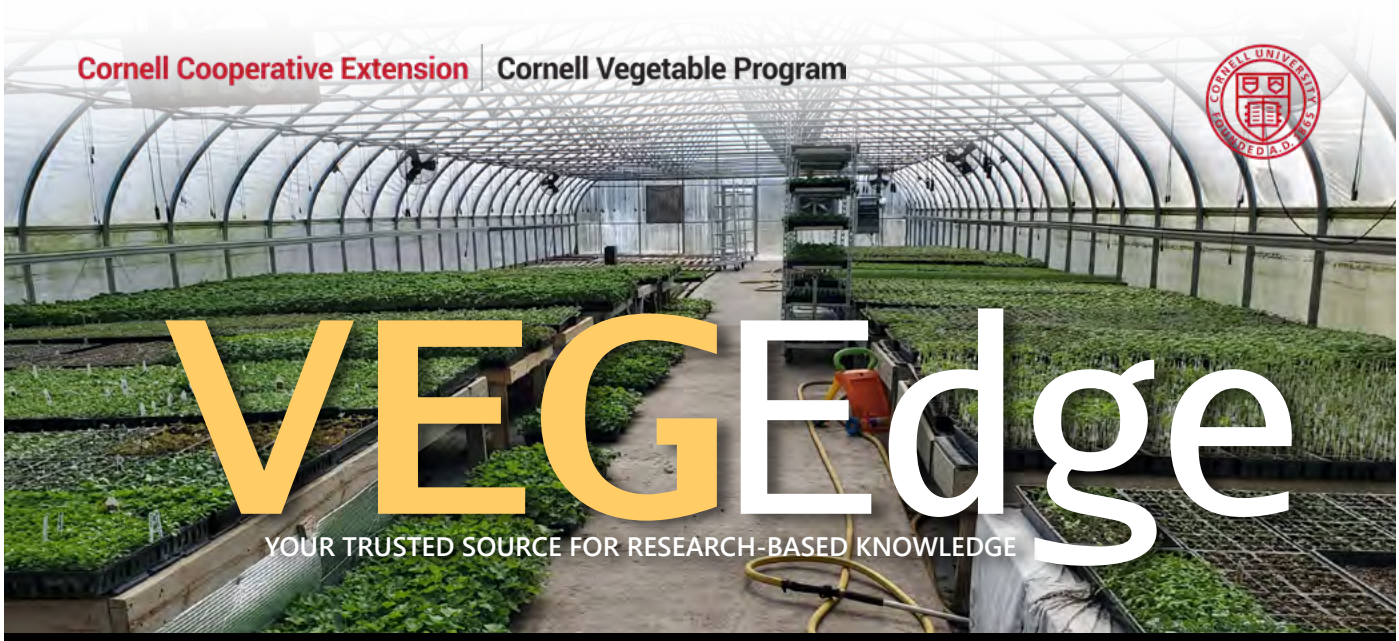
Cornell Cooperative Extension | Cornell Vegetable Program



# VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

Volume 19 • Issue 3 • March 1, 2023



## Testing Irrigation Water for Plant Health

*Judson Reid, Cornell Cooperative Extension, Cornell Vegetable Program*

Noted in this issue of VegEdge is the importance of water testing for GAPs certification and likely in the future, federal Food Safety Modernization Action (FSMA) requirements (pending final rule); see "Agricultural Water Test Sample Drop-Off Sites" on page 6. The tests under these programs are intended to provide meaningful results specific to quantified E. coli for human safety. However, these tests do not indicate the suitability of irrigation water for plant safety.

To understand the quality of water for our crop health, we need to have our irrigation tested for a number of chemical parameters. For vegetable transplants (and spring ornamentals) the most important values to assess are pH, alkalinity (primarily calcium bicarbonate), and a measure of salts: EC (Electrical Conductivity) or TDS (Total Dissolved Solids).

Elevated levels of pH and calcium bicarbonate in most NYS irrigation wells indicates the injection of acids for transplants and flowers. This increases nutrient availability in the root zone in the short term and prevents pH elevation over the long term. If we don't acidify high pH and alkalinity, we can expect nutrient deficiencies, in particular iron and manganese, although phosphorus and potassium are also highly influenced by these parameters.

A common symptom of high-water pH is iron deficiency in tomatoes.
*Photo: Judson Reid, CCE Cornell Vegetable Program*

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## About VegEdge

VegEdge newsletter is exclusively for enrollees in the Cornell Vegetable Program, a Cornell Cooperative Extension partnership between Cornell University and CCE Associations in 14 counties.

The newsletter is a service to our enrollees and is intended for educational purposes, strengthening the relationship between our enrollees, the Cornell Vegetable Program team, and Cornell University.

We're interested in your comments. Contact us at:
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VegEdge is published 25 times per year, parallel to the production schedule of Western New York growers. Enrollees in the Cornell Vegetable Program receive a complimentary electronic subscription to the newsletter. Print copies are available for an additional fee. You must be enrolled in the Cornell Vegetable Program to subscribe to the newsletter. For information about enrolling in our program, visit cvp.cce.cornell.edu. Cornell Cooperative Extension staff, Cornell faculty, and other states' Extension personnel may request to receive a complimentary electronic subscription to VegEdge by emailing Angela Ochterski at aep63@cornell.edu. Total readership varies but averages 700 readers.



**Help us serve you better by telling us what you think. Email us at *cce-cvp@cornell.edu* or write to us at Cornell Vegetable Program, 480 North Main Street, Canandaigua, NY 14424.**

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**The next issue of VegEdge newsletter will be produced on April 5, 2023.**

## Farmers Raising Children Survey

**The American Farm Bureau Federation has included the need to support rural childcare access in its 2023 policy priorities for the Farm Bill.** To help inform farm organizations and legislators in their activities, The National Farm Medicine Center and The Ohio State University are **conducting a survey about farm and ranch families' experiences balancing children and work**.

The survey is open to part- and full-time farmers, ranchers, and their partners with children under 18. They can be farming in rural, urban, or suburban areas. Read more about the research project at https://marshfieldresearch.org/nccrahs/Farm-ChildrenChildcare

Take the **Farm and Ranch Families Raising Children online survey** by **March 17**.

## 2023 Farm Market Pricing Survey

Vegetable Growers News is seeking input on pricing benchmarks from farm markets across the country. The farm market pricing survey seeks retail per-pound data on specific commodities in these categories:

- Pre-picked conventionally grown fruits and vegetables;
- Pre-picked organically grown fruits and vegetables;
- U-pick conventionally grown fruits and vegetables; and
- U-pick organically grown fruits and vegetables.

Cider and baked goods are also included. The more responses, the more complete picture of pricing we can present, from regional influences and how farm retail managers can put a premium on the goods and services they provide.

All qualified respondents who complete the survey are eligible to win a $50 Visa gift card. Individual responses will not be shared, only presented in compilation with other responses.

Take the **Farm Market Pricing online survey**.

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Although sulfuric acid is the most common conventional acid, citric acid is the choice for organic growers. The introduction of acids (and other nutrients) into the irrigation system is possible with a proportional injector. The amount injected will depend on the pH and calcium bicarbonate of the untreated irrigation water.

Most of our vegetable transplants grow best in a pH of 6-6.5. Setting a pH target of 6.2 (or a slightly lower) for the irrigation water can help us estimate rates of acid injection. There are online tools to help with the calculation of acid injection, such as the ALK CALC app from University of New Hampshire: https://extension.unh.edu/agric/AGGHFL/alk_calc.cfm. You can also reach out to fresh market specialists Elizabeth, Judson or Robert for support in this process. Remember that acids are very dangerous concentrates and should be kept away from children.

This winter we have received a number of water samples that show high levels of TDS or specifically, sodium (Na). Counteracting salts is not as easy as pH/alkalinity. Reverse osmosis is a technique where pressure forces water through a membrane that restricts salt movement. However, there remains a large proportion of saline water in this process, making it impractical for greenhouses that use hundreds of gallons on a sunny March day. If a well tests high for TDS/EC, we need to consider alternate water sources for greenhouse use.

A proportional injector is critical to reduce high pH and alkalinity common in New York irrigation wells. *Photo: CCE Cornell Vegetable Program*

| | | (ppm) | meq/l | lbs/ac in |
|---|---|---|---|---|
| Calcium | (Ca) | 52.27 | 2.61 | 11.85 |
| Magnesium | (Mg) | 19.29 | 1.59 | 4.37 |
| Potassium | (K) | 2.72 | 0.07 | 0.62 |
| Sodium | (Na) | 99.99 | 4.35 | 22.68 |
| Iron | (Fe) | < 0.10 | | |
| Total Alkalinity | (CaCO3) | 288.26 | | 65.38 |
| Carbonate | (CO3) | 0.00 | | |
| Bicarbonate | (HCO3) | 351.73 | 5.77 | 79.77 |
| Hydroxide | (OH) | 0.00 | | |
| Chloride | (Cl) | 111.49 | 3.14 | 25.29 |
| Sulfur as | (SO4) | 11.17 | 0.23 | 2.53 |
| Salt Concentration | (TDS) | 591.10 | | 134.06 |

A real water sample result received this spring that shows very high salt levels. Imagine applying 22 lbs/ac of sodium! *Photo: CCE Cornell Vegetable Program*

If water quality is impaired by EC, or other factors, and no other source or remediation is possible, the final management tool is somewhat counterintuitive: use more of the problematic water! Yes, by fully flushing our vegetable transplant trays we will at least reset the root zone to the initial problem levels in the water. If we do not leach out the potting media, salts, bicarbonates and other problems accumulate above the initial water levels. This can be a challenge in March if we have cloudy weather and transplants are still small. ●

# Cornell Web Resources on Vegetable Diseases

*Margaret Tuttle McGrath, Plant Pathology and Plant-Microbe Biology Section, SIPS, Cornell University, Long Island Horticultural Research and Extension Center*

There are two Cornell websites created with the goal to assist growers and extension specialists with identifying and managing diseases. They have excellent photographs, information and applied research results about diseases of vegetable crops, plus herbs and strawberry.

### Long Island Horticultural Research & Extension Center – Vegetable Pathology Website

The Long Island Horticultural Research & Extension Center vegetable pathology website: blogs.cornell.edu/livegpath/

#### *Disease Identification Help*

The first objective of this website is to share the many photographs taken by Prof. Meg McGrath of diseases and disorders of vegetables, herbs and strawberry, plus a few insect pests, to assist with identification. So far 874 photographs have been posted in the Photo Gallery with information about the problems and their management.

#### *Research Results & Educational Resources*

Most of the field research has been evaluations of new resistant varieties, conventional fungicides, and organic fungicides with

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focus on biopesticides. The Research section has brief results summaries posted with links to the full research reports and photographs. A lot of research has also been conducted on fungicide resistance in the cucurbit powdery and downy mildew pathogens. Specific topics include:

- basil downy mildew
- cucurbit downy mildew
- cucurbit powdery mildew
- Phytophthora blight (cucurbits and pepper)
- late blight of tomato, foliar diseases of tomato
- fungicide resistance
- biopesticide evaluations for organic and conventional disease management
- biofumigation
- reduced tillage
- impact of ozone on plant productivity

The Extension & Outreach section links to additional resources. They include descriptions and links for:

- basil downy mildew monitoring website
- cucurbit downy mildew monitoring and forecast website
- late blight monitoring website
- extension write-ups and presentations
- organic disease management for vegetables
- gardener resources

### Cornell Vegetables Disease Factsheets and Articles Website

www.vegetables.cornell.edu/pest-management/disease-factsheets/

This is a replacement for the Vegetable MD Online website whose old platform could not be updated. Many pages from the old website have been updated and posted at the new website. The top section has links to articles about diseases and management practices affecting multiple crops. The first article is about general tips on diagnosing plant diseases. Examples of other article topics include Phytophthora blight, white mold, seed treatment, cropping sequences, managing fungicide resistance, and copper fungicides. There is also a section listing diseases by crop with information about the disease plus photographs. Some are updated factsheets from the old Vegetable MD Online website; others are links to the Photo Gallery at the other website. There are also tables of fungicides for cucurbit crops and tomato.

The 'Disease-resistant varieties' section lists varietal resistances to diseases and disorders by crop. The information is from several seed company catalogues. Excel spreadsheets are available to view or download and include the seed companies and whether organic or nontreated seed is available. The Biopesticides page has:

- general biopesticide information
- lists of biopesticides registered in New York, with the labeled diseases
- a downloadable excel spreadsheet that has disease control efficacy study results summarized from dozens of evaluations conducted at universities and published in Plant Disease Management Reports

Posting information and updating content at these websites is an on-going activity to ensure growers and extension specialists have the resources for effective disease control and successful vegetable crop production.

# Winter Squash Varieties and Breeding Lines Show Promise for Powdery Mildew Resistance in New York

*Elizabeth Indermaur, Gregory Inzinna, Michael Mazourek, and Christine Smart, SIPS, Cornell*

### Commercial Squash Lines

Six winter squash varieties were evaluated for resistance to cucurbit powdery mildew (CPM) in 2021 in New York. Varieties included butternuts 'Bugle' (Rupp Seeds), 'Waltham' and 'Butterfly' (HM Clause), kabochas 'TNK-157' and 'TNK-163' (Takii Seed), and Hubbard 'Golden Delicious' (Rupp Seeds). **'Bugle' and 'Butterfly' had the lowest disease severity of all varieties and were among the highest yielding (Figure 1).** 'TNK-163' and 'Golden Delicious' produced the fewest (23.50 and 15.25) marketable fruit per plot. 'Bugle' yielded significantly smaller fruit than 'Waltham' (0.90 and 2.05 lbs), but 'Butterfly' was intermediate in weight (1.68 lbs) and not significantly different from the other butternut cultivars. The other four varieties produced fruit with numbers and weights that were similar to one another. Soluble solids content and flesh firmness values were comparable across the six varieties. **'Bugle' and 'Butterfly', like all cultivars with *Pm-0* derived resistance, reduce CPM.**

### Breeding Lines for Processing Squash

Two field trials were conducted to evaluate resistance to CPM in processing squash breeding lines in 2022 in NY. One trial evaluated CPM resistance in improved 'Dickinson' lines. 'Dickinson' is a large-fruited industry standard processing cultivar that is related to butternut squash and susceptible to CPM. The two parents 'Bugle' (butternut, CPM resistant) and 'Dickinson' (CPM susceptible) were assessed alongside four of the most promising progeny from the breeding lines generated by this original cross. Each of the four progeny contains two copies of the CPM resistance gene *Pm-0*. **Of the four progeny tested, Accession 3 had significantly less disease than 'Dickinson' and was no different from 'Bugle' (Table 1).** This demonstrates that CPM resistance has been bred into a commercially desirable variety. The number of fruit did not significantly differ across the progeny and 'Dickinson' (Table 1); 'Bugle' had significantly more marketable fruit per ten-plant plot, and the fruit are smaller, which is normal and expected for this genotype. Accession 3 had internal fruit and processing qualities that resemble 'Dickinson' in canning trials conducted in the fall of 2022. Further evaluations of Accession 3 are planned for the 2023 field season.

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The second trial included 15 accessions of *Cucurbita maxima*, representing multiple market classes, to search for genetic resistance that could be bred into more susceptible cultivars. **The squash accessions 'Tabalque', 'Zapallito de Tronco', and 'Plomo Ruso' had numerically the least disease, but did not have statistically less disease than any other variety except 'Mayo Blusher' (Table 2, Figure 2).** Currently, *C. maxima* cultivars do not carry the *Pm-0* gene that is common in butternuts (*C. moschata*) and are generally susceptible to CPM. Breeders are working towards incorporating resistance into commercially desirable *C. maxima* varieties.

**Table 1. Results of winter squash (*Cucurbita moschata*) breeding line field evaluations. Yield parameters were calculated per ten plants.**

| Pedigree | Foliar Disease Severity (%)[1] | | Marketable Fruit[2] Number | | Marketable Fruit[2] Weight (lbs) | |
|---|---|---|---|---|---|---|
| Bugle | 24.2 | a | 42.0 | b | 8.2 | a |
| Accession 3 | 25.0 | a | 10.7 | a | 8.7 | a |
| Accession 6 | 31.7 | ab | 20.0 | a | 9.4 | ab |
| Accession 4 | 51.7 | ab | 11.7 | a | 9.6 | ab |
| Accession 5 | 55.0 | b | 16.3 | a | 9.2 | ab |
| Dickinson | 55.0 | b | 22.0 | a | 10.6 | b |
| *P value* | *< 0.01* | | *< 0.001* | | *< 0.05* | |

Statistically significant differences between accessions were determined with the Tukey's HSD test, at *P*=0.05. Numbers followed by the same letter are not significantly different.

1 Percent disease severity on adaxial leaf surfaces estimated per plot on 9/20/22

2 Marketable fruit were free from developmental issues and abiotic or biotic damage

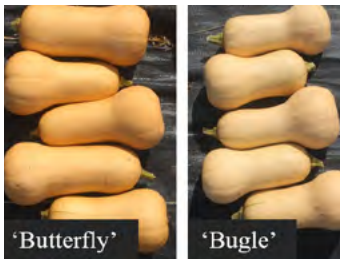


Figure 1. Representative fruit from commercially available, powdery mildew resistant cultivars 'Butterfly' and 'Bugle'. *Photos: E. Indermaur, Cornell AgriTech*

**Table 2. Results of field evaluations of a winter squash (*Cucurbita maxima*) diversity panel and commercial controls. Yield parameters were calculated per ten plants.**

| Accession | Foliar Disease Severity (%)[1] | | Marketable Fruit[2] Number | | Marketable Fruit[2] Weight (lbs) | |
|---|---|---|---|---|---|---|
| Tabalque | 18.3 | a | 17.0 | abcd | 18.6 | a |
| Zapallito de Tronco | 22.5 | ab | 30.0 | d | 39.4 | ab |
| Plomo ruso (Plaunorskja) | 23.3 | ab | 7.5 | ab | 94.6 | abc |
| Golden Delicious | 35.8 | abc | 12.3 | abcd | 99.4 | abc |
| Amzibegovska | 36.7 | abc | 10.0 | abc | 92.8 | abc |
| Queensland Blue | 37.5 | abc | 19.3 | abcd | 146.1 | bc |
| Fipushi | 38.3 | abc | 21.7 | abcd | 131.7 | abc |
| No. 7488 | 38.3 | abc | 7.3 | ab | 79.1 | abc |
| Kestane | 40.8 | abc | 15.3 | abcd | 193.0 | c |
| Ambar | 46.7 | abc | 8.0 | ab | 41.1 | ab |
| Golema | 48.3 | abc | 5.7 | a | 52.3 | ab |
| Autumn Cup F1 | 53.3 | bc | 16.7 | abcd | 46.2 | ab |
| Thunder F1 | 54.2 | bc | 23.7 | bcd | 77.6 | ab |
| Buttercup Burgess Strain | 54.2 | bc | 27.3 | cd | 64.4 | ab |
| Dickinson | 55.0 | bc | 20.3 | abcd | 342.1 | d |
| Mayo Blusher | 65.0 | c | 11.0 | abc | 99.0 | abc |
| *P value* | *< 0.001* | | *< 0.01* | | *< 0.01* | |

Statistically significant differences between accessions were determined with the Tukey's HSD test, at *P*=0.05. Numbers followed by the same letter are not significantly different.

1 Percent disease severity on upper leaf surfaces estimated once on 9/20/22

2 Marketable fruit were free from developmental issues and abiotic or biotic damage


Figure 2. Representative fruit from the powdery mildew resistant parent 'Bugle', the susceptible parent 'Dickinson', and the progeny with promising disease resistance and canning qualities. *Photos: Elizabeth Indermaur, Cornell AgriTech*


Figure 3. Representative fruit from *Cucurbita maxima* breeding lines with promising powdery mildew tolerance. *Photos: Elizabeth Indermaur, Cornell AgriTech*

# Agricultural Water Test Sample Drop-Off Sites

*Robert Hadad, Cornell Cooperative Extension, Cornell Vegetable Program*

If you are curious about the quality of your irrigation ponds, streams, wells, or other surface water source, water testing is an important tool to consider. If your buyer wants you to get an audit and be certified under GAPs, Harmonized GAPs, or other third-party program, water testing becomes a requirement. In the near future, the FSMA federal regulations (when the pre-harvest water rule is finalized) may require water quality risk assessments, water testing helps provide important information.

Getting the right test and doing so in a timely manner has been a challenge. Water testing that provides meaningful results requires a quantified generic E. coli test or an Enumeration E coli test. Some water testing labs only do a potable water test called a presence/absence test. The Enumeration test provides test results as in numbers of (bacterial) colony forming units (CFU or most probable number MPN). Having a number allows you to track the results with a comparable baseline. Each water source should be tested 3-4 times a season and do this each growing season.

Sampling should occur early in the season then again before key harvest times during the season. So, for example, if your first harvest is in late June, sample early June, then in again in early/mid-July, early/mid-August, and if there are significant crops, like leafy greens going into the fall and irrigation is still needed, then sample in mid-September. Sampling could be done after a large rain event where a lot of runoff gets into your water sources. During real dry spells, if pond levels drop a lot, test then too.

**Water samples need to be kept cool and transported to the lab within 8 hours of when the sample bottle was filled**. This is critical. Many counties don't have local water labs that can do these tests and getting them to other labs can mean hours on the road. One solution here in WNY comes from water test sample drop-off sites being set up. Refer to the list and map for these locations. Water tests require following specific instructions that can be found along with the sample bottles at these sites. Pay the fee (ranges from ~$50-$60 each), get the bottle(s), fill out the form, follow the sample instructions and get the bottles back to the drop-off sites before 9:00 am on the dates specific to that location.

- Lozier Environmental Consulting in Rochester is setting up this service to assist farmers in getting their water samples analyzed in a timely convenient manner.
- If you are in Ontario County, contact Nancy Anderson at the CCE Ontario County office in Canandaigua at 585.394.3977 x427. You can pick up the supplies (forms, bottles, instructions, and takes payment) at the CCE office. You will be required to take your sample(s) to a drop-off site in Canandaigua; the bottles will be picked up and delivered to Life Science Labs in Syracuse for analysis.

Once you get your test results and require assistance interpreting the information, contact Robert Hadad at 585-739-4065, or email Robert at rgh26@cornell.edu.

### Water Testing Drop-Off Sites in Western NY

Drop-off/pick-up sites have been set up in a number of locations across the region. Water test sample bottles, forms, and information are available at each site. For quantitative generic E. coli water testing (farm food safety) use the Enumeration test option.

There are other water tests available for farm and home: well water tests, chemical, and others. The lists can be found with the forms and bottles at the sites.

REMEMBER: Water tests need to be completed by a laboratory in under 8 hours of the samples being taken. Water samples must be dropped off the morning of pickup before the listed times for each site.

| Site and Location | Due before |
|---|---|
| **Albion:** Albion Hardware, 146 South Main Street, Albion NY, 585-589-1713 | Wedneday 9:00 am |
| **Sodus:** The Country Hardware Store, 10 West Main Street, Sodus NY, 315-483-6571 | Friday 9:00 am |
| **Fulton:** Northern Ace Home Center, 2721 State Route 3, Fulton NY, 315-592-2063 | Friday 9:00 am |
| **Penn Yan:** Martin's Equipment and Hardware, 900 NY-14A, Penn Yan NY, 315-536-7056 | Friday 9:00 am |
| **Romulus:** Fishers Supply, 2139 Yerkes Road, Romulus NY, 607-869-9317 | Friday 9:00 am |
| **Andover:** Country Crossroads Feed & Seed, 3186 County Route 61, Andover NY, 607-478-8858 | Tuesday 9:00 am |
| **Addison:** Country Crossroads Feed & Seed, 94 Front Street, Addison NY, 607-359-2424 | Tuesday 9:00 am |
| **Panama:** Eastern States Metal Roofing, 7821 NY-474, Panama NY, 716-355-4374 | Tuesday 9:00 am |
| **Conewango Valley:** Andy Raber's Blacksmith Shop. 12451 Eldredge Rd, Conewango Valley | Tuesday 9:00 am |
| **Rochester:** Lozier Environmental Consulting*, 2011 East Main Street, Rochester NY, 585-654-9080 | Monday - Friday 8:00 am - 4:00 pm |

* Lozier Environmental Consulting has set up the sites across the region, teaming up with local businesses who are trying to make water testing more accessible for farms. For more information on the program, call Lozier at their Rochester location.

# 2023 Hardy Kiwi (Kiwiberry) Update

*Anya Osatuke, Small Fruit Specialist, Cornell Cooperative Extension, Harvest New York*

Over the past couple years, fruit of the hardy kiwi plant has started emerging in the unrefrigerated section of grocery stores. The grape-sized, smooth-skinned fruits of hardy kiwis are branded as "kiwiberries". Because they do not have the fuzz, they can be eaten whole. Commercially-available kiwiberries for sale in New York are primarily grown in the American Pacific Northwest, New Zealand, and Chile. I have seen these imported fruits for sale at Wegmans, as well as at GreenStar, a store serving the Ithaca area.

The hardy kiwi plant is in the same genus as large, fuzzy kiwi: *Actinidia*. Two species of *Actinidia* can be called hardy kiwi: *A. arguta* and *A. kolomitka.* Sometimes, *A. kolomitka* is distinguished by calling it an "arctic kiwi". *A. arguta* and *A. kolomitka* readily hybridize, as well. Fuzzy kiwi plants grow in zones 7 – 10b, whereas hardy kiwi plants can be grown in zones 6-9; selections of *A. kolimitka* can grow as far north as zone 4b. This article will refer to *A. arguta, A. kolomitka*, and their hybrids as hardy kiwi. The fruit will be referred to as kiwiberries.

Surprisingly, the hardy kiwi has been grown in the Northeast since the early 20th century: vines were sold commercially to home-owners as a landscape plant. Why isn't the fruit better known? Because the vines are monoecious: a male and a female plant are needed to make fruits. Historically, vines were not sold based on their gender, and most home plantings couldn't be fertilized.

At the University of New Hampshire, Dr. Iago Hale and his team have been working to document the history of hardy kiwis, with the goal of improving this crop's performance in the Northeast.

The selling point: hardy kiwis are a unique crop that can offer diversity for New York growers. As the fruit ripen in the fall (September – October), kiwiberries can bolster sales of other fall produce. Fruits of the variety 'Ken's Red' will turn red when ripe, potentially a novel U-pick opportunity. Kiwiberries ripen after picking, making possible sales into winter. Dr. Hale is partnering with Hartmann's Plant Company to offer genetically-certified nursery stock. This overcomes a major hurdle for the industry, as varieties sold under the same name have shown vastly different fruit characteristics. Dr. Hale's team has identified two varieties, 'Geneva 3' and 'Ken's Red', as the most promising commercial varieties for our region. To boot, they have written a hardy kiwi production guide. All of this information can be found online at the Nor'east Kiwiberries Website: https://www.noreastkiwiberries.com/

Yet, there also are several reasons why hardy kiwi plants may not work for a grower's operation. The vines need to be installed into a robust trellis system, usually 6' tall. The plants grow vigorously and need to be pruned twice a year, once in the winter and once in the spring. Large plantings seem to work better than small ones; growers should have the space to install at least five plants (one male and four to six females), plus a windbreak. Finally, these uncommon fruits can be hard to sell at a good price for the grower. As an uncommon fruit, demand varies strongly by region, and the robust import market may be enough to keep adventurous consumers satisfied.

I've visited a couple growers who have overgrown hardy kiwi plants on their property. These plants can grow huge, vining up barns and flagpoles to heights of 10 feet or more. With so many dense tendrils, they shade their own buds out of production, and hardly yield any fruit—usually, picking the rare, high-up berries is more trouble than it's worth. Especially if the berries aren't great-tasting, it may make more sense to take these vines out and let something more profitable grow in that space. Some folks grow "Issai", the only self-pollinating variety of hardy kiwi, but this variety is not recommended for commercial fruit sales due to low yields.

There is concern that hardy kiwi may be invasive in Western New York. University of Minnesota has evaluated their research orchard for 30 years and found no signs of invasiveness, a trait they characterize using 4 factors: rogue seedlings in the orchard, rogue seedlings in surrounding wood lots, suckers emerging 10+ feet from the plants, and vines reaching onto nearby trees and growing on them. However, their commercial orchard is very well-managed: the fruit is picked clean, the vines are regularly pruned, and the orchard floor is mowed. The hardy kiwi is not a plant we should "set and forget".

Taking the good and the bad into account, hardy kiwis are offered for sale by many nurseries. In my opinion, hardy kiwi can be a good option for established growers with a robust plan for selling the fruits. U-pick and value-added products will likely fetch a higher price than selling wholesale. While large plantings will likely be more productive than small ones, it seems risky to rely on hardy kiwi to be the major part of farm revenue. We have more resources than ever to manage hardy kiwi profitably. Considering the ecological impact potential, I believe that discouraging folks from keeping unprofitable plantings is just as important as encouraging profitable ones.

### Citations and Further Reading

Emily Tepe, University of Minnesota | Exploring the Invasiveness Potential of Hardy Kiwi | February 2020. https://fruit.umn.edu/kiwiberry-invasive-potential

Iago Hale, University of New Hampshire | Nor'east Kiwiberries | Updated January 2021. https://www.noreastkiwiberries.com/production-guide/vine-management/

# Are Laser Scarecrows Effective? Research and Grower Experience

*Julie Kikkert, Cornell Cooperative Extension, Cornell Vegetable Program*

Last week I attended two laser scarecrow sessions at the Eastern NY Fruit & Vegetable Conference in Albany which featured lively discussions amongst vegetable and grape growers. Both sessions were grower panels about on-farm experiences. The overall feeling was that birds do not like the lasers and will avoid the fields if other food is available nearby. Some growers had near 100% control of their bird problems, while others ranked the lasers closer to 70% bird control on their farms. One question was posed as to whether there was research data to back up the claim that lasers control birds. Excellent question and that is where Cornell Cooperative Extension comes in! Below is some background on the research followed by a summary of the grower comments at the meeting. I am happy to discuss the results personally with anyone who is considering testing a device on their farm. We will continue our on-farm research in 2023.

### Background and Research Results

Birds rely on their excellent eyesight for navigation, finding food, and to sense threats. They are better able to see motion and are more sensitive to color than are humans. The use of laser beams to deter birds was first suggested in the 1970's, but numerous technological advances were needed to develop effective and practical devices. Nowadays, fully automated, portable lasers are a realistic option for bird control (Brown and Brown, 2021).

Research on the effectiveness of lasers to control birds in agricultural settings is challenging because birds may descend on fields in random patterns and it can be difficult to find control fields without other bird deterrents being used. Nevertheless, initial experiments were conducted using hand-held lasers to herd birds away from specific locations. Lasers were determined to be effective at moving birds initially only to have them return when the lasers were not in use (Gorenzel et al. 2002; Clausen et al., 2019).

Automated robotic laser scarecrows were developed and are offered commercially by several companies (e.g. Armada, Bird-Control Group, Carpe Diem Technologies) however, research on the effectiveness of these devices in the scholarly literature is very limited and not every device is optimized for all crops. For example, Brown and Brown (2021) noted that the P-3 Anti-avian System, Carpe Diem Technologies Inc.) was designed for use in orchards and did not fully meet the needs of sweet corn growers. While not an exhaustive literature search, I recently found a published report on the efficacy of the Avix Autonomic Mark II (www.birdcontrolgroup.com, Delft, The Netherlands) for controlling wild birds in a poultry farm (Elbers and Gonzales, 2021).

Dr. Rebecca N. Brown and David H. Brown (2021) from the University of Rhode Island (URI) developed a robotic laser scarecrow (http://laserscarecrow.info) which is currently available in limited supply as a kit for $650 as part of their research. The laser scarecrow uses a 50 mW green laser diode (wavelength 532 nm ± 5) with a solid beam, 14 mm in diameter. The device is fully automated and programmed to move randomly within a full 360-degree circle on the horizontal plane. The angle and rotational speed of the laser diode are adjustable. Table 1 shows a brief summary of data from three years of trials with the URI laser using split-plot treatments where half of the field was covered with the laser beam and half was not (the non-treated control sections). The data demonstrates the potential of this technology for deterring birds from sweet corn fields.

**Table 1. Effect of a laser beam treatment on bird damage to sweet corn fields at the University of Rhode Island Research Farm. Summarized from Brown and Brown, 2021.**

| Trial Year | Average Number of Damaged Ears | | Significance (p-value)[1] |
|---|---|---|---|
| | Untreated Control | Laser Treatment | |
| 2017 | 48.4 | 14.6 | 0.0002 |
| 2018 | 23.8 | 13.7 | 0.0046 |
| 2019 | 20.3 | 14.9 | 0.0332 |

1 A treatment is considered significantly different than the control if this value is 0.05 or less

Brown and Brown continue to refine the design and conduct field trials. In recent personal communication, Dr. Rebecca Brown indicated that Rhode Island sweet corn growers who employ the laser with no other control methods often experience as much as 20% bird damage in their commercial fields. Dr. R. Brown is field testing the laser scarecrow in combination with a BirdGard squawker and found the two are more effective together. Research is also being conducted with caged birds in Florida, overseen by wildlife biologists. Results will be published within the next year.

In the past few years, Cornell Cooperative Extension partnered with University of Rhode Island (URI) to field test their laser scarecrow design in commercial sweet corn fields in New York made possible with grant funding from the New York Farm Viability Institute and a USDA NIFA multi-state Specialty Crop Block grant. Chuck Bornt, Vegetable Specialist from the CCE ENY Commercial Horticulture Program worked with eastern NY farms, while Marion Zeufle (NYS IPM) and myself worked with western NY farms. Our research along with grower-cooperator feedback from multiple states led to significant improvements in the design and resulted in the URI laser scarecrow becoming much more durable in the field and more user-friendly. Last year, the 2022 model was deployed on six fresh market farms and one processing vegetable farm in western NY. Prior to harvest, the number of ears with bird damage was recorded at different distances from the laser. In fresh market fields where laser scarecrows were deployed, overall bird peck ranged from 0 to 7.4%. Most fresh market growers used other bird control methods (chemical control,

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scare-eye balloons, squawkers, etc.) in addition to the lasers. Processing fields were subject only to our treatments and while not significantly different when analyzed statistically, the overall bird peck was 20.6% in control fields with no treatment, 7.5% in fields with a laser scarecrow, and 3.0% in fields with a laser scarecrow plus BirdGard squawker, supporting our observation that birds avoided fields with the lasers if other foods sources were available nearby. Bird damage increased with distance from the laser in the larger fields which were roughly 2,000 ft long. My colleague, Chuck Bornt from Cornell Cooperative Extension in ENY also deployed the URI laser scarecrow in that region and collected similar data, which has not yet been analyzed.

## Grower Comments from the Sessions

### *Sweet Corn*

Altobelli Family Farm in Kinderhook, NY grows about 100 acres of sweet corn annually. They have worked with the URI laser scarecrow for several years and have 3 units. They set it up with the laser unit about 4 ft above the sweet corn canopy and the laser slightly angled downwards and sweeping over the field. The laser scarecrow units are positioned in the roadways within the blocks of the sweet corn field. They typically plant 20 row blocks with the corn on 30-inch rows and the length of the block is about 1,000 ft. The laser shoots 20 rows one direction and 20 rows the opposite direction. It takes care of about 60 rows of corn and likely shoots out about 1,000 ft. They try to get the laser set up at least 10 to 14 days before harvest but have seen it work when the birds were already in the field. They've had great results with the laser in combination with poppers and scouting around and using shotgun blasts when needed. It has also been important to manage the plantings such as keeping the corn further away from tree lines. Swamps and other sources of water will draw birds and they will come into the sweet corn fields when people are not around, so it is important to manage locations of fields that will be ripe during the peak times of bird pressure. The URI lasers are easy to use, relatively inexpensive and are easily moved. They swap out the 12-volt deep cycle batteries once a week and do not rely on solar chargers. The automated lasers are nice because the farm employees don't have to go out into the fields as often to control birds. You can't just set and forget the lasers, but they are relatively low maintenance.

Kinderhook Creek Farm in Stephentown, NY has used the URI laser for several years as well. They plant about 200 acres of sweet corn in 30-acre blocks. The 5 to 10-acre fields are spread over a 10-mile radius. Bird pressure peaks between mid-July to the first week of August. They have tried everything to get rid of birds: shotguns, BirdGard squawkers, propane cannons, scare-eye balloons, topping the corn, kite hawks on 30 ft poles, etc. They first tried lasers several years ago using a Christmas light laser with a motor that spun it around. It was cheap and covered maybe three acres but didn't work that great. The URI lasers cover about 5 acres but are not the silver bullet they hoped for. The laser scarecrows are set in from the headrow with the laser positioned at least 4-ft above the canopy to adjust for different corn varieties and the topography of the land. The lasers are moved about every 5 days, alternating days that they move the propane cannons. They've had some really good success with the laser scarecrow in some fields, but in other fields nothing would move the birds. Last year they had an 8-acres field that was a total loss from bird damage despite multiple control tactics.

AJ Farms Produce & Grain, LLC, in Melrose, NY feels that the laser is another useful tool in the toolbox to deter birds. They position the URI laser scarecrow about two feet above the crop canopy depending on the topography of the field. They usually have roadways about every 90 ft. The laser covers a little more than 3 acres and possibly up to 5 or 7 acres when placed in the middle of the field with propane cannons on each end of the field. The birds do not come into the field with this set up. They don't like the laser. The farm has also used air dancers with a generator in the fields and Avian Control chemical spray, both with success. A combination of methods has provided the best control.

### *Grapes*

The grape growers in ENY used the commercially available AVIX Autonomic Mark II sold by the Bird Control Group https://www.birdcontrolgroup.com/. The device can be mounted on a barn (building) and run by AC power if available or mounted on a tall stationary post or movable wagon where it is powered by two deep cycle marine batteries which can be kept charged using solar panels. The unit contains a single laser that has a focused green beam. It is a class 3B laser which can cause damage to the human eye if an individual were to look directly at the beam. According to the company website, bird's most developed sense is eyesight and they perceive green lasers as physical objects. Hence, the birds are scared away from the laser beam. The Bird Control Group website says that the laser beams used in their devices are proven to reduce bird nuisance by more than 70% and that bird habituation doesn't occur. The system can be programmed and monitored through iOS and Android apps. The device can cover in the range of 20-25 acres depending on the dimensions and topography of the field.

Grape growers noted that netting to reduce birds was very expensive to purchase and manage. Birds can penetrate nets where it is pinned, and the netting gets in the way of late season sprays and other operations. Milea Estate Vineyard, Staatsburg, NY sustained serious bird damage in 2022 even though the vineyard was fully netted just prior to veraison. The western block of Chardonnay grapes next to the treeline was a complete loss. Birds perched on the over-the-row netting and worked their way through. Clouds of Starlings and blackbirds hovered over the field.

As an alternative to netting, Clover Pond Vineyard (Altamont, NY in Albany Co.) purchased the AVIX Autonomic about six years ago. It is not cheap, but cheaper than bird netting. They showed a nice video of the AVIX Autonomic mounted high up on the barn and how it moves systematically across the eight-acre field in one swath. It also has an up and down motion. It is programmed to run on a timer from about 5:00 am until dark when the birds are actively feeding. It is easier to see the beam if it is

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running at night and looks like a laser light show in the field. Running the beam at night is not needed but can help with set up. For safety, the farm driveway has lights that flash when someone approaches and warns them not to go any further. The device is also programmed not to shine on a nearby road, and the beam does not go above horizontal so as not to bother airplanes. The laser is operated from August through harvest. The vineyard feels that the laser set up is extremely effective. It does not provide perfect control because as the beam moves across the field, part of the field is briefly not protected, and Starlings will fly in until the beam comes back around within a matter of minutes and scares them away. Last year they had one row out of 70 with a little bit of damage. They further noted that in new blocks of grapes that are not protected by a laser because they are not yet planning to harvest, they had a nearly full crop of Marquette grapes, and were considering dropping the crop manually. The Starlings came in and took out the fruit within one day. They are planning to purchase a new laser unit to cover this additional block because of the topography of the land another unit is needed to make sure of good coverage.

Victory View Vineyard in Easton, NY has used the AVIX Autonomic for 3 years. Their featured red variety, Marquette is grown with an open canopy to get lots of sunshine, but it makes them very accessible to birds such as Cedar waxwings, Robins, Starlings and Cardinals. Initially, they used audio control (BirdGards) which were affordable and easy to move around. They were effective for 10-14 days until the birds get acclimated. You must then move the units and/or change out the sound cards. Eventually, they became less effective over time. They then purchased the AVIX Autonomic laser scarecrow. It is completely automated and you program it with a cell phone app to cover the area of land that you want protected from birds. They initially used it on a 3.5-acre block, but now it covers all 7 acres. It took about 6 hours to program it for 2022. They have it set for 4 blocks and a fifth block to hit the surrounding tree line and a nearby power line, still maintaining a downward angle. It can be programmed to move randomly among the different blocks. They have it mounted on a 16 ft wooden post (6 in x 6 in) that is in the ground with concrete. Two 200 W solar panels charge the two RV batteries. When he purchased the unit, it was a little over $10,000 plus about $2,000 for the posts and solar panels. It is not cheap, but they rank the effectiveness as a 7 or 8 on a scale of 1 to 10. They post warning signs in the field when the laser is being used. There is also an online safety training from the company that one must take.

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# Upcoming Events

## NYS Processing Vegetable Industry Roundtable Meeting

**March 15, 2023 (Wednesday) | 9:00 am - 3:00 pm**
**First United Methodist Church, 8221 Lewiston Rd (Route 63), Batavia, NY 14020**

Processing vegetable industry members who grow, manage, or support crop production for Nortera, Seneca Foods and/or Love Beets, are encouraged to attend this roundtable meeting. This event is broken into sessions:

- **Morning Session: ALL Processing Crops** – offering 2.0 DEC credits in categories 1a, 10, 23, and 3.0 CCA credits
- **Afternoon Session: Beets and Carrots** – offering 2.0 DEC credits in categories 1a, 10, 23, and 2.0 CCA credits

This FREE event includes lunch! Pre-registration is required for lunch. For more info, email Julie Kikkert at jrk2@cornell.edu or call 585-313-8160. Full event details and registration are available at https://cvp.cce.cornell.edu/event.php?id=1745.

## Brownbag Virtual Food & Farm Business Planning Series

**Thursdays, March 16 - April 20, 2023 | Noon - 1:00 pm via Zoom**

CCE Broome is offering a free, six-week virtual series focused on helping you create or refine your farm, or food business, business plan. Each week you'll hear from experts in the field focused on different aspects of the business plan. The sessions will be on Thursdays from 12-1 pm starting on March 16th. Topics include: Legal Considerations, The Three Financial Statements & How to Make Decisions, Setting Up Systems for Keeping Records, Telling Your Story Through Social Media, Human Resources On Your Farm, Financing Your Farm Dream.

Registration is required to receive the Zoom links for the series. Any questions can be directed to Laura Biasillo at lw257@cornell.edu.

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# Upcoming Events *continued*

## 2023 NYS Dry Bean Meeting and Cutting Event

**March 22, 2023 (Wednesday) | Meeting: 9:00 am - noon**
**Cutting: 1:00 pm**
**Cornell AgriTech, Jordan Hall Second Floor Auditorium, 630 W North St, Geneva, NY 14456**

The NYS Dry Bean Meeting is back in person this year, and will be paired with the annual Dry Bean Cutting Event! The morning meeting will include market updates, presentations on the latest dry bean research in New York, and incorporating NY dry beans into schools. 2.0 DEC credits available.

COST: $10 for CVP enrollees; $15 for Non-enrollees. See the full agenda and REGISTER ONLINE at CVP.CCE.CORNELL.EDU.

The Dry Bean Cutting will follow the meeting and showcase the canned dry beans from the 2022 Dry Bean Variety Trial.

Lunch will be provided in between the two events. Questions? Contact Margie Lund at mel296@cornell.edu, 607-377-9109.

## Oswego Co. Muck Onion Growers' Pre-Season Roundtable Meeting Featuring Nematodes

**March 22, 2023 (Wednesday) | 1:00 pm - 3:00 pm**
**Duskees Sports Bar & Grill, 8 Bridge St, Phoenix, NY 13135**

Muck onion growers are encouraged to join us for this FREE open discussion about pathogenic nematodes. Share your experiences and help design research trials and experiments for 2023 to better understand and manage this pest. See the full agenda at CVP.CCE.CORNELL.EDU. 2.0 DEC credits will be available.

## Pre-Season Elba Muck Onion Grower Roundtable Meeting

**March 23, 2023 (Thursday) | 10:00 am - 12:00 noon**
**Big O Farms, 5520 North Byron Rd, Elba, NY 14058**

Attention Elba muck onion growers! Share your experiences as we provide our updates on our perennial sowthistle research, onion thrips and Iris yellow spot virus trials. Your input will help us develop research plans for the 2023 field season! See the full meeting agenda at CVP.CCE.CORNELL.EDU. 2.0 DEC credits will be available (categories 1a, 10, and 23). This event is FREE!

## 2023 DEC Special Permit Training

**April 11, 2023 | CCE Wayne County, Newark, NY**
**April 12, 2023 | CCE Orleans County, Albion, NY**

Special Permit Training is back in-person this year. Special Permits (SP) will relieve the certified pesticide applicator from "on-site within voice contact" supervision of non-certified pesticide applicators when they are handling federally-restricted-use pesticides for which they hold a Special Permit. The 8 specific labels covered: **Endigo ZC, Warrior II with Zeon Technology, Agri-Mek SC, Beseige, Leverage 360, Danitol 2.4EC, Mustang Maxx, and Lannate LV**.

**Pre-registration required.** For details and to register for either location, visit LOF.CCE.CORNELL.EDU/EVENTS.PHP

**Cornell Cooperative Extension**
**Cornell Vegetable Program**

480 North Main Street
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VegEdge is the highly regarded newsletter produced by the Cornell Vegetable Program. It provides readers with information on upcoming meetings, pesticide updates, pest management strategies, cultural practices, marketing ideas, and research results from Cornell University and Cornell Cooperative Extension. VegEdge is produced every few weeks, with frequency increasing leading up to and during the growing season.

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**Cornell Cooperative Extension**
**Cornell Vegetable Program**

For more information about our program, email cce-cvp@cornell.edu or visit CVP.CCE.CORNELL.EDU