Cornell Cooperative Extension | Cornell Vegetable Program

VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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Greenhouse Transplants – Keep It On the Level!

Judson Reid, Cornell Cooperative Extension, Cornell Vegetable Program

Most of our work with vegetable crops in April involves transplants in greenhouses. Nutrient deficiencies, pests and root rots are challenges this time of year and growers understandably look for solutions such as fungicides and fertilizers. However sometimes the cause of the problem can be straightened out with no additional chemicals.

Benches (Tables)

The importance of a quality growing surface for flowers and vegetable transplants is often overlooked in our mad attempt to balance light, temperature, fertilizer and moisture for our crops in springtime. However, a clean, well-drained bench or table can actually solve many of the challenges we are trying to address with crop inputs such as water, fertilizers and pesticides. A level table improves drainage for transplants, which can help decrease problems such as high salts, root rots, and nutrient imbalances. Where tables are uneven, low spots will be overwatered which slows growth as the plants struggles through a perpetually saturated root zone. Our observation is that wooden benches or tables tend to warp over time with moisture, weight, and heat. This leads to patchy growth of transplants. Further, wooden benches tend to hold onto moisture more than steel, which creates an environment for pathogens and pests.

Onion transplants give us a clear indication of where low spots are in the greenhouse benches. These areas become overwatered as we seek to keep the high spots moist. Overwatering leads to root rots, pillbugs, and nutrient deficiencies. *Photo: J. Reid, CCE*

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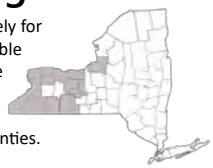
About VegEdge



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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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.

Contents

The next issue of VegEdge newsletter will be produced on May 3, 2023.

Accumulated Growing Degree Days, 4/17/23

Nina Gropp, CCE Cornell Vegetable Program

Accumulated Growing Degree Days (AGDD)
Base 50°F: April 1 - April 17, 2023

Location**	2023	2022	2021
Albion	88	26	52
Appleton	84	22	42
Arkport	99	12	43
Bergen	93	23	50
Brocton	103	24	68
Buffalo*	75	21	75
Ceres	81	11	56
Elba	87	23	52
Fairville	107	25	50
Farmington	111	25	50
Fulton*	100	19	60
Geneva	108	26	52
Hammondsport	103	23	47
Hanover	89	24	66
Jamestown	94	14	63
Lodi	125	36	55
Lyndonville	85	24	45
Niagara Falls*	81	26	48
Penn Yan*	111	20	52
Rochester*	105	28	53
Romulus	98	23	54
Sodus	105	28	55
Versailles	NA	20	70
Waterport	82	21	37
Williamson	89	24	44

* Airport stations
** For other locations: http://newa.cornell.edu

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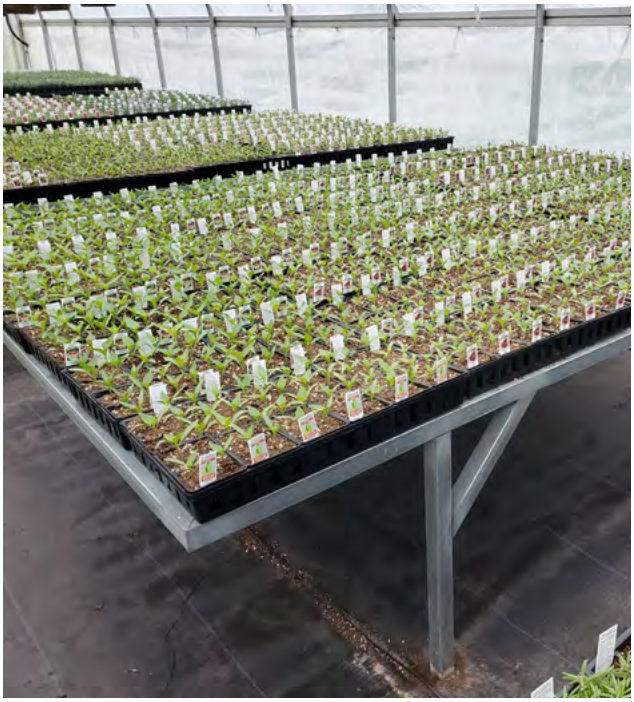
One of the unique pests we see in these situations is pillbugs (and/or sowbugs). These shelled crustaceans can actually be thought of as beneficial, when their population is a modest part of an overall soil ecosystem. However, in a transplant greenhouse they can nibble on roots and stems, and be a general nuisance, particularly if retail customers object to their presence. There are a couple of pesticides labeled for pillbugs; Anitxx Plus is a combination of iron phosphate and spinosid, giving us a certified organic option to control them. Scimitar (lamda-cyhalothrin) is a restricted use pyrethroid with a greenhouse label. But again, better than applying any insecticide, would be to have a level floor and bench to provide uniform drainage.

Wooden benches are less expensive that steel, however they create additional moisture and hiding spaces for pillbugs. *Photo: J. Reid, CCE*



Aluminum or other impervious surfaces decrease pathogens and pests such as pillbugs. These sturdier benches also stay level when placed on a level floor. *Photo: J. Reid, CCE*

Adjuvants 101: What Growers Should Know

Daniel Bergman, Ph.D., Technical Representative, Nutrien Ag Solutions, with contributions by Joe Vaillancourt, Adjuvants Product Manager, Nutrien Ag Solutions; originally printed in VegEdge in April 2019, edited by Christy Hoepting, CCE Cornell Vegetable Program for 2023 reprinting

If you want to maximize your crop yield every year, you need to understand adjuvants. Defined broadly, **an adjuvant is a product that enhances the ability of another product to work more effectively.** Adjuvants don't contain pesticidal active ingredients; instead, they aid active ingredients in overcoming environmental and equipment-based fail factors to maximize application performance.

Of course, in reality, adjuvants are much more complex than that. There are many different types, and it's important to know which types to use in which situations. Using the wrong kind of adjuvant in certain conditions can actually cause more harm than good.

That's why the best advice on adjuvants that I can share with growers is this: ***Read The Label***. If an adjuvant is recommended for use with a specific product, the label on that product will say so. It will also provide additional important information, such as adjustments to make if you're applying on a very hot day, have the wrong spray-tank pH, or if you're dealing with high winds.

Unfortunately, reading the label can sometimes cause additional confusion, especially when you're mixing multiple products into a single tank. That's when a deeper understanding of adjuvants is extremely helpful.

With that in mind, let's talk about what the types of adjuvants are, how they work, and what you need to know.

Types of Adjuvants

There are five main categories of adjuvants. They are:

- **NIS (non-ionic surfactant):** The most commonly used adjuvant, NISs are water-soluble and aid with coverage on the plant as well as with uptake. They're considered the workhorse of the industry because of their leaf-wetting ability and common use recommendations by many pesticide labels.
- **COC (crop oil concentrate):** Mostly used with herbicides, COCs drive active ingredients into plants by helping with uptake and penetration.
- **MSO (methylated seed oil):** Like COCs, MSOs are oils, but they act more aggressively than COCs. In other words, they accelerate the plant's uptake of active ingredients. They're also usually used with herbicides.
- **Organosilicones:** These are silicon-based adjuvant systems that provide *extreme* wetting and aid in uptake and penetration. You have to be careful with 100% organosilicones products when applying to crops with upright leaves such as onions, because they can run the spray solution off the leaf of the plant and potentially running down into the neck of the onion, causing an excessive accumulation of spray solution. **It's usually better to use silicon blends, which combine organosilicones with an oil or NIS.**

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- **Spreader-stickers:** Most adjuvants in this category are more "stickers" than they are "spreaders," so the term is a bit of a misnomer. These are non-ionic adjuvants that impart adhesiveness to the pesticide solution, helping pesticides or fungicides to stay on leaves longer and resist being washed off by rain or irrigation.

How Adjuvants Work

Adjuvants work in a few different ways, all of which are designed to help other pesticidal products work more effectively. Adjuvants can:

- **Modify droplet size.** Put simply, adjuvants can make the droplets coming out of your sprayer larger, mid-ranged in size, or smaller. On a windy day, having larger droplets (500+ microns) means less drift, but larger droplets are more susceptible to bouncing or running off the leaf surface. Smaller droplets (< 150 microns), on the other hand, are more susceptible to drift. Most of the time, it's best to strive for a mid-range droplet (150-500 microns) for optimum drift management, leaf retention and coverage.
- **Increase droplet retention.** Droplets that run off the surface of a leaves aren't very effective at delivering pesticidal active ingredients to the plant surface. Adjuvants that retain spray droplets on the leaf surface are best.
- **Improve leaf wetting.** Spray solutions tend to poorly wet the leaf surface and do little good when applied to crops that have very waxy leaf surfaces like onions and cabbage. Adjuvants help lower droplets' surface tension so the pesticidal products cover the leaf more efficiently and gets through the waxy leaf cuticle and into the plant.
- **Promote better uptake.** Adjuvants can increase the rate of pesticide penetration through the plant cuticle and into the leaf surface.

As you can see, there's a lot to know about adjuvants. And while we can only touch on the basics in this article, having at least some level of knowledge comes in handy, because you can better understand what your product's label is telling you. If you're using a pesticide or plant protectant, it'll tell you to use adjuvants to improve penetration and performance. If you have tough weed conditions, labels may ask you to go with an oil-based adjuvant (a COC or MSO). If conditions exist that may cause a higher concern of phytotoxicity, a NIS recommendation may be the right answer.

Adjuvants and Tank Mixes

It's entirely possible that a single tank mix will involve multiple pesticide products with each of their own adjuvant recommendation. While that isn't necessarily an **issue it's on you to determine whether your particular mix will result in adjuvant conflicts.** The first place to start is to go through your full list of label adjuvant instructions and sort them from most to least restrictive. If you give first consideration to your most restrictive instructions and go step by step, you'll be able to avoid most conflicts.

Sometimes you have instructions on two products that are in direct conflict with each other. Here's an example involving an herbicide Chateau® and an insecticide Movento® that you may want to use in very close proximity in onion (we know this combo should not be tankmixed). Chateau's label tells you not to use an adjuvant, because that will result in the onion taking up too much of it too quickly, resulting in excessive phytotoxicity (e.g. leaf necrosis). Movento, however, says it requires an adjuvant that aids in uptake to achieve maximum performance. Which do you spray first?

The solution: **Apply Chateau as directed, wait three to five days, then come back with Movento combined with an adjuvant** that improves penetration. Be sure to follow the label instructions.

Check your Conditions

Temperature

You can have an encyclopedic knowledge of products and adjuvants and still run into issues. That's because pesticide products and adjuvants aren't always the only two variables at play. Heat, for example, is an important factor to consider. **If you're spraying on a hot day, you'll want to avoid high rates of oil-based adjuvants.** Oil-based products tend to have greater wax solubility at high temperature, which can too aggressively dissolve the waxy surface of the leaf. Obviously, that's bad. **Instead, go with an NIS.** It's water-based and more forgiving on a hot day. (This is one of the reasons NISs are considered an industry workhorse; they're the best option in a wide variety of situations.)

Water Hardness

Another factor that **many growers may overlook is the quality of the water they use in their tank mix.** Many municipalities have hard water, which means it has high levels of calcium, magnesium or iron dissolved in it. These hard water metals bind with pesticide actives and built-in emulsifiers, thus reducing application efficacy.

Don't underestimate the importance of checking the hardness of your water. It's an issue that can directly impact your pesticide use efficiency and yield if it isn't addressed properly.

Water pH

While not as important or common as water hardness, the pH level of your water is also worth checking. As with hardness, this is easily checked using readily available test strips. **Ideally you want your spray-tank water to be neutral or slightly acidic.** If anything, your water supply is likely to have a higher pH than is ideal, but an acidifier will easily help with that needed adjustment.

Excessive Acidification

If you're using metal-based fungicides (such as those that include copper or tin), don't use an adjuvant that reduces pH and thus increases the acidity of your mix. If you acidify your tank mix too much, you can end up with too much copper or tin available. This in turn can cause plant phyto.

Read the Label!

I said these three little words a few times already, but it's worth repeating: ***read the label*.** The vast majority of the time, the labels on the products used in your tank mix will tell you everything you need to know about which adjuvants to use and when to use them. Best of luck this season!

Anticipate and Avoid Maggot Damage with Forecasts

Elizabeth Buck, Cornell Cooperative Extension, Cornell Vegetable Program

Spring is a time when we all eagerly welcome the reinvigoration and return of our favorite seasonal species. Seed Corn and Cabbage Maggots are not two of them.

Seed corn maggots are a problem in large seed crops like corn, peas, beans, and onions. They are attracted by decaying organic matter like fresh manure or green material. They are a larger problem in areas that were converted out of grass hay or sod.

Cabbage maggots feed on cole crop roots and stems. They are a major concern during transplanting and hardening off stages. Onion maggots attack onions and can kill young plants. Plants that survive can have bulb damage and be unmarketable.

The developmental stage progression for both these pests are well-characterized by growing degree days, a method for counting heat accumulation. There are good forecasting models that combine weather observations, the upcoming forecast, and the known pest development processes as a function of growing degree days to predict the emergence, main, and peak flight periods.

NEWA is a weather station network that has a lot of pest and disease forecasts, including for seed corn, cabbage, and onion maggots. NEWA has an easy-to-use web platform where you can select a station from a map or search list. To find the crop forecasting tools, simply scroll down or use the tab on the upper right for the full list. The website will remember your station selection as you move between forecasts for different pests and diseases.

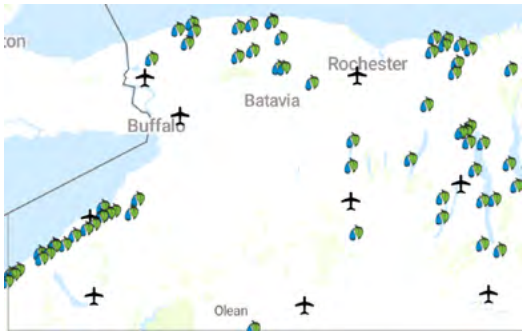

Figure 1. Map of NEWA stations locations across the Cornell Vegetable Program area. The NEWA system also uses airport weather stations.

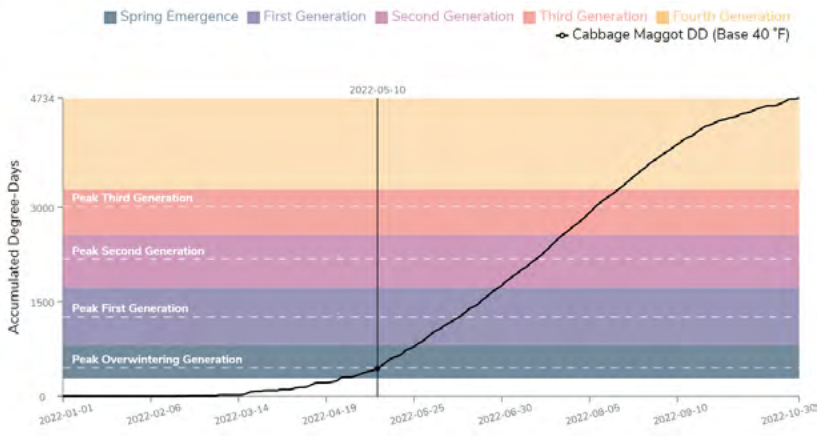

Figure 2. Cabbage maggot results for May 10, 2022 (last year) in Geneva. The curved black line charts GDD40 accumulation and each colored band represents one generation of cabbage maggot. The dotted line running across each band represents the peak flight mark. You can see that on May 10, 2022, Geneva was at peak flight for the overwintering cabbage maggot generation.

For folks without a NEWA station nearby or who aren't into web-based forecasts, you can track GDDs yourself to time your preventative controls and pest avoidance steps.

Currently, seed corn maggot forecasts are based on the accumulation of Growing Degree Days (GDD) above 39 degrees (GDD39) since January 1. The overwintering generation flight peaks around 360 GDD39 and lasts until about 800 GDD39. Work is underway to further enhance the forecasting model by including landscape and spatial elements.

Cabbage maggot and onion maggot both count GDDs above 40 degrees (GDD40) from January 1.

- The overwintering flight of cabbage maggot starts around 288 GDD40. This roughly aligns with the bloom window for the wild plant Yellow Rocket. The flight reaches 50% around 450 and 95% around 700. There are 3 subsequent flights throughout the summer. They peak sequentially around 1260 +/- 59 GDD40, 2176 +/- 38 GDD40 and 3014 GDD40. The biofix indicator for the second flight is day lily bloom, Canada thistle for the third generation, and New England Aster for the fourth flight.
- Overwintering onion maggot adults begin to emerge between 290 and 490 accumulated GDD40, starting from January 1. The flight peaks between 610 and 850 GDD40; you can use 735 as an approximation for peak flight. The later two generations of onion maggot don't typically cause appreciable damage to established crops.

Attract and Maintain Pollinators on the Farm

Robert Hadad, Cornell Cooperative Extension, Cornell Vegetable Program

Some years ago, I ran a small trial comparing cucumber marketable yields where strips of buckwheat were planted to attract native pollinators vs. cucumbers planted away from any other flowering plants. Part of the study was to survey the types of native bees and frequency of visits to cucumber flowers. The cucumber rows planted near buckwheat had over 33% higher marketable yields (straight fruit, full size) than the control cucumber plot which had many curved and partially pollinated stunted fruit. There were 9 native bee species besides the Italian honeybee visiting cucumber flowers (12 bee visits in 5-minute time intervals). The control plot had the honeybee and 3 native bee species with only 3 visits per flower in 5-minute intervals. There were also many parasitic wasps and other beneficial insects seen routinely crossing back and forth from the buckwheat strips to the cucumber rows. Anecdotally, few cucumber beetles were seen feeding on those cucumbers than the control. So there is something to be said about attracting native pollinator populations to your fields.

An in-depth article on pollinators, ***Improving Pollinator Habitat on the Farm***, written by Hannah Whitehead Shell, UMass Vegetable Program, was published in the April 13, 2023 issue of UMass Extension *Vegetable Notes*. The article includes numerous links to resources and lists of native pollinators and pollinator plants.

Photo by Caitlin Tucker

There are often misconceptions that to have pollinator habitat on the farm means there is a loss of tillable acres. Many pollinator habitat strips can be planted between fields, set back from field edges, or even interplanted among some crops. A simple start can begin with protecting existing areas where pollinators are already attracted to. In many old fields, marginal ground separating fields often has filled in with a diversified array of plants including wildflowers, wild berries, flowering shrubs, and trees. The important part of caring for these strips is to limit pesticide drift there. Don't use the areas for dumping left over spray material or tank wash.

On some farms there are patches of ground that aren't suitable for vegetables but could have deliberate plantings of beneficial habitat put there. A good list of pollinator plants can be found at the site Pollinator Plants Northeast Region. Some of the plants include wildflowers like boneset, wild bergamot, swamp milkweed, asters, and goldenrod. Shrubs and trees include pussy willow, basswood, ninebark, and wild chokecherry.

If you are using cover crops (and most farms should be growing cover crops) can also be pollinator attractors while doing their agricultural duty for your soil. Plants include buckwheat (mow before 50% flowering and can be reseeded) alfalfa, clover, peas, sunflower, and mustards. More information on these can be found at Cover Cropping for Pollinators and Beneficial Insects from SARE Outreach.

If you are running a fresh market operation and are looking for an add-on crop, bouquet flowers can be grown. The flowers attract pollinators as well as being a decent cash crop. It is amazing how fast and how many beneficial insects are attracted and do a great job pollinating and keeping pests down.

If you are considering adding some pollinator attracting crops, let us know and we can assist! We would like to monitor the progress to document more on how these tools work for our produce farms. Contact Robert Hadad at 585-739-4065, rgh26@cornell.edu. ●

300 Farm Workers Trained in Pesticide Safety

24th Annual DEC Special Permit Training Back In-Person in the Cornell Vegetable Program Region

Last week, Cornell Vegetable Program Specialist, Christy Hoepting teamed up with the Tree Fruit Pest Management Specialist from Lake Ontario Fruit Team, Janet van Zoren, and a Spanish Education Specialist from Cornell Agricultural Workforce Development Program to train almost 300 farm workers in pesticide safety in both English and Spanish!

Special Permits 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. ●

Upcoming Events

Virtual Good Agricultural Practices (GAPs) Grower Training

May 2, 2023 (Tuesday) | 8:45 am - 4:30 pm | via Zoom

Good Agricultural Practices (GAPs) is a voluntary food safety audit program requiring minimum standards for the production, handling, packing, and storing of fresh fruits and vegetables. Many wholesale buyers, including grocery stores, schools, and other institutions, require GAPs certification from farms in order to purchase their produce. Farms considering expanding their wholesale markets should attend this training, which will cover:

- An introduction to the GAPs certification program and audit requirements
- Record-keeping and worker training, health and hygiene
- Manure, compost, and wildlife management
- Preharvest, harvest, and postharvest food safety assessments
- Production water management
- Postharvest water use & packinghouse sanitation
- Traceability and transportation
- Writing a farm food safety plan

COST: $25 per farm. REGISTER to receive a Zoom link. For more information, call Elisabeth Hodgdon, 518-650-5323.

This event is brought to you by CCE Oneida Co., CCE Broome Co., CCE Yates Co., the Eastern NY Commercial Horticulture Program, the Lake Ontario Fruit Team, and the Cornell Vegetable Program.

Better Process Control School for Acidified Foods

May 9, 2023 (Tuesday) | 8:20 am - 5:00 pm
and May 10, 2023 (Wednesday) | 8:20 am - 2:30 pm
Cornell AgriTech, Jordan Hall, Geneva, NY 14456

This training course, offered by Cornell's Food Venture Center, covers the FDA requirements for facilities manufacturing shelf stable foods using Mild Thermal Processes, such as acidified foods and Water Activity Controlled Foods. It is is an important educational opportunity for operators, mid-level managers, and employees of food processing plants that utilize thermal processing. Food safety and quality assurance personnel, individuals who work with rigid and flexible packaged food products, academia, auditors, and government inspectors can improve their thermal processing knowledge through this training.

- FDA regulations 21 CFR 108, 113, and 114 require that each processor of low-acid or acidified foods operate with a certified supervisor on hand at all times during processing to prevent public health problems in low acid and acidified packaged foods.
- The course meets USDA FSIS regulations 9 CFR 431 for thermally processed meat and poultry products.
- Subject areas include thermal processing system operations, microbiological food safety, equipment operations, acidification, and container closure evaluation for low acid and acidified canned foods.

COST: $450 per person covers the program, lunch, and the text book. **REGISTER by April 26th** by contacting Gemma Osbourne at 607-227-9137 or gro2@cornell.edu, or Sarah Lincoln at 315-787-2255 or sjl38@cornell.edu.

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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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