Fruit Notes

Volume 89 Number 3, Summer 2024

Fruit Notes

Editors: Jaime C. Piñero & 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 electronic subscription is $35.** Each 1-year subscription begins January 1 and ends December 31. 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: https://extensionsalesportal-umass.nbsstore.net/fruit-notes-electronic-subscription Correspondence should be sent to: Fruit Notes, Stockbridge School of Agriculture, 207 Fernald Hall, University of Massachusetts Amherst, MA 01003.

Table of Contents

Cover: Minneiska cv. 2-D canopy apples at Zingler Farms, Murray (Snowbelt), New York, August 13, 2024. Minneiska cv. to be sold as SweeTango by Lake Ontario Fruit Company. Minneiska cv. comes off patent in late 2026 and will be available to anyone grown and sold as 'Minneiska.' Photo by Jon Clements

Effectiveness of MAGISTER® SC miticide in controlling European Red and Two-Spotted Spider Mites and its Impact on Predatory Mites

Jaime C. Piñero, Tyler Bonin, Heriberto Godoy-Hernandez
Stockbridge School of Agriculture, University of Massachusetts Amherst

In apple production, controlling arthropod pests like the European red mite *(Panonychus ulmi*) and the two-spotted spider mite (*Tetranychus urticae*) is vital for high-quality yields. Originating from Europe and the Middle East respectively, these mites are notorious for causing significant damage to apple orchards. The European red mite (ERM) can lead to severe defoliation, particularly in cooler climates. The two-spotted spider mite (TSSM), found across Europe, Asia, and North America, is highly resistant to many miticides and can rapidly reproduce in a multitude of crops.

The New England Tree Fruit Management Guide lists 15 materials that can be applied against European red mite throughout the summer. One of those materials is Magister® SC (active ingredient: Fenazaquin; IRAC group 21A acaricide and group 39 fungicide**).** Magister® SC is a miticide that, according to the label, can be used to control spider mites, broad mites, flat mites, Eriophyid mites, psyllids, whiteflies, and powdery mildew on a variety of crops. According to the manufacturer "*Magister SC is a suspension concentrate that works by contact to kill mites and some insects. It can control eggs by contact and immature and adult mites by both contact and ingestion. It also has fungicidal activity. Magister SC is active at both low and high temperatures and has a residual effect, but is soft on beneficial insects*".

Here, we sought to assess the efficacy of Magister® SC at controlling European red mites and two-spotted spider mites in two blocks of a commercial apple orchard with high populations of both mite species. We also assessed the impact of Magister® SC on beneficial arthropods.

Materials and Methods

This field study was conducted between July 3 and August 16, 2024, at C.N. Smith Farm in East Bridgewater, Massachusetts. Two apple blocks were selected for investigation: the 'Trellis' block (~3.5 acres) and the 'Honeycrisp' block (~1.9 acres). The 'Trellis' block comprised G.41 and G.11 rootstocks of various cultivars, including Gala, Honeycrisp, Ambrosia, Crimson Crisp, Ludacrisp, and Evercrisp. The 'Honeycrisp' block consisted entirely of M.26 rootstock, with Honeycrisp standard trees. Sampling occurred once before the application of Magister® SC miticide and three times afterward to evaluate the impact on pest mite and mite predator populations.

Miticide Application. Magister® SC (Gowan, Co.), a foliar miticide from the quinazoline chemical class, was applied to both blocks on July 13, 2024, at a rate of 32 oz/acre across all rows.

Foliage Sampling. Leaf samples were collected on four dates: July 3 (pre-spray), July 17 (1st post-spray), August 2 (2nd post-spray), and August 16 (3rd post-spray). On each sampling date, 25 leaves were collected per row, with 5 leaves taken from 5 evenly distributed trees within each row. From each tree, two fully developed leaves were selected from the lower canopy, two from the middle canopy, and one from the upper canopy. The sampling procedure ensured a representative distribution across different tree heights. The details of each sampling are as follows:

- **July 3 (pre-spray):** 6 rows from the 'Honeycrisp' block (rows 1, 3, 5, 7, 9, 11) and 13 rows from the 'Trellis' block (rows 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25).

- **July 17 (1st post-spray):** 4 rows from the 'Honeycrisp' block (rows 1, 5, 9, 12) and 6 rows from the 'Trellis' block (rows 1, 5, 9, 13, 17, 21).

- **August 2 (2nd post-spray):** 3 rows from the 'Honeycrisp' block (rows 3, 7, 11) and 6 rows from the 'Trellis' block (rows 3, 7, 11, 15, 19, 23)

- **August 16 (3rd post-spray):** 2 rows from the 'Honeycrisp' block (rows 1, 7) and 4 rows from the 'Trellis' block (rows 1, 7, 13, 19).

Leaf samples from each row were examined under a stereomicroscope. A 3.5 cm diameter circle was drawn on the underside of each leaf, and within this circle, mite eggs, nymphs, and adults of European red mite (ERM) and two-spotted spider mite (TSSM), as well as predatory mites and other natural enemies (e.g., lacewings), were counted.

Results

Apple cultivars differ in their susceptibility to mites, which is crucial for effective pest monitoring. In the mixed-cultivar 'Trellis' block, Magister® SC demonstrated consistent efficacy in controlling pest mites across all cultivars, so we present the results for the entire plot.

Pest Mite Populations. On July 3, prior to the miticide application, pest mite densities (adult and nymph motiles) were high: 13.7 per leaf in the 'Honeycrisp' block and 18.95 in the 'Trellis' block (Table 1), exceeding the action threshold of 5 mites per leaf for July, as per the New England Tree Fruit Management Guide. For ERM nymphs and adults, densities in the 'Honeycrisp' block were nearly 2.5 times higher than those of TSSM, whereas in the 'Trellis' block the reverse was observed, with TSSM densities exceeding ERM by 1.92 to 1.6 times (Table 1). The 'Trellis' block is comprised of at least 6 cultivars, so whole-block results are being presented.

The first post-application sampling (July 19) showed a significant reduction in pest mites: 60.9% in the 'Honeycrisp' block and 79.2% in the 'Trellis' block for mite eggs (Table 2). ERM nymphs and adults saw an 81.4% and 92% reduction, respectively, while TSSM nymphs and adults experienced 67.1% and 82.3% reductions in the 'Trellis' block. However, in the 'Honeycrisp' block, the reductions were less pronounced, with a 26.1% decrease for TSSM nymphs. By August 2, TSSM populations rebounded in the 'Honeycrisp' block, while reductions continued in the 'Trellis' block.
The relative differences in efficacy between the two blocks can be attributed to better spray coverage in the 'Trellis' block, where the G.41 and G.11 rootstocks allowed for more open canopies, compared to the denser foliage in the M.26 'Honeycrisp' block, which likely impeded coverage.

Table 1. Densities (mean number found per leaf) of European Red mite (ERM) and two-spotted spider mite (TSSM) eggs (both species combined), nymphs, and adults before (3 July sampling) and after the spray of Magister® SC. The densities of predatory mites and predatory lacewings (eggs and larvae combined) are also shown. Motiles refer to the combined adult and nymph stages of mites that are capable of movement.

TRELLIS block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings	MOTILES (number/leaf)
3-Jul	21.6	4.29	8.2	2.5	3.96	0.05	0.01	18.95
19-Jul	4.5	0.8	2.7	0.2	0.7	0	0.1	4.4
2-Aug	1.08	0.04	0.68	0.02	0.11	0.09	0.02	0.85
16-Aug	2.54	0.14	1.12	0.05	0.3	0.8	0	1.61

HONEYCRISP block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings	MOTILES (number/leaf)
3-Jul	18.59	6.03	2.41	3.77	1.46	0.04	0.01	13.67
19-Jul	7.26	1.7	1.78	0.43	0.58	0	0.03	4.49
2-Aug	17.03	1.17	4.89	0.21	0.48	0.4	0.04	6.75
16-Aug	10.32	0.66	2.18	0.06	0.64	0.68	0	3.54

Figure 1. From left to right: View of a lacewing egg (note the silken stalk which is attached to plants), two lacewing larvae, and a predatory mite (*Amblyseius* sp.).

Table 2. For the 'Trellis' and 'Honeycrisp' blocks, percentage change in pest and predatory mite and lacewing populations compared to those recorded on 3 July (pre-spray of Magister® SC). A positive percentage indicates a reduction in the number of mites and lacewings, while a negative percentage (highlighted in green boxes) reflects an increase in their population.

TRELLIS block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings
19-Jul	79.2	81.4	67.1	92.0	82.3	100.0	-900.0
2-Aug	95.0	99.1	91.7	99.2	97.2	-80.0	-100.0
16-Aug	88.2	96.7	86.3	98.0	92.4	-1500.0	100.0

HONEYCRISP block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings
19-Jul	60.9	71.8	26.1	88.6	60.3	100.0	-200.0
2-Aug	8.4	80.6	-102.9	94.4	67.1	-900.0	-300.0
16-Aug	44.5	89.1	9.5	98.4	56.2	-1600.0	100.0

Natural Enemy Populations. The primary predators observed included lacewing eggs and larvae and predatory mites from the *Neoseiulus* (*Amblyseius*) genus (Figure 1). In the pre-application sampling, predatory arthropods were nearly absent. Post-spray, predatory mite numbers decreased, whereas lacewing numbers were unaffected by the miticide. Over time, predatory mite populations gradually increased, peaking by mid-August (Table 2).

Table 3 shows the pest-to-predator ratios. Before the spray, the ratio was 379:1 and 342:1 for the 'Trellis' and 'Honeycrisp' blocks, respectively. With such a ratio of pest-to-predators, it would have been impossible to rely on predatory arthropods for mite control.

Table 3. Ratio of pest mite motiles (European red mite and two-spotted spider mites combined) to predatory mites.

Sampling date	Trellis block	Honeycrisp block
3 July	379.0	341.8
19 July	All predatory mites were killed	
2 August	9.4	16.9
16 August	2.0	5.2

While the spray of Magister® SC killed predatory mites, by August 2 predator numbers were bouncing back. By August 16, these ratios had improved to 2:1 and 5.2:1, indicating a favorable balance between pest mites and their predators. The recommended ratio is 10 pest mites per predator (New England Tree Fruit Management Guide).

Conclusions

A single mid-July application of Magister® SC effectively reduced pest mite populations in two orchard blocks facing high densities of European red mites and two-spotted spider mites. While predatory mites were initially impacted by the spray, their numbers rebounded and peaked by mid-August, achieving a beneficial ratio of 2 and 5 pest mites per predatory mite—well within the recommended threshold for effective biological control. This suggests that the treatment provided adequate control of pest mite populations while allowing predatory mites to recover.

Acknowledgements

We thank Chris Smith for allowing us to conduct on-farm research at C.N. Smith farm. This work was funded in part by the Massachusetts Fruit Growers Association.

Tyler is pursuing a bachelor's degree with Individualized Concentration and Heriberto is a Ph.D. student in the Plant and Soil Science at the University of Massachusetts Amherst.

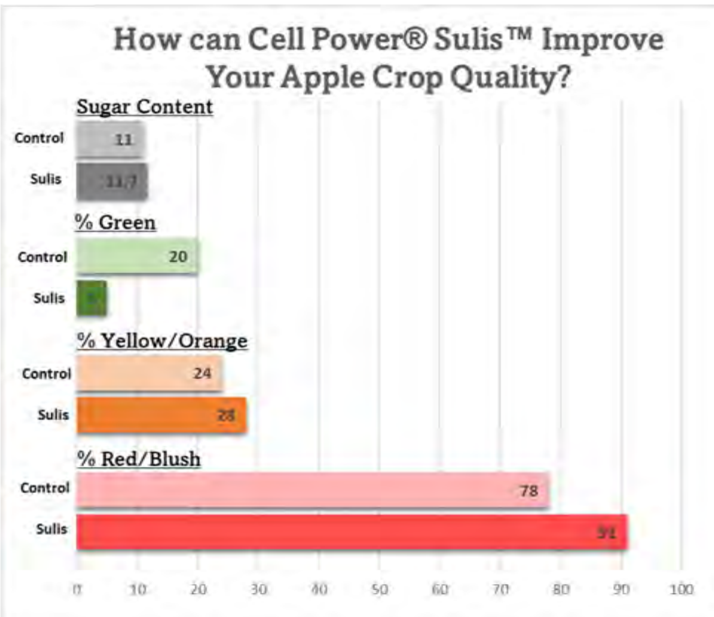
OMEX® Cell Power® Sulis® Increases Brix, Color, and Storability

Molybdenum is essential for the production of abscisic acid (ABA). "This is one of two plant hormones associated with fruit maturity," explains British Researchers, who have been researching the important role of molybdenum in crops.

"We can force the plant **to use Molybdenum more quickly, producing high levels of ABA, with Cell Power® Sulis® technology**. We're giving the plant the resource to do what it needs to do, more efficiently.

With **Sulis®** this product also includes specific cell wall protectants, helping maintain the integrity of cell walls. These counter ethylene, enhancing the ABA effect and **preventing softening of the fruit**. The further inclusion of **boron doubles down on sugar production**.

To stimulate color and brix ahead of harvest, apply **Sulis®** as soon as fruit starts maturation, repeating the application at 7-10 day intervals.



2024 Jon Clements Featured Speaker at the New Jersey State Horticultural Society Summer Meeting and Orchard Tour

Win Cowgill
Professor Emeritus Rutgers University
Win Enterprises International, LLC

Jon Clements
Extension Educator, University of Massachusetts Amherst

Wightman Farms, Morris County NJ and owner Adam Costello welcomed the New Jersey State Horticulture Society and other farmers on a summer educational meeting and research tour for commercial fruit growers and industry representatives on June 27, 2024. Twenty five growers participated on a beautiful sunny early summer day, sponsored by the [New Jersey State Horticultural Society.]

Wightman Farms owner Adam Costello led a farm tour/ wagon ride of the orchard. Win Cowgill, Jon Clements and Adam provided demos and instruction of growing tall spindle apples, summer pruning apples, precision apple crop load management, and peach and cherry culture. Jon Clements, Extension Educator, University of Massachusetts was the featured guest speaker. Jon demonstrated and spoke on using a drone and ATV-mounted camera for precision apple crop load management and yield maps. Using Outfield (outfield.xyz) and Vivid Machines (vivid-machines.com) for the drone and ATV-mounted camera respectively, he showed how multiple programs — such as blossom and fruit variability "heat" maps — can be used for better precision apple crop load management using plant growth regulators for thinning thereby improving profitable yield and return bloom. The link below highlights the handout Jon provided on the new Outfield technology.

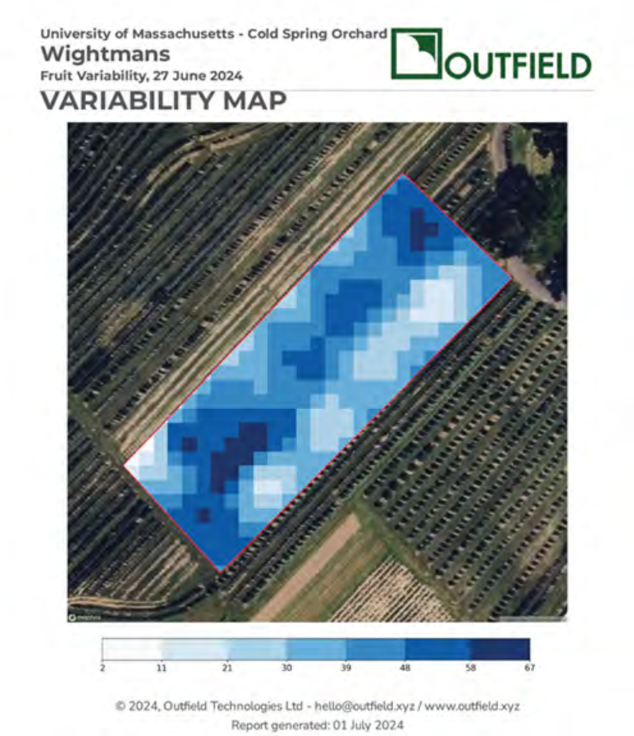
Jon Clements, Extension Educator, University of Massachusetts was the featured guest speaker.

Jon demonstrated and spoke on using Outfield drones/ Vivid Machines- for apple crop load management and yield maps. Jon will also review multiple programs for better predicting crop load management for better precision with plant growth regulators for improved yields and return bloom.

The link below highlights the handout Jon provided on the new Outfield technology.

[Precision Apple Cropload MANagement (PACMAN)](#)- Link to the Precision MGT handout from the event.

Jon demos the drone flyover of one of Wightman's apple locks which resulted in the fruit variability map - Photo: Win Cowgill.



Outfield fruit variability map produced post-flyover

Outfield Drone- Photo Jon Clements

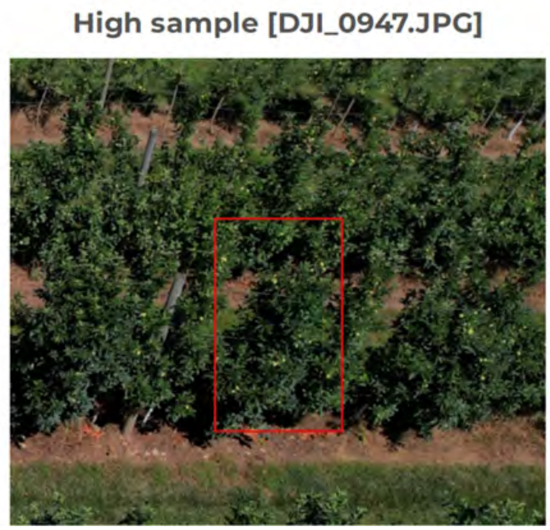
DJI drone controller with flyover map displayed on the iPhone - Photo: Win Cowgill

Wightman Farms aerial view - Photo: Wightman Farms

Vivid Machines (vivid-machines.com) camera mounted on the hood of the Kubota ATV.

From left to Right- Adam Costello, Jamie Bourgeois, Kary Broadhecker, Tim VonThun, Tor Andersen

Example of High sample apple tree as seen but the Outfield drone flyover



Wightmans Drone View of High Crop Load Trees

Harvesting Hope: Addressing Food Insecurity and Agricultural Waste Through Gleaning in Massachusetts

Michael Hannigan[1], Mateo Rull-Garza[2], Jaime C. Piñero[2]
[1]Farm and Food Systems Program, Greenfield Community College
[2]Stockbridge School of Agriculture, University of Massachusetts Amherst

About 30% of crops in the U.S. are never harvested, leading to significant food waste. This results in financial losses for farmers, higher consumer prices, and wasted resources like water and energy. Food loss happens at multiple levels, including on farms due to labor shortages or imperfections, during transportation due to damage, and at the consumer level due to over-purchasing or rejecting imperfect produce. The unrealistic standards for fruit and vegetable appearance mean that many blemished but edible crops go to waste, even though people with limited access to healthy food may be more willing to accept them. Addressing waste at all stages is crucial for improving resource use and food security.

Food insecurity is linked to economic instability and systemic inequalities, affecting marginalized communities disproportionately. Many families facing food insecurity buy cheap, processed foods, which can lead to health problems like obesity. The high cost of fresh produce, often driven by inefficiencies and waste in the supply chain, limits access to healthier options. Reducing food waste could help make nutritious food more affordable and improve public health.

Gleaning as a Solution to Food Waste and Insecurity. Gleaning, where volunteers collect leftover crops after commercial harvests, is an effective but underutilized strategy to reduce food waste and combat food insecurity. The practice has a long history and remains a valuable way to redirect surplus food to those in need. However, in the U.S., large-scale farming, logistical challenges, and liability concerns limit its use. Massachusetts-based organizations like the Boston Area Gleaners have made significant progress, salvaging hundreds of thousands of pounds of food, but more needs to be done to promote and expand gleaning efforts.

The Role of Tax Incentives and Liability Protections. Farmers can benefit from federal tax deductions for donating food, but many don't use these incentives due to low awareness or the complexity of the process. Simplifying tax policies and educating farmers could encourage more participation. Liability concerns also deter some farmers, despite existing legal protections for food donors. Additional state-level protections, such as those proposed in Massachusetts, could further ease concerns and increase participation in gleaning programs.

To address these issues effectively, this research surveyed a large group of Massachusetts fruit growers, mostly apple growers, Apples are one of the most widely grown fruits in the state, and their production presents unique opportunities and challenges for gleaning. Apple orchards often need help with labor shortages, market fluctuations, and strict aesthetic standards, leading to significant portions of the harvest being left unpicked. With our research, we sought to determine (1) the number of apple growers participating in gleaning programs, (2) the number of apple growers using or aware of federal tax and liability protection policies, and (3) whether a tax credit in Massachusetts would encourage apple growers to participate in gleaning programs.

Materials and Methods

To explore the barriers farmers face in participating in gleaning programs and evaluate the effectiveness of proposed tax incentives and liability protections for food donations, we employed a mixed-methods approach that included quantitative data collection through a survey, qualitative research through interviews, and experiential learning through participation in gleaning activities.

We distributed an eleven-question survey at the Massachusetts Fruit Growers' Association 2024 annual meeting held on July 10th, 2024, at the UMass Cold Spring Orchard (Belchertown, MA). The survey was designed to assess farmers' attitudes, concerns, and potential barriers and motivators regarding participation in gleaning programs using a combination of multiple-choice and quantitative scale questions. The survey consisted of 10 multiple-choice and quantitative scale questions.

The survey was distributed at the 2024 Massachusetts Fruit Growers Association meeting at Cold Spring Orchard, with over 100 fruit growers represented. Of the 25 apple growers who completed the survey, 91% were male, and 54.5% were in their 60s and 70s. Most growers had farms between 30 and 96 acres.

Results

Participation in gleaning programs was notable, with 64% having participated at least once (Figure 1).

Figure 1. Percentage of Massachusetts fruit growers who have participated in gleaning at least once. Data indicates that the majority (64%) of growers surveyed have participated in gleaning.

However, awareness and use of federal tax incentives were low, as 76.5% of respondents were either unaware of or had not used the incentive (Figure 2A). Regarding state tax incentives, 64% indicated these would motivate them to participate in gleaning, while 28% wanted more information (Figure 2B).

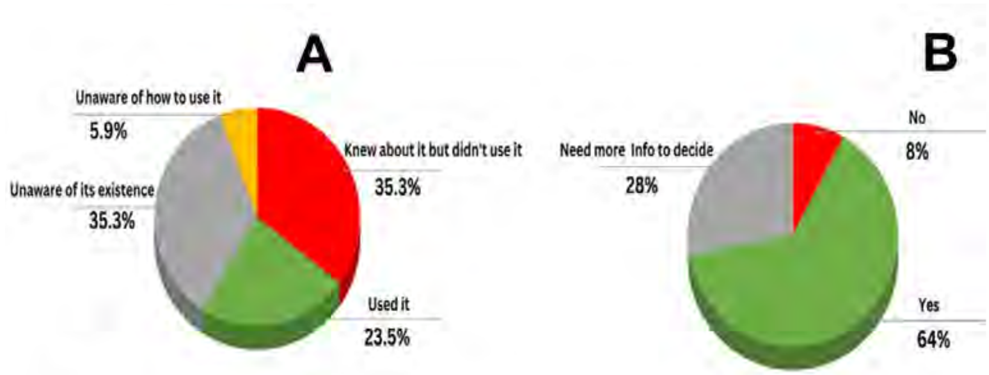


Figure 2. (A) Awareness and use of the gleaning federal tax incentive by Massachusetts Fruit Growers. **(B)** Would additional state tax incentives motivate Massachusetts fruit growers to participate in gleaning? The proposed incentives would allow a non-refundable credit from net taxable income for the year of the donation, equal to the fair market value of donated food crops, not exceeding $5,000 per year.

We ran a statistical test to discern whether the finding that only 17% of farmers ($n = 23$) in a study conducted by Duke World Food Policy Center (2022) considered tax incentives as an important motivator was different to our finding that 64% of farmers ($n = 24$) are encouraged by tax incentives to participate in gleaning. We found that this difference was statistically significant. Regarding liability protections, 45.8% said state-specific protections would encourage participation, 25% wanted more information, and 29.2% were not motivated by these protections (Figure 3A). Awareness of federal liability protections was low, with 80% unaware of the Good Samaritan Act (Figure 3B).

The main barriers to gleaning were a lack of time or labor (70%), lack of information about gleaning programs (40%), insufficient surplus to donate (40%), and liability concerns (20%). Tax incentives and public recognition were rated as the most important motivators, with tax incentives significantly more motivating than liability protections (Figure 4).

Conclusion

Our research shows that enhancing protections and offering incentives, as proposed in "An Act Encour-

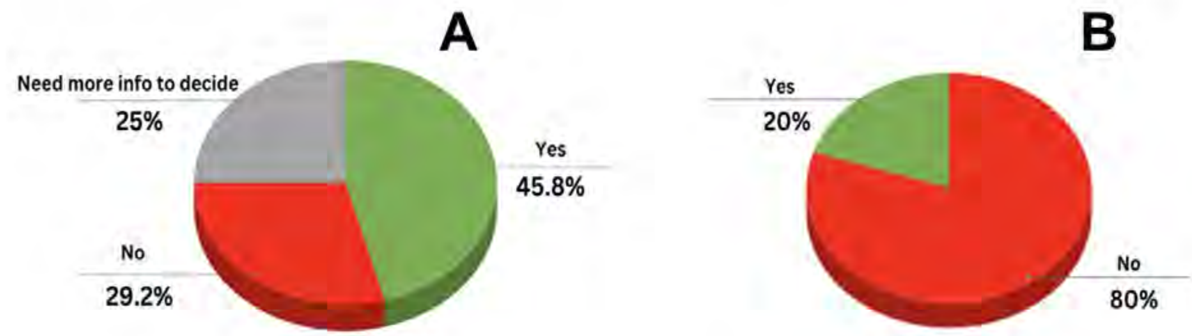


Figure 3. (A) Awareness of federal liability protections for farmers participating in gleaning, **(B)** Assessing the impact of additional State liability protections as incentives to increase participation in gleaning programs

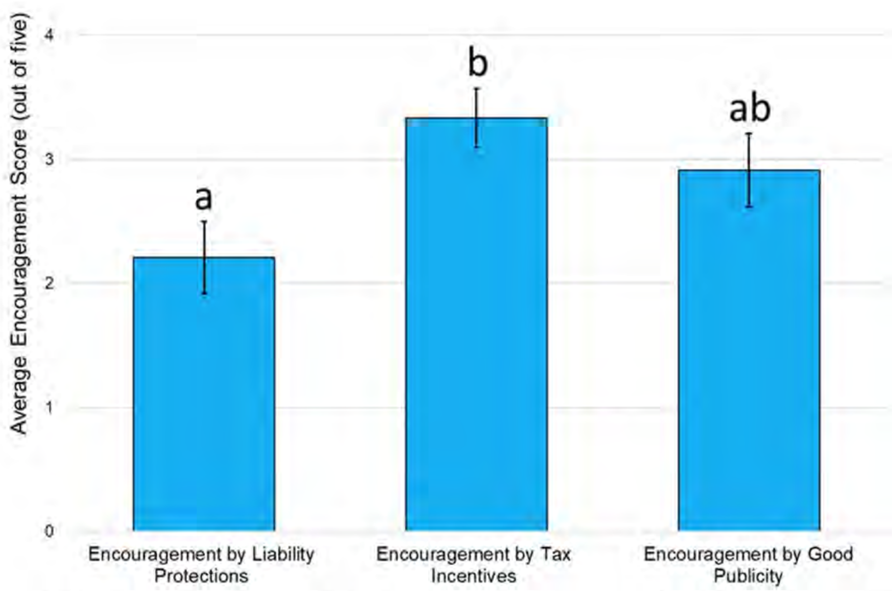


Figure 4. Encouragement provided by liability protections, tax incentives, and public relations on a scale of 1 (not likely) to 5 (very likely). Tax incentives and public recognition are rated as the two most important motivators whereas tax incentives are significantly more encouraging than liability protections. Good publicity is not significantly more motivating than liability protections.

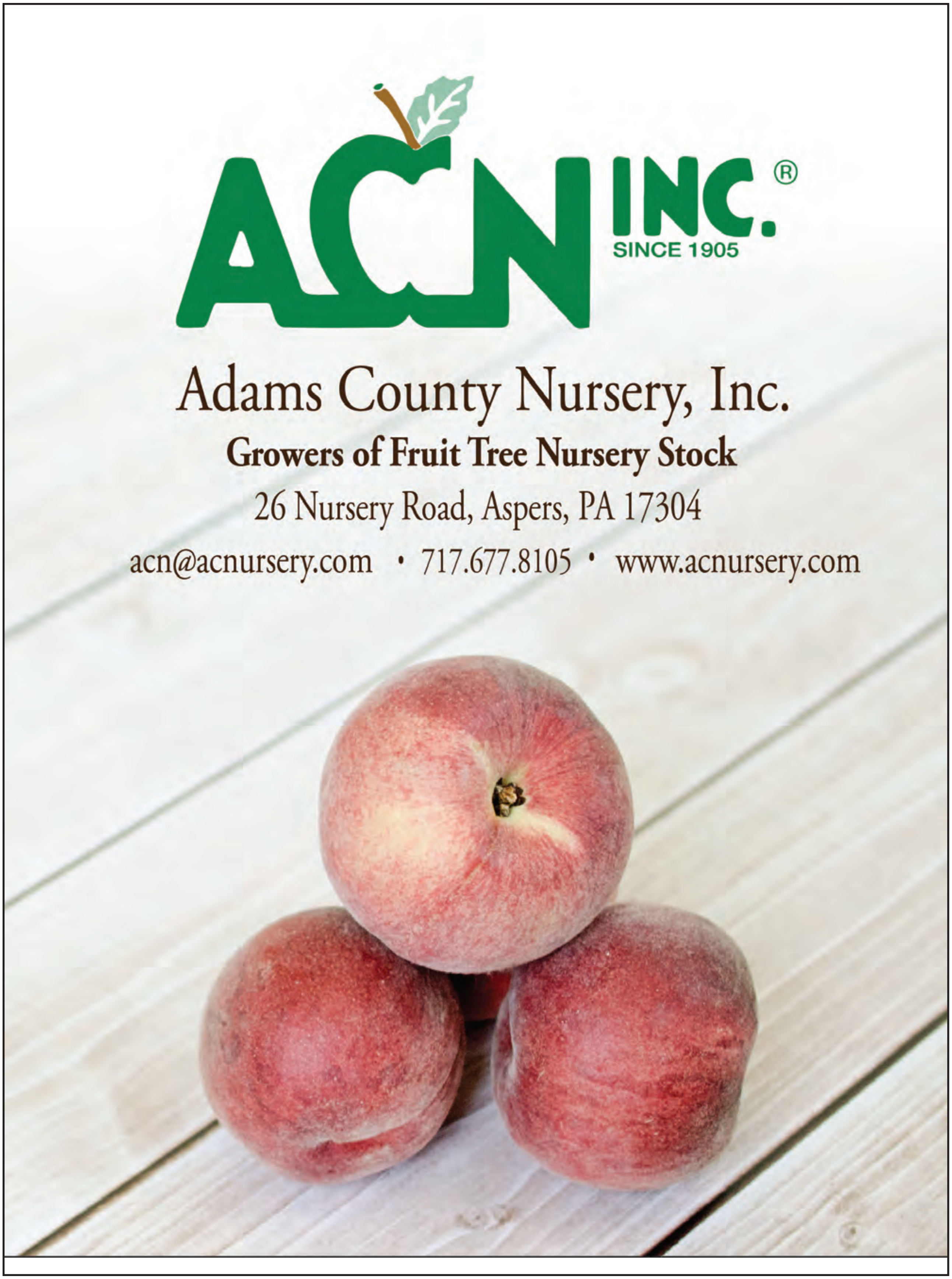
aging Donation of Food to Persons in Need" (MA S.920/H.1594), can significantly increase gleaning participation among Massachusetts apple growers. Liability protections would encourage 45.8% of growers, while 64% support state tax credits. Expanding these incentives, along with direct payments for donated produce, would make participation more attractive. Though liability is not the top concern, it plays a crucial role in reducing legal risks. Clear communication, streamlined tax processes, and strong outreach are essential to maximize engagement. Further research across other agricultural sectors is needed to develop broader programs, helping reduce food waste and strengthen food security statewide.

Acknowledgements

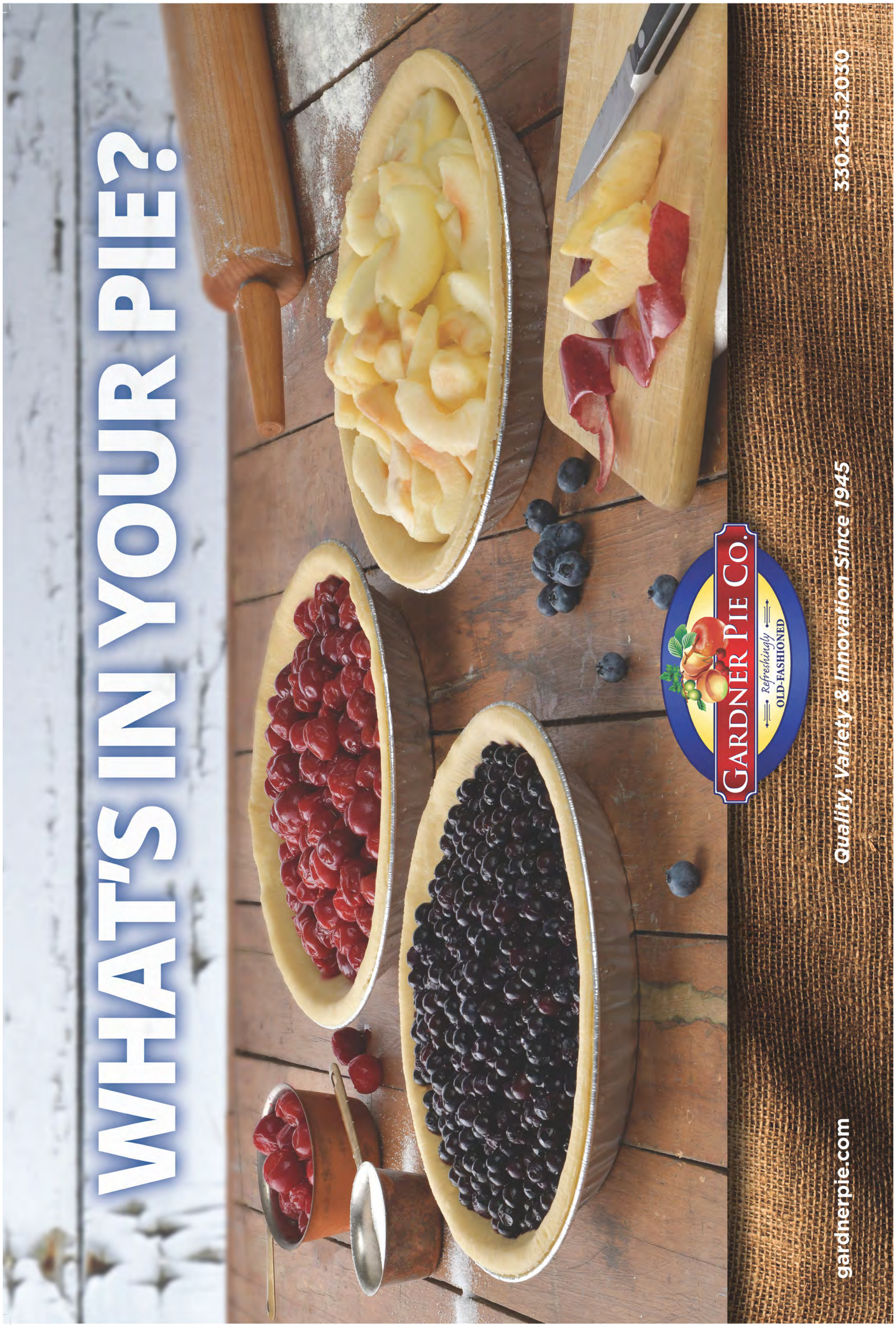
Thank you to the REEU intern team and the MA growers who completed the survey.

Mike Hannigan is an undergraduate student at Greenfield Community College and a summer 2024 intern in the Research and Extension Experience for Undergraduates (REEU) program. Mateo Rull-Garza is a graduate student at the University of Massachusetts, Stockbridge School of Agriculture.

Editor's note: Gleaning ensures food safety by adhering to strict harvesting practices, with no produce collected from the ground. All gleaned produce is harvested in the same way as the farm's market-bound crops, using volunteer labor. For example, apples are picked directly from the trees, and no fruit that has fallen to the ground is collected, maintaining the same safety standards as commercial harvests.


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

Available in 16 oz. and 64 oz. sizes


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


Fruit Notes