started around August 3rd. Overall, the populations of OBLR were comparatively low in orchards "A" and "C" (less than 5 moths in total were captured in the monitoring traps for the entire season). In orchard "B", the population of OBLR was higher,

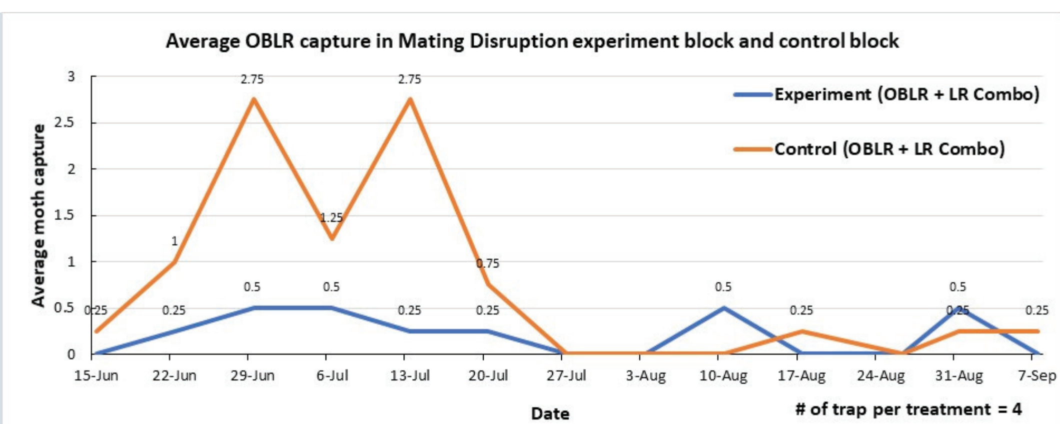


Figure 4. Average number of OBLR captured in trap baited with OBLR and LR Combo lure in Orchard "B".

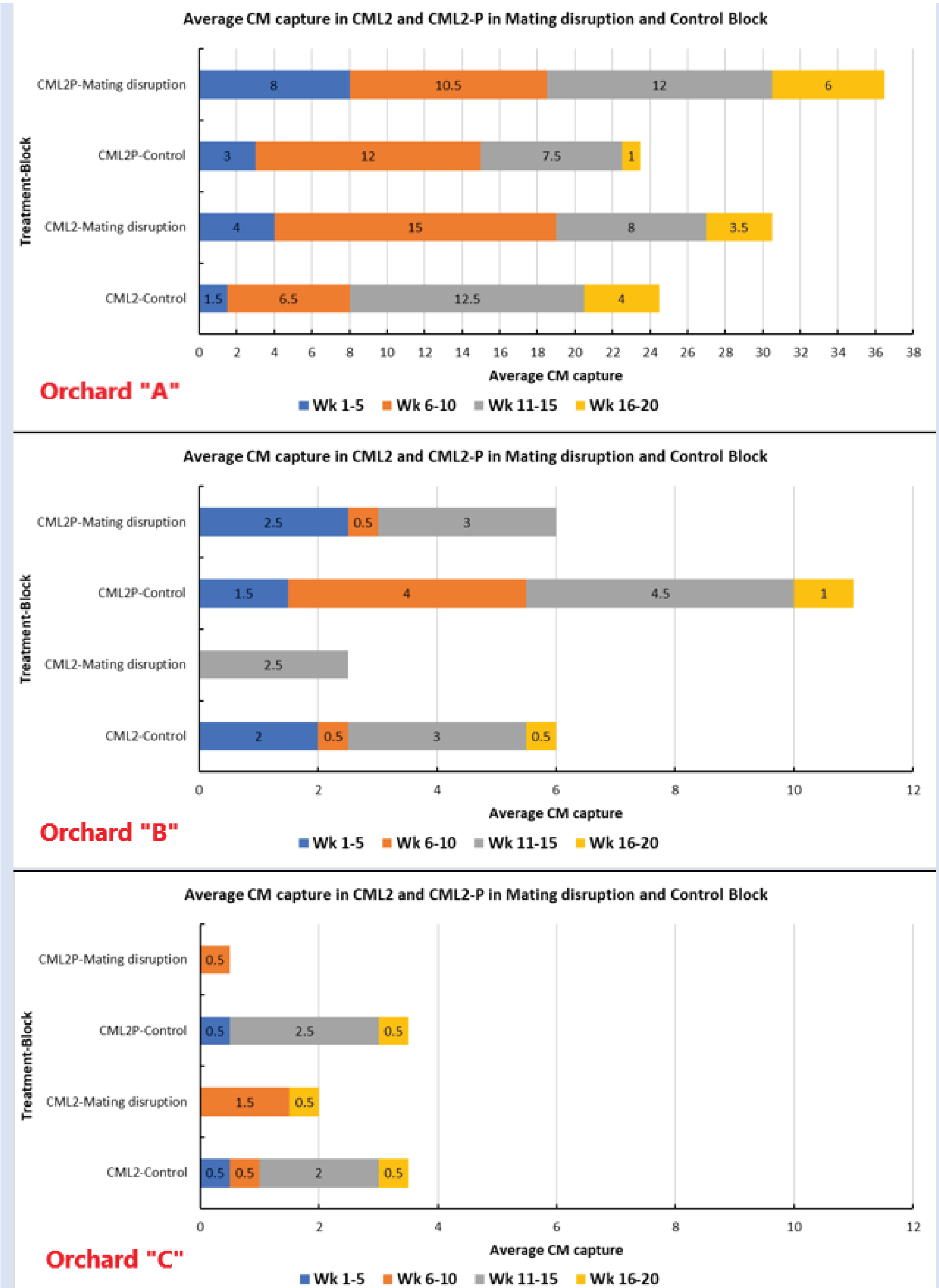


Figure 5. Average number of CM captured in monitoring traps baited with CML2 and CML2-P lures in orchards "A", "B" and "C". The CM season was divided into 4 periods (Weeks 1 -5; weeks 6-10; weeks 11-15; weeks 16-20).

with 49 moths captured in all. Comparatively, the average number of OBLR was higher in the control block compared to the mating disruption block earlier in the season (Figure 4).

In orchard "A", there was 0.1% suspected injury in the mating disruption block and 0.15% suspected injury in the control block. In orchard "B", there was zero injury in the mating disruption block and 0.15% suspected injury in the control block. In orchard "C", there was 0.15% suspected injury in both the mating disruption and the control blocks.

The LR Combo lure used in the experiment was attractive to both sexes of OBLR. Upon dissection, it was found that 40% of the captured female in control block were mated but in mating disruption block none were mated. The monitoring trap that was placed for OBLR also captured redbanded leafroller (RBLR) in substantial numbers. This may be due to the overlap of compounds present in the pheromone lure of both species.

Codling moth (CM): In general, captures of CM in orchard "B" and "C" were higher in the control block than in the mating disruption block (Figure 5A-C). In contrast, CM populations in orchard "A" were higher in the mating disruption block than in the control block (Figure 5A). The likely reason may be higher pest pressure in the mating disruption block of the orchard. In terms of fruit injury, zero injury was CM was recorded in mating disruption and grower standard blocks in all orchards and blocks, except for orchard "A" where we recorded 0.05% fruit injury in the mating disruption block and 0.1% injury in the control block.

Conclusions

Under the conditions of this study involving low moth populations, the Trécé dual mating disruption system marketed as CIDETRAK® CMDA + LR DUAL MESO™ for CM and OBLR seems to be working well as determined by low injury and low moth captures in mating disruption blocks relative to the grower standard (control) blocks. The higher OBLR populations recorded in orchard "B" indicated that the LR combo lure can be used as a lure to monitor both sexes of OBLR.

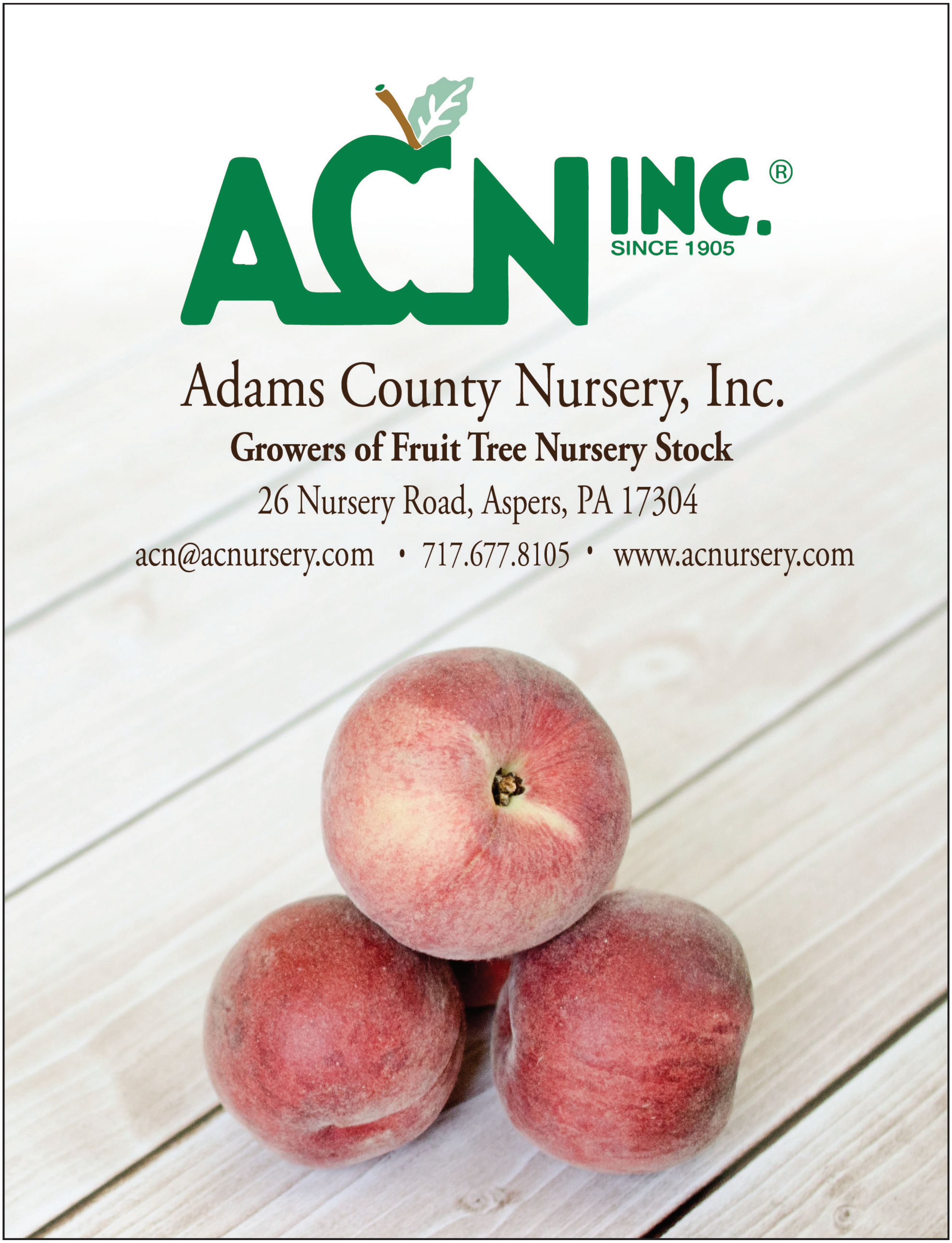
Acknowledgements

We thank Keith Arsenault (Ragged Hill Orchard, West Brookfield, MA) and Albert Rose (Red Apple Farm, Phillipston, MA) for providing us the apple blocks to conduct the experiment. Thanks to Brent short (Trécé Inc., Adair, OK) for providing the mating disruption dispensers, monitoring traps and lures. We express our appreciation to Heriberto Godoy Hernandez, Prabina Regmi, and Dorna Saadat for assistance.

NOURSE
Delivering Quality

High-quality plants.
Exceptional customer service.
It's our mission.
Literally.

NourseFarms.com | 413-665-2658 | info@noursefarms.com


ACN INC.®
SINCE 1905
Adams County Nursery, Inc.
Growers of Fruit Tree Nursery Stock
26 Nursery Road, Aspers, PA 17304
acn@acnursery.com • 717.677.8105 • www.acnursery.com

2021 Periodical Cicada in New Jersey and Pennsylvania

Win Cowgill
Professor Emeritus, Rutgers University, Win Enterprises International, LLC.

Growers across NJ and eastern PA have been inundated with this brood of insects, see the Brood X map for areas affected (Figure 1). Figure 2 shows that eastern US, NY, and western MA are impacted by Brood 11, but not this season (2021).

Danger to Leaders on Newly Planted and Young Trees

The adults cause injury with their thick needle-like ovipositor while laying eggs, not through feeding injury (Photos). The adults oviposit in the leaders and branches causing breakage of one-year-old wood. The most effective insecticidal control is through direct contact of the adults while spraying.

My observations this season are that you need to apply every 2-3 days max. With no residual impact, it is essential to hit the adult females when they are in your trees or on the fly. The best time is when they are active in the daytime, usually morning. As evening approaches, they are less active, especially with cooler temperatures. We want to kill as many as possible at each application.

The adults are large hard-shelled insects and are difficult to kill. Some insecticides knock them down, but they are back up in several hours.

If there is a large population in adjacent woods or trees (hedgerows), the females will repopulate theapple orchard the next day after application and begin laying eggs again. With some materials, like Cavalary (Lambda-cyhalothrin), they seemed to land and shy away for a day, but then are back in full force a day later.

Photo 1. Cicada Damage to apple shoot- Photo credit: G. Krawczyk, Penn State University.

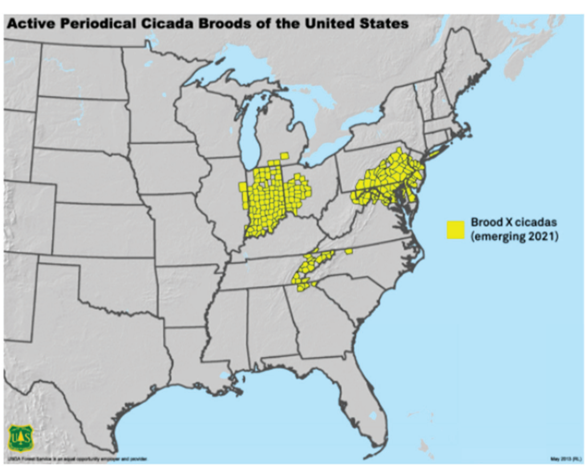


Figure 1. NJ-PA-brood X map. US Forest Service.

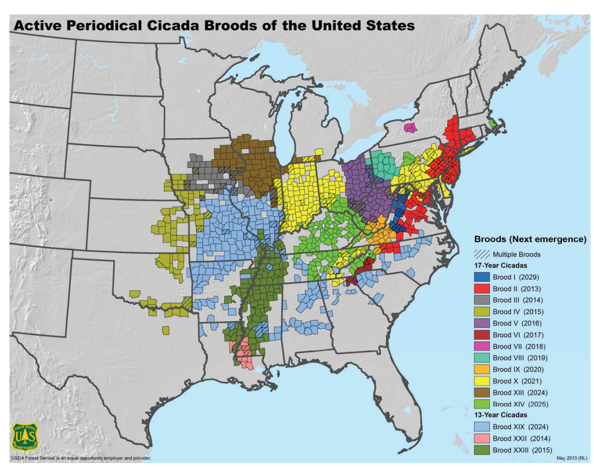


Figure 2. MA and NY have overlapping Broods (Brood 11). US Forest Service.

Photo 2. Cicada on apple shoots. Photo credit Win Cowgill.

Table 1. Pesticide impacts on cicada oviposition, from Chis Bergh, Virginia Tech, 2004.

Treatment	Rate amt form/acre	Mean number of cicada oviposition slits/branch May 27	June 3	June 10	June 17
Actara 25WG	5.5 oz	9.9 a	21.1 a	26.7 a	30.2 abc
Asana XL	14.5 fl oz	1.3 b	2.6 b	3.4 c	3.5 e
Assail 70WP	3.4 oz	2.1 b	15.6 ab	21.9 ab	19.3 bcde
Avaunt 30WG	6.0 oz	9.7 a	21.1 a	31.1 a	38.4 a
AzaDirect 1.20%	1.0 qt	4.6 ab	16.4 ab	27.4 a	34.3 ab
Calypso 480SC	8.0 fl oz	5.1 ab	15.1 ab	21.1 ab	27.1 abcd
Danitol 2.4EC	21.0 fl oz	1.2 b	1.8 b	2.1 c	2.1 e
Lannate LV	3.0 pt	1.4 b	4.9 b	9.3 bc	11.1 de
Warrior 1CS	5.1 fl oz	1.2 b	7.6 ab	11.1 bc	13.3 cde
Untreated check		7.9 ab	21.3 a	28.4 a	32.6 ab

Means within a column followed by the same letter(s) are not significantly different (Fisher's Protected LSD, P > 0.05).

Table 2. Pesticide impacts on cicada damage, from Chis Bergh, Virginia Tech, 2004.

Treatment	Rate amt form/acre	Mean no. flagged shoots/tree (June 24)	Mean no. fallen shoots/tree (June 24)
Actara 25WG	5.5 oz	8.3ab	1.75a
Asana XL	14.5 fl oz	0.3e	0.50ab
Assail 70WP	3.4 oz	3.0cde	0.25ab
Avaunt 30WG	6.0 oz	9.0a	1.75a
AzaDirect 1.20%	1.0 qt	4.8abcd	0.75ab
Calypso 480SC	8.0 fl oz	4.5bcde	0.75ab
Danitol 2.4EC	21.0 fl oz	1.0de	0.0b
Lannate LV	3.0 pt	5.0abcd	0.75ab
Warrior 1CS	5.1 fl oz	4.5bcde	0.50ab
Untreated check		7.3abc	1.25ab

Means within a column followed by the same letter(s) are not significantly different (Fisher's Protected LSD, P > 0.05).

Table 3. Pesticide effects on cicada mortality via bioassay (180 adult cicadas tested in 6 replicates of 30 individuals each, from Biddinger and Hull, 2004).

Treatment	Rate/A in 100 gal water/A	Concentration (ppm)	Av. % Mortality at 48 hours
Actara 25WDG	4 oz	75	58.3 b*
Assail 70WG**	2.5 oz	141	97.8 c
Calypso 4SC	4 fl oz	150	87.8 c
Warrior 1CS**	3 fl oz	28	72.8 b
Water			13.9 a

Pesticides for Cicada Control (sources Cornell, Penn State, Virginia Tech)

Most past work on cicada was done in 2004 by Penn State, Cornell, and Virginia Tech. Thanks to Peter Jenstch for all the telephone guidance on controlling this pest this season.

Lanate (methomyl) and the pyrethroid-class insecticides, including Asana (esfenvalarate), Danitol (fenpropathrin) or Warrior (lambda-cyhalothrin), have proven to be quite effective against the cicada, often providing high mortality on contact.

Of these insecticides, it appears that two of the pyrethroids are capable of maintaining low oviposition damage to trees to reduce limb breakage and fruit loss. In studies conducted by Chris Bergh at Virginia Tech in Winchester, VA, three dilute applications were made at 6–8-day intervals to young trees beginning on May 28. Near the end of the egg-laying season, Asana applied at the high labeled rate of 14.5 oz/A and Danitol applied at 21.0 oz/A provided significantly better ovipositional deterrence to the 17-year cicada. These same two materials, Asana and Danitol, were the best in 2004 in work conducted by Peter Jenstch at Cornell. All materials tested had very little residual control, and so we must depend on knock down of the adults with our strongest hottest materials, it may require a scheduled application every 3-5-7 days, depending on the numbers of insects in your area/orchard (according to Peter Jentsch, Hudson Valley, NY).

If you see cicada, spray with a knock-down pesticide as soon as weather allows. Depending on cicada population and their movement into your orchard blocks, you may have to spray on a 2-3-day schedule. If you have young trees, be more vigilant and spray more often to prevent damage to leaders and new scaffolds. Note each material's label restrictions for frequency of application. Likely, we will have a mite problem with multiple applications of these materials, as we are killing mite predators, Plan on applying an ovacide mite material like Apollo or Savey 50 DF at end of your cicada applications and then keep a close eye on mite eggs and adult populations.

The best information comes from Cornell and Penn State newsletters, both based on data from the last brood and insecticide trials in 2004.

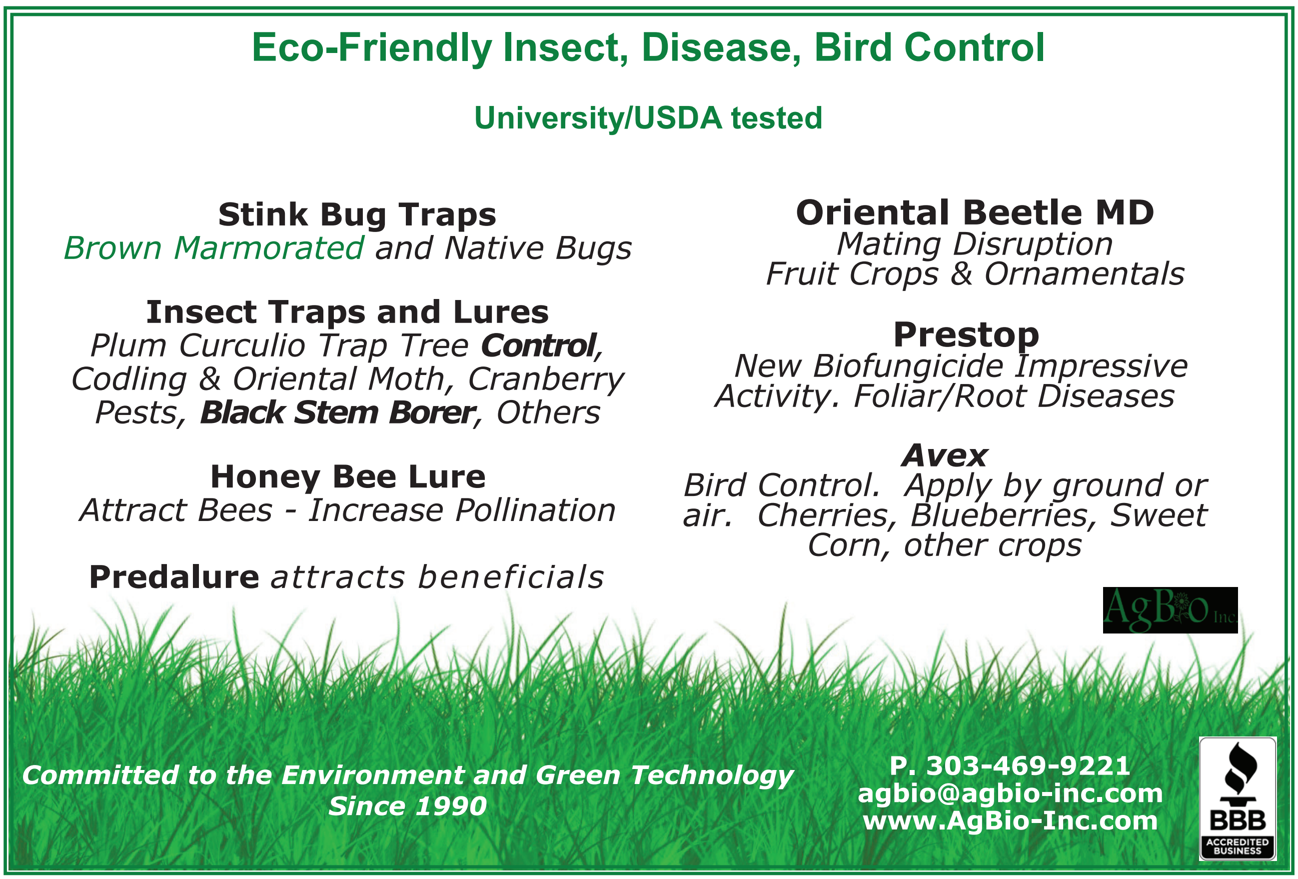
For More Information

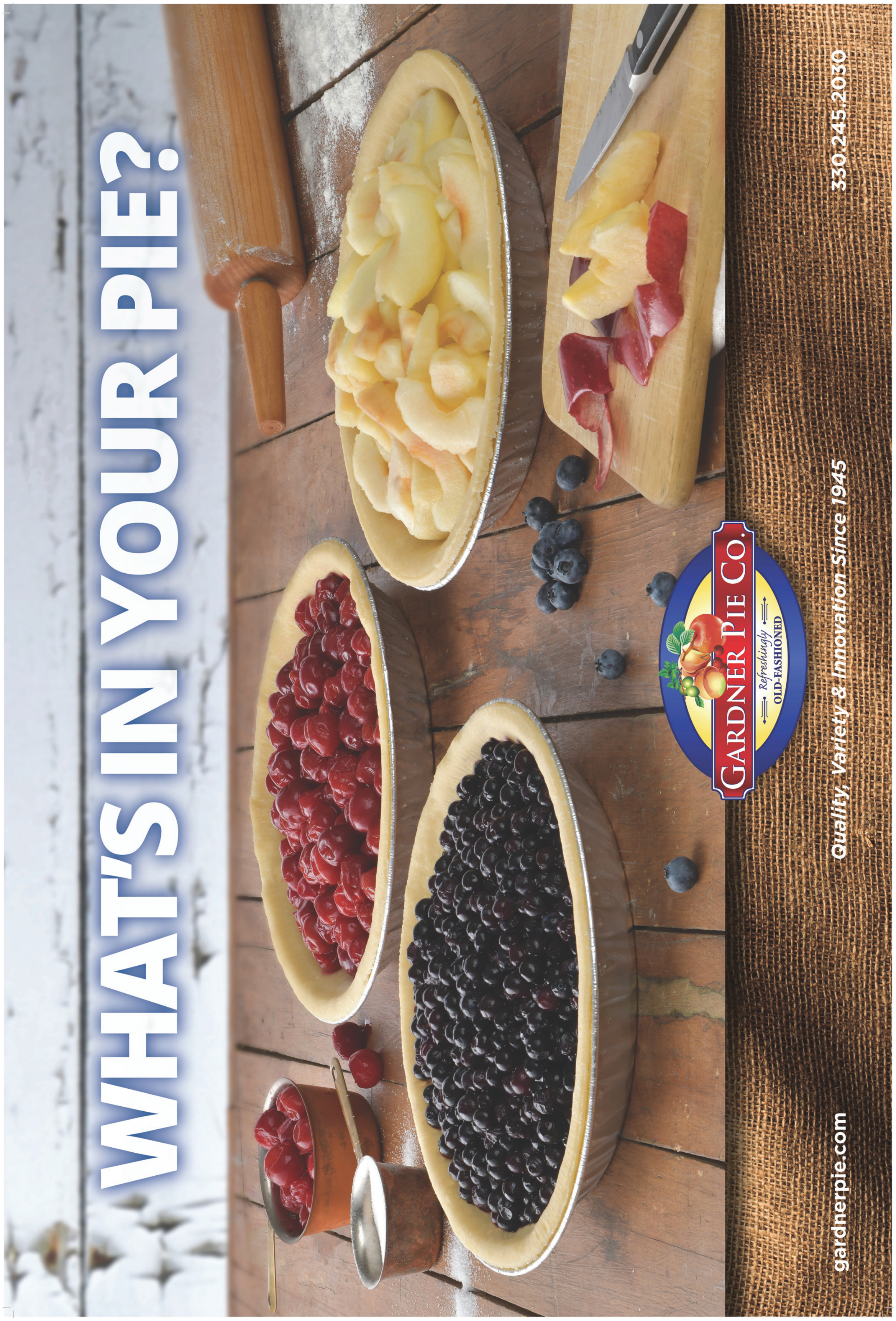
Full reports, maps, and research results are provided at the links listed below.

Resnick, B. 2021. Where billions of cicadas will emerge this spring (and over the next decade), in one map. https://www.vox.com/science-and-health/22362042/cicada-brood-x-map-2021

Jentsch, P. 2013. He's only mostly dead – Managing Brood II of the 17-year cicada in the Hudson Valley, 2013. http://www.scaffolds.entomology.cornell.edu/2013/SCAFFOLDS%206-10-13.pdf

Krawczyk, G. and D Biddinger. 2021. A Blast from the Past: 17-Year Cicada Control in Pennsylvania Apple Orchards, 2021. https://extension.psu.edu/a-blast-from-the-past-17-year-cicada-control-in-pennsylvania-apple-orchards-2021




WHAT'S IN YOUR PIE?
GARDNER PIE CO.
Refreshingly
OLD-FASHIONED
Quality, Variety & Innovation Since 1945
gardnerpie.com
330.245.2030

2020 Update on NC-140 Fuji and Honeycrisp Apple Rootstock Trials in New Jersey

Megan Muehlbauer, Rebecca Magron, and Win Cowgill
Rutgers New Jersey Agricultural Experiment Station, Rutgers University

Over the past 40+ years the NC-140 Regional Rootstock Project has leveraged the support and resources of both Universities and tree fruit experts from around the country to trial novel rootstocks to continue to propel North American tree fruit production into the future. Optimal rootstock choice aids greatly in maximizing vigor, yield, disease and insect resistance for tree fruit orchards. However, environmental factors, diseases and insects change with time. Thus, it is critical to maintain trials to test for these evolving challenges. As well as to establish new trials of rootstocks from breeding programs around the world.

Overview of Trials

The Rutgers Snyder Research and Extension Farm in Pittstown, NJ is currently host to a number of NC-140 trials including the 2014 Fuji and Honeycrisp rootstock trials. The Honeycrisp trial was planted in 2014 at a spacing of 4' x 12' (907 trees per acre), and the Fuji trial is planted at 5' x 13' (672 trees/acre). The trees have been maintained according to commercial standards as described in the New Jersey Tree Fruit Production Guide. Both were planted and trained to the Tall Spindle Production system, the standard for the fresh market apple industry.

The Honeycrisp planting consists of 14 rootstocks (B.10, G.11, G.202, G.214, G.30, G.41, G.935, G.969, M.26 EMLA, M.9 NAKBT337, V.1, V.5, V.6, and V.7). While the Fuji planting consists of only 11 rootstocks (G.11, G.202, G.214, G.30, G.935, M.9 NAKBT337, M.26 EMLA, V.1, V.5, V.6, and V.7).

Data from each planting is collected at harvest. This includes total yield per tree, vigor (as assessed by trunk cross-sectional area, TCA), and number of fruit per tree. These data are used to extrapolate average fruit weight and average yield efficiency for each rootstock.

2020 Growing Season

The 2020 growing season had a rough start in Northern New Jersey. In Mid-March due to Covid, much of the state was shutdown. Rutgers University implemented a hiring freeze that impacted all research at outlying field stations and lead to delays in pruning the NC140 trials. Growers in the Northern Part of the state had 9 different cold and freeze events during our apple bloom period. Luckily, there was little to no damage of the apple crop at the Rutgers Snyder Research Farm in Pittstown, NJ. The remaining season was fairly normal with no notable temperature swings, droughts or floods. Interestingly, very little bitter rot or bitterpit was observed in the trials for the 2020 growing season.

Yield and Vigor for 2020, Honeycrisp

Honeycrisp fruit were harvested on September 14, 2020. Average yields were highest on the V.5 rootstocks (54.6 lb./tree), this rootstock also produced the largest number of fruit per tree (104 fruit/tree). Average yields were found to be the lowest on G.202 (12.8 lb./tree), this rootstock also yielded the lowest number of fruit per tree (20 fruit/tree). The average TCA was highest for V.6 (7.4 in^2), and lowest for G.202 (2.4 in^2). Average yield efficiency was found to be the highest for G.969 (15.8 lb./in^2) followed by G.935 with lowest for G.202 (5.5 lb./in^2) (Table 1). There was no statistical difference in the number of suckers (Table 1).

Yield and Vigor for 2020, Fuji

Fuji fruit were harvested on November 2, 2020. Average yields were highest on V.6 rootstocks (71.2 lb./tree); however, the greatest number of apples were found on G.30 rootstocks (123 fruit/tree). G.214 were the lowest yielding rootstocks (26.8 lb./tree), and also had the lowest number of fruit per tree (43 fruit/tree). The average TCA was highest for V.6 (8.9 in^2), and lowest for G.202 (4.8 in^2). The highest average yield efficiency was found to be G.30 (9.7 lbs/in^2) and the lowest on M.26 EMLA (5.7 lbs/in^2). This was similar to the 2019 growing season where the highest yield

Table 1. Yield and tree vigor data for 14 rootstocks included in the 2014 NC-140 Honeycrisp Rootstock Trial located at the Snyder Research and Extension Farm in Pittstown, NJ.

Rootstock	Trunk cross-sectional area (in²)	Yield (no. fruit/tree)	Fruit weight (oz)	Root suckers (no./tree)	Yield (lbs/tree)	Yield efficiency (lbs/in²)
G.202	2.4 e	20 b	10.9 a	0 a	12.8 c	5.5 b
G.11	2.5 e	28 b	13.0 a	0 a	18.1 bc	7.9 ab
B.10	3.1 de	29 b	9.4 a	0 a	16.9 bc	5.7 b
G.41	3.2 de	36 b	9.6 a	0 a	22.5 abc	7.1 ab
G.214	3.3 de	58 ab	9.3 a	1 a	31.2 abc	9.6 ab
M.9 NAKBT337	3.4 de	51 b	9.4 a	2 a	27.8 abc	8.7 ab
G.935	3.6 de	82 ab	9.3 a	4 a	43.1 abc	12.0 ab
M.26 EMLA	4.1 cde	43 b	11.8 a	7 a	24.6 abc	6.5 b
G.969	4.6 cde	146 a	7.2 a	4 a	63.5 a	15.8 a
G.30	5.5 bc	52 b	10.6 a	4 a	31.5 abc	7.1 ab
V.1	6.0 ab	70 ab	9.9 a	3 a	41.8 abc	7.0 ab
V.7	6.1 ab	97 ab	8.2 a	1 a	49.6 abc	8.8 ab
V.5	6.3 ab	104 ab	9.4 a	0 a	58.5 ab	9.4 ab
V.6	7.4 a	80 ab	11.2 a	0 a	54.6 abc	7.0 ab

Means not followed by a common letter are different at odds of 20:1 (Tukey's HSD, *P*=0.05).

Table 2. Yield and tree vigor data for 11 rootstocks included in the 2014 NC-140 Fuji Rootstock Trial located at the Snyder Research and Extension Farm in Pittstown, NJ.

Rootstock	Trunk cross-sectional area (in²)	Yield (no. fruit/tree)	Fruit weight (oz)	Root suckers (no./tree)	Yield (lbs/tree)	Yield efficiency (lbs/in²)
G.202	4.8 b	59 a	9.1 a	1 a	32.7 a	7.5 a
G.214	5.5 b	43 a	9.9 a	0 a	26.8 a	5.9 a
G.11	5.6 ab	76 a	9.7 a	0 a	45.4 a	8.3 a
G.935	5.8 ab	69 a	9.8 a	0 a	38.9 a	6.6 a
M.9 NAKBT337	5.9 ab	62 a	9.1 a	1 a	34.9 a	6.0 a
M.26 EMLA	7.3 ab	58 a	10.1 a	1 a	34.4 a	5.7 a
V.1	7.5 ab	87 a	8.6 a	0 a	45.6 a	6.0 a
G.30	7.7 ab	123 a	8.5 a	1 a	66.5 a	9.7 a
V.5	8.7 a	69 a	9.1 a	0 a	38.9 a	5.0 a
V.7	8.9 a	114 a	9.0 a	0 a	61.4 a	7.0 a
V.6	8.9 a	122 a	9.6 a	1 a	71.2 a	8.0 a

Means not followed by a common letter are different at odds of 20:1 (Tukey's HSD, *P*=0.05).

efficiency was also found to be G.30, although the lowest was found to be M.9 NAKBT337 (Muehlbauer et al. 2020). All rootstocks produced fewer than 2 root suckers per tree, and there was no statistical difference in the number of suckers by rootstock (Table 2).

Average fruit weight, average yield per tree, and average yield efficiency were not significantly different among rootstocks.

Comparison of Honeycrisp and Fuji

In comparing the Fuji and Honeycrisp yields (Figure 1), they differed in which rootstock produced the greatest yields (Fuji/V.7 and Honeycrisp/V.6). Interestingly, in 2019, both Fuji and Honeycrisp produced their greatest yields on V.7 (Muehlbauer et al. 2020). Similarly, in 2020, they differed on the root-

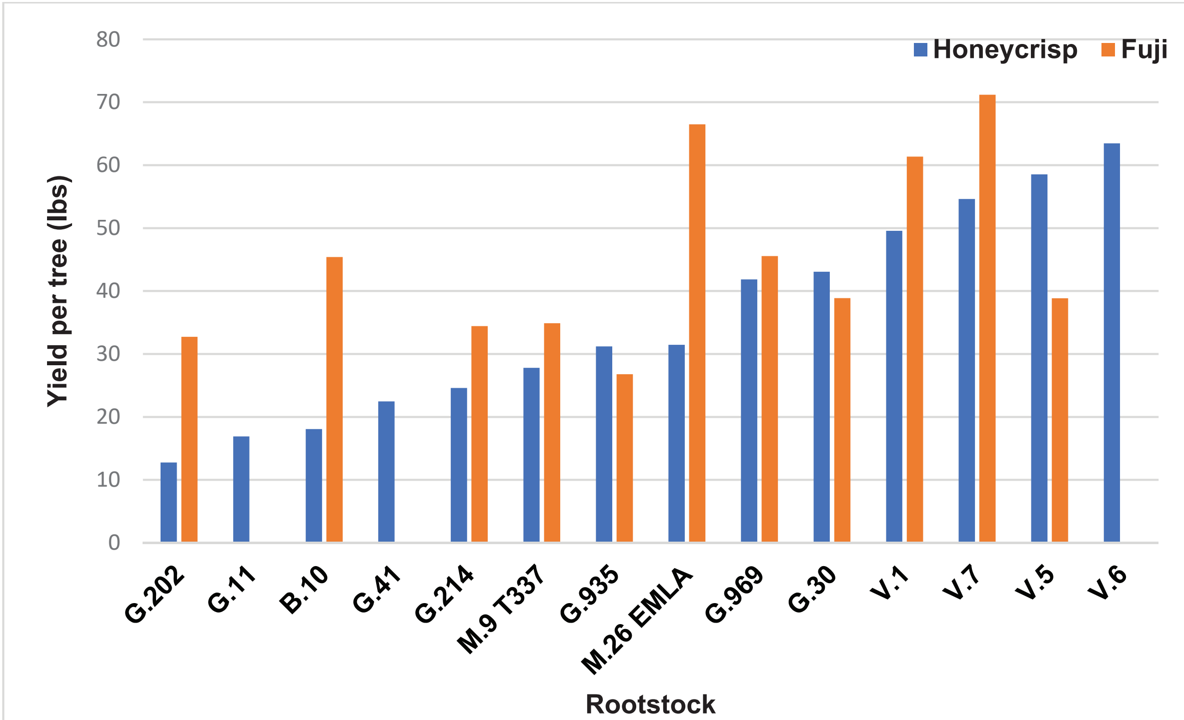


Figure 1. Yield per tree in 2020 for Honeycrisp and Fuji trees in the 2014 NC-140 Apple Rootstock Trials at the Rutgers Snyder Research and Extension Farm, Pittstown, NJ.

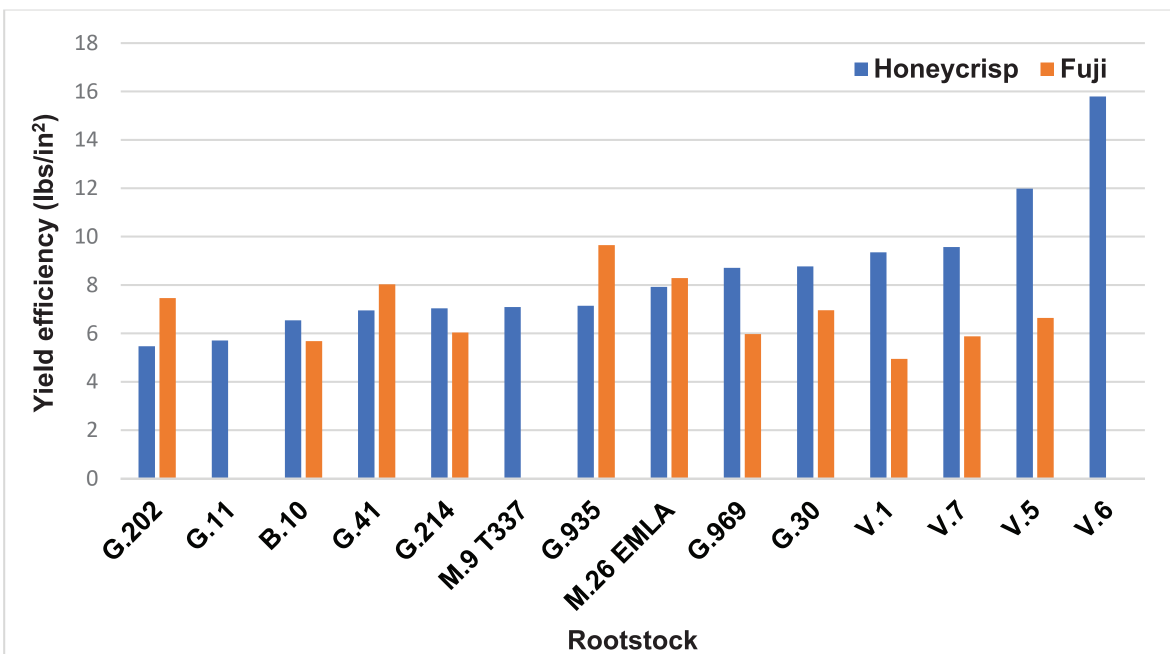


Figure 2. Yield efficiency (yield/TCA) in 2020 for Honeycrisp and Fuji 2014 NC-140 Apple Rootstock Tria at the Rutgers Snyder Research and Extension Farm, Pittstown, NJ.

stock that produced the lowest yields (Fuji/G.935 and Honeycrisp/G.202). However, again in 2019, both Fuji and Honeycrisp produced their lowest yields on G 202 (Figure 1) (Muehlbauer et al. 2020).

In comparing Honeycrisp and Fuji yield efficiency (Figure 2), the rootstock with the highest yield efficiency for Fuji and Honeycrisp differed (Fuji/V.6 and Honeycrisp/G.969). This differed from the 2019 growing season where Fuji had the highest yield efficiency on G.30, although it was followed closely by V.6, and Honeycrisp/M.9 NAKBT337 were the most efficient. The lowest yield efficiency also different between Fuji and Honeycrisp, Fuji/M.26 EMLA and Honeycrisp/G.202 for the 2020 growing season. This differed slightly from 2019 where the lowest yield efficiencies were found on Fuji/M.9 NAKBT337 and Honeycrisp/G.41. (Muehlbauer et al. 2020)

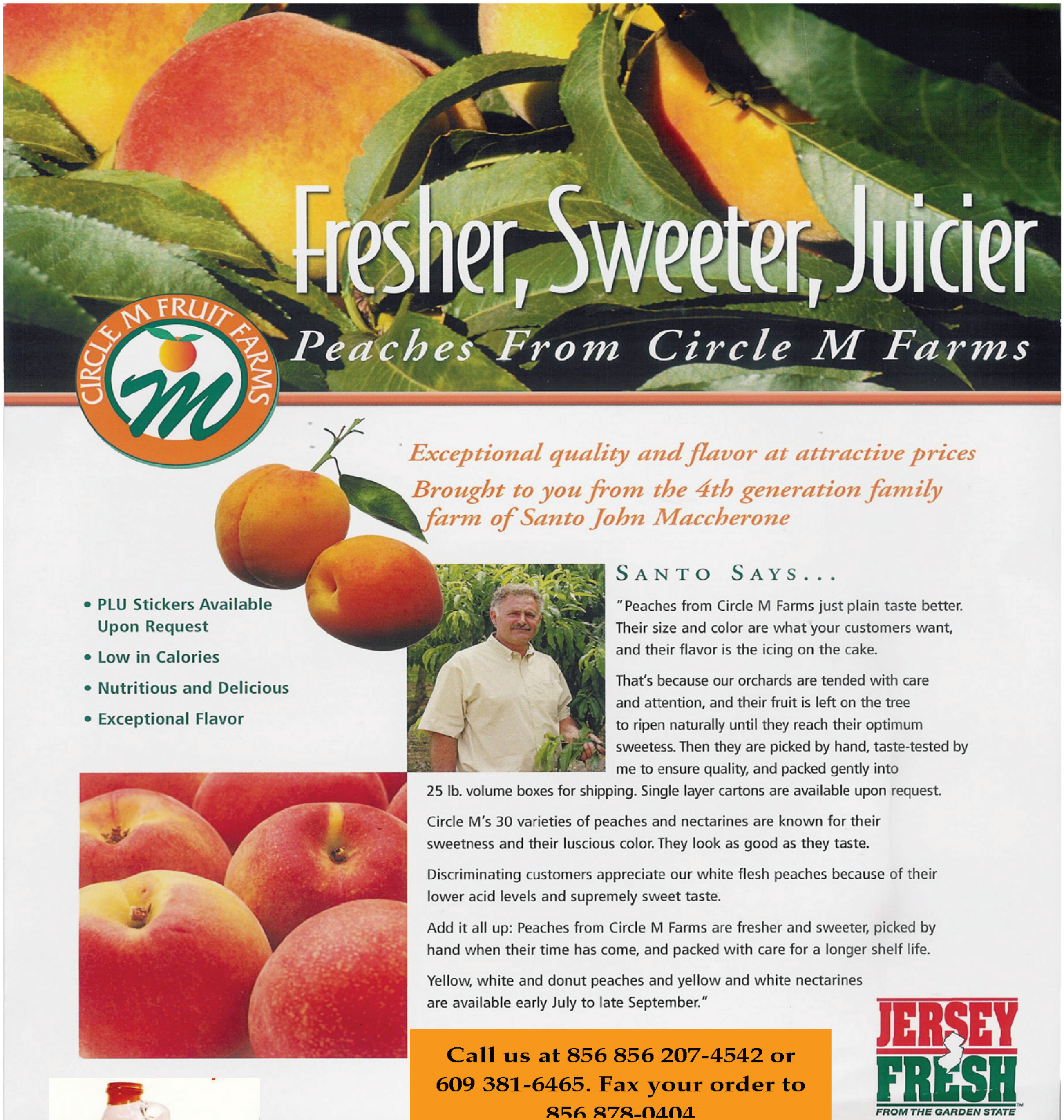
Conclusions

The Vineland (V.1, V.5, V.6, and V.7) series rootstocks we tested and M.26 EMLA, G.30 continue to show significant vigor in both the 2014 Fuji and Honeycrisp NC-140 rootstock trials. In particular, V.6 had the greatest TCA for both Fuji and Honeycrisp scions. The Vineland rootstocks tested with Fuji were too vigorous for a tall spindle system. None of the Vineland rootstocks, M.26 EMLA, or G. 30 look good in tall spindle with Fuji. Establishing this trial at 3' x 12' instead of 5' x 13' would have increased competition between trees and may have improved performance in a tall spindle system. However, at the established 5' x 13'spacing, the average fruit weight, average yield per tree, and average yield efficiency was not significantly different among rootstocks, and none were stellar performers.

Note that G.30 is a rootstock that has been evaluated in numerous NC-140 and other rootstock trials over the years. It fell out of favor with our US nurserymen as it is hard to propagate so there are very few stoolbeds of G.30 and therefore limited production.

The biggest conclusion from the NC-140 2014 Honeycrisp Trial is that G.969 and G.935 significantly outperformed the other stocks in yield efficiency and should be considered as rootstocks for Honeycrisp planted in a tall spindle system at 3' x 12' spacing.


STS
SUMMIT TREE SALES, INC.
REPRESENTING THE COUNTRY'S FINEST NURSERIES
Your One-Stop Source
For Commercial Fruit Trees
• New varieties
• Reliable rootstocks
• Top quality nursery trees
• Decades of industry knowledge
Dawn Melvin
Matthew Schuld
Your time is valuable,
make Summit your first call!
800.424.2765
www.summittreesales.com • Like us on Facebook



Made from fresh New Jersey Peaches
"Peach Cider Drink, Peach Salsa, Peach Preserves"
Santo John Maccherone
circlemfarmsllc@gmail.com
Circle M Farms
88 Sandy Ridge Road
Salem, N.J. 08079

Fruit Notes

University of Massachusetts Amherst
Stockbridge School of Agriculture
205 Paige Laboratory
Amherst, MA 01003-9286