Growing degree days (GDD) allow us to "count" the number of time units the plant experiences in the optimal growth zone.

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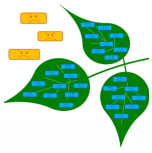

Biopesticides protect plants from diseases in different ways. Learn how biofungicides work and how to use them.

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The 2019 Cornell Commercial Vegetable Guidelines are available: the go-to source for practical information on growing and managing vegetable crops in NYS!

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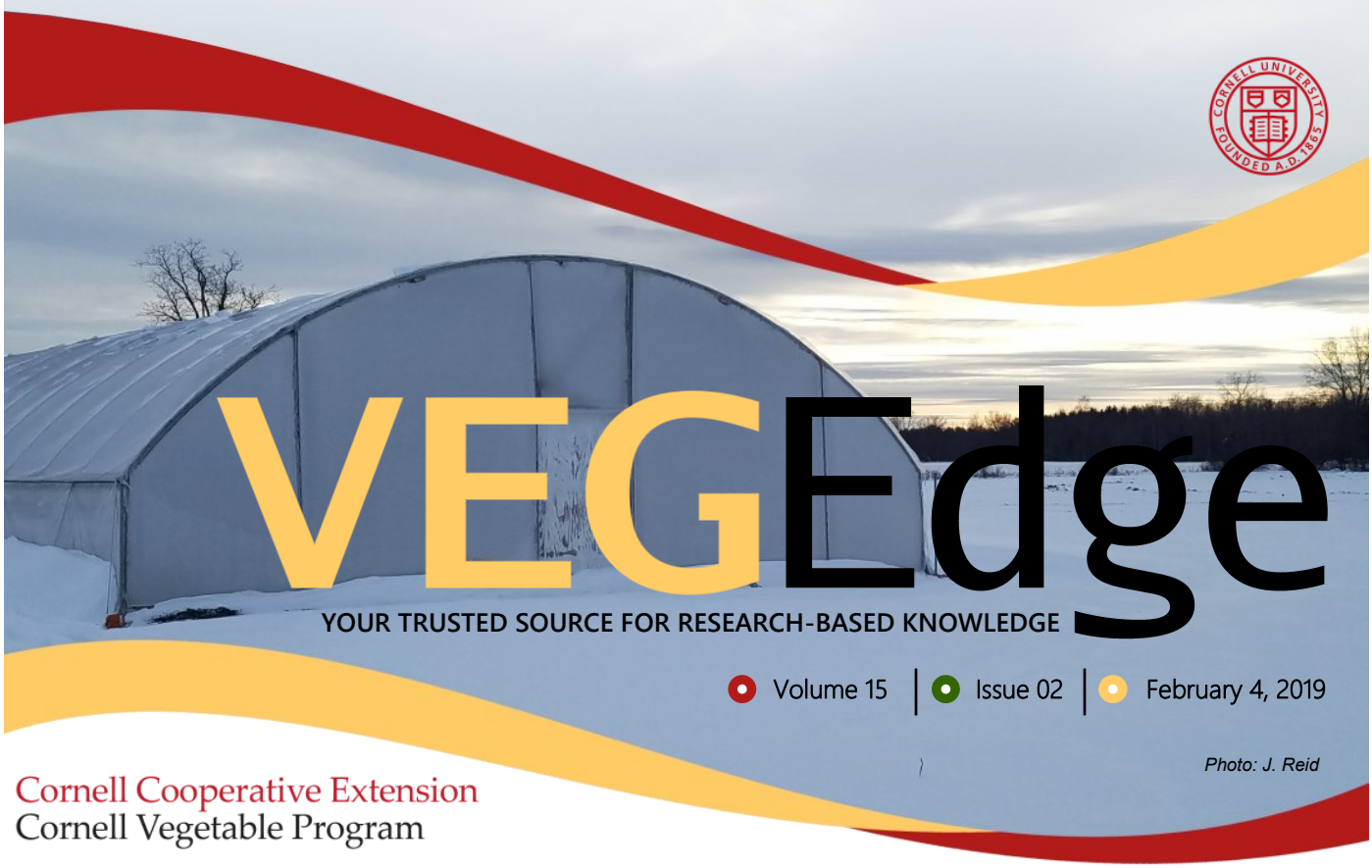

VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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Photo: J. Reid

Cornell Cooperative Extension
Cornell Vegetable Program

What are Growing Degree Days? How They Work and Why They are Useful

Elizabeth Buck, CCE Cornell Vegetable Program

Scheduling crops is inherently difficult. There's not really been much available for use in the planning stages - more or less just the variety's listed days to harvest and your own past experiences. So, that boils down to hoping for a cooperative spring and marking the calendar so many days out to get a sense of the harvest period. Some years that works.

But there are plenty of examples when calendar counting to predict harvest does not suffice. Anyone get caught in a bind with fall cole crops that came in a week or two early last year, which led to blown out, unmarketable heads? How about cool years when the melons are sluggish and you've missed the target window? Plants don't read calendars or seed packets. They do respond strongly to the weather. (I know, ground-shattering information.)

Each crop has a lower and upper temperature at which it ceases to function efficiently. This isn't the same as a frost, which causes crops to cease functioning. That **loss of efficiency is** marked by **reduced photosynthetic output**, and **that delays crop maturity**. In hot (especially dry) weather plants will close the stomate openings on their leaves to reduce water loss. Closing the stomates reduces CO_2 uptake and reduces the amount of sugar that can be produced to maintain the existing plant tissue and support new growth. Hot weather also places other stress related metabolic demands on the plant that ultimately lead to lower -than-normal sugar production. Cool temperatures slow metabolic functioning down and can cause cellular damage, which the plant must repair before returning to efficient growth. The range of temperatures **between the lower and upper threshold tem-**

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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.

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The next issue of VegEdge newsletter will be March 4, 2019.

peratures is the sweet zone in which the crop does most of its growing.

Growing degree days (GDD) allow us to "count" the number of time units the plant experiences in the optimal growth zone. The growing degree day concept is handy because it removes the calendar element of crop timing and replaces it with **a biology-based (biofixed) method**. It is true that GDD can fail to accurately predict crop maturity when there are unusual amounts (high or low) of soil moisture. However, in most cases we do not have excessively wet summers and most fresh market (and an increasing amount of processing acreage) has irrigation capacity. Because they are biologically-based and because we can influence water availability, growing degree days are reliable indicators of crop maturity. Use of GDD to describe, select, and schedule corn varieties has become standard – the field corn industry simply refers to GDD as CHU (crop heat units).

There are a few different ways to count GDDs. I'll go through them using snap bean as an example.

All GDD models begin with selecting a base temperature, which is the lower threshold value for reliable crop growth. In snap beans the base temperature is 50 degrees. The base temperature value differs with crop. For example pea is close to 40 degrees and cantaloupe is about 55. The base temperature can be noted as a subscript; for snap beans it becomes GDD_{50}.

The **Daily Average Method** is the simplest method and does not take hot temperatures into account very well. The formula for a single day is: $\frac{(High\ temp+low\ temp)}{2} - base\ temp.$ For snap bean, hot late July day with a high of 90 and a low of 68 becomes: $\frac{(90+68)}{2} - 50 = \frac{(158)}{2} - 50 = 79 - 50 = 29\ GDDs$. The daily average method is the best one for performing home calculations. The other drawback to this method is that it takes only the daily average temperatures into account, which is fairly coarse data. It cannot differentiate between a cool day with many hours of 60 degree weather and a day with a cold morning but many hoursin the optimal growth zone.

The other two approaches are actually constitute two families of related calculation methods. Both method families rely on math that is more complex than most folks (including me) really want to take on. They use trigonometry style mathematics (specifically sine-based) and some use calculus based math (integration). If you like doing that kind of math by hand, let me know and I'll get you the equations. There are charts that can be used for some of the approaches to determine the degree days.

The BE (Baskerville-Emin) Method does a better job of aligning the GDD count with plant growth during cool conditions. This is also sometimes called the sine method. The BE method also does not take high temperatures into account, so the BE and Daily average methods perform equally well in moderate to hot weather. Much of the older GDD research was based on sine methods. Newer research is either sine or cut-off depending on the specific biology of the pest/disease/weed/crop being studied. Most online GDD tools use a version of the sine method. Avoid the online GDD tools that don't allow you to set your base temperature.

The final set of methods are **Cut-off Methods**, and these do the **best job of matching up accumulated GDD count with the actual crop growth conditions**. The cut-off methods do factor in the negative effects of excessively warm temperatures. The most common cut-off (or threshold) temperatures used by these models is 50 and 86 degrees, which would be abbreviated as $GDD_{50/86}$. These are almost exclusively done as computer models.

Most of the GDD tools are available online only because of the complex math and because they use information collected at regular (often hourly or less) intervals from weather stations. This produces a very fine level of detail and some very accurate GDD counts, and often allows you to select a locations quite close to the farm.

So, to boil it all down with a real world example. I grew snap beans in 2016 and 2017 in Southern Ontario, Canada and, for fun, tracked the calendar, GDD_{50}, and $GDD_{50/86}$ methods to see which best lined up with when the crop was ready. The Calendar method (days to harvest from planting) was off by 3 to 7 days, which is far too many for a processing crop. The GDD_{50} method was pretty close, within a day or two. The $GDD_{50/86}$ method was equally accurate as the GDD_{50} in terms of crop harvest date. However, the $GDD_{50/86}$ method provided a better indication of my eventual yield potential when I looked at the accumulated GDD during flowering. Why? Because these were both hot summers and snap bean flowers do not do well in high heat, which can reduce yields. In the end, either the regular sine method or the cut-off method worked to schedule the crop, but only the cut-off method provided additional detail related to how much heat stress my crop was exposed to during a critical developmental stage.

GDD information is useful in many ways. The above example shows that the cut-off method can be used for crop scheduling and to provide indications of fields that may have lower yield potential due to heat stress. GDD is a powerful tool for use in the modeling of insect pest flights, and is a backbone to many successful IPM pest (and disease) prediction models. Weed scientists use GDD to describe weed growth and to define exactly when weeds do the most competitive damage with crops – when you most need to control weeds. Tracking growing degree days is a good way to start moving your farm into a more information-based management system as an effort to make scouting and spraying tasks more efficient.

Interested in talking with Elizabeth Buck in-person? Join her at her February Office Hours at local CCEs (10:30am - 3:00pm): Cattaraugus 2/7, Niagara 2/13, Chautauqua 2/11, Orleans 2/26

How do Biofungicides Work and How do I Use Them? What do Biofungicides Add to Vegetable Disease Management? Part 2

Amara Dunn, NYS IPM, and Sarah Pethybridge, Cornell

Remember from Part 1 of the Biocontrol Bytes blog post *[also printed in the 12/01/18 issue of VegEdge, pg 4. ed. AO]* that we are studying what biopesticides can add to effective disease management of cucurbit powdery mildew and white mold. After "what is a biopesticide?" the next most common questions about this project are about the specific biopesticides we're testing:

- How do they work?
- Can I tank mix them with other pesticides or with fertilizers?
- Do I need to use these products differently than I would use a chemical pesticide?

Winter squash in our cucurbit powdery mildew biopesticide trial conducted in western NY, eastern NY, and on Long Island in 2018. We are also testing biopesticides for white mold. *Photo: Meg McGrath, Cornell*

Modes of action – How do they work?

As you may recall from the February 2018 post, biopesticides work in different ways, and the five biofungicides we're studying cover the range of these modes of action.

Table 1. Modes of action for five biopesticides, based on product labels and information provided by the project registrant

Product	Active ingredient	Eats pathogen	Makes antimicrobial compounds	Excludes pathogen	Induces plant resistance	Promotes plant growth/ stress tolerance
Contans	*Paraconiothyrium minitans* strain CON/M/91-08; formerly *Coniothyrium minitans*	X				
Double Nickel	*Bacillus amyloliquefaciens* strain D747		X	X	X	X
LifeGard WG	*Bacillus mycoides* isolate J				X	
Regalia	*Reynoutria sachalinensis* extract (giant knotweed plant)				X	X
Serifel	*Bacillus amyloliquefaciens* strain MBI 600		X	X	X	X

Biopesticides protect plants from diseases in different ways. I like to divide them up into the five modes of action (MOAs) in this table.Like many biopesticides, some of the products we are testing have more than one MOA. (See enlarged table: https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/e/7831/files/2019/01/2-MOA-table-all-products-2gjoihq.jpg)

Eats pathogen

The fungus active ingredient of Contans (*Paraconiothyrium minitans* strain CON/M/91-08; formerly called *Coniothyrium minitans*) "eats" (parasitizes and degrades) the tough sclerotia of the fungus, *Sclerotinia sclerotiorum* that causes white mold. Sclerotia survive in the soil from year to year. However, for this strategy to be effective, the fungal spores within Contans have to first make contact with the sclerotia. The time between colonization and degradation of sclerotia is about 90 days.

Makes antimicrobial compounds

The active ingredients in Serifel and Double Nickel are bacteria – same species but different strains. They both produce compounds that are harmful to plant pathogens (antimicrobial). According to the manufacturer, most of the foliar efficacy of Double Nickel is due to the antimicrobial compounds already present in the container. But the manufacturer notes that some of the efficacy also comes from the live bacteria that are responsible for this product's other modes of action, especially the induction of plant resistance (more on this later). The strain of bacteria in Serifel has been formulated so that it contains only living bacteria (no antimicrobial compounds). The manufacturer's goal is for the bacteria to produce antimicrobial products unique to the specific environmental conditions after application. Double Nickel and Serifel are examples of different strategies for using antimicrobial-producing bacteria to fight plant diseases. Our goal is to explain how the products work; not tell you which strategy is better.

Excludes pathogen

The bacteria in Double Nickel and Serifel also can protect plants from disease by growing over (colonizing) the plant so that there is no space or nutrients available for pathogens. How important this mode of action is to the efficacy of Double Nickel depends on the setting and time of year (according to the manufacturer). Cucurbit leaves exposed to sun, heat, and dry air are not great places for bacteria to grow, and pathogen

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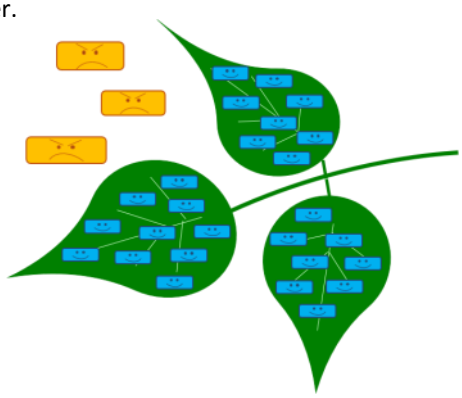

Some biopesticides contain microbes that grow on the plant. These beneficial microbes use up space and nutrients so there is no room for the pathogen, excluding it.

exclusion is not likely to be very important in protecting cucurbit leaves from powdery mildew. The antimicrobial MOA is more important here. Apple blossoms being protected from fire blight in the early spring could be a different story. The bacteria in Serifel tolerate a wide range of temperatures in the field, but the manufacturer recommends applying this product with a silicon surfactant to help the bacteria spread across the plant surface better.

Induces plant resistance

Plants have mechanisms to defend themselves. Some pathogens succeed in causing disease when they avoid triggering these defenses, or when they infect the plant before it has a chance to activate these defenses. Some biofungicides work by triggering plants to "turn on" their defense mechanisms. This is called "inducing plant resistance." It is the sole mode of action of the bacteria in LifeGard, and one of the modes of action for the active ingredients in Double Nickel, Regalia, and Serifel.

Promotes plant growth and/or stress tolerance

The last biofungicide being studied in this trial has a plant extract as an active ingredient, instead of a microorganism. Regalia works by both inducing plant resistance, and also promoting plant growth and stress tolerance. Some of the other products in this trial also share these MOAs. According to the label, some crops treated with Regalia produce more chlorophyll or contain more soluble protein. This final MOA (promotion of plant growth and stress tolerance) is also sometimes shared with "biostimulants". But remember that "biostimulant" is not currently a term regulated by the EPA. This may be changing in the future, so stay tuned. Biostimulants enhance plant health and quality. They are not registered as pesticides, and must not be applied for the purpose of controlling disease. Make sure you read and follow the label of any product you apply.

Best practices – How do I use them?

We'll get to some product-specific details in a minute, but first some notes about best uses for *all five* of these products.

- **They need to be used preventatively.** For biofungicides to eat pathogens, exclude them from plants, induce plant resistance, or improve plant growth and stress tolerance, they need to beat the pathogen to the plant. It takes time for the plant to fully activate its defenses, even if "flipping the switch" to turn those defenses on happens quickly. The same applies to promoting plant growth and stress tolerance. And if you want the beneficial microorganism to already be growing where the pathogen might land, of course you need to apply the product before the pathogen is present. Microbes that produce antimicrobial compounds also work best if they are applied when disease levels are low.
- **Use IPM.** These biofungicides (and most, if not all, biofungicides) were designed to be used with other pest management strategies like good cultural practices, host resistance, and other pesticides. For example, they can be included in a conventional spray program to manage pesticide resistance.
- **Mix what you need, when you need it.** Don't mix biofungicides and then leave them in the spray tank overnight. Some products may need to be used even more promptly. Check the label.
- **Store carefully.** Generally, away from direct sunlight and high heat. Follow the storage instructions on the label.
- **They have short intervals, but still require PPE.** One of the benefits of biofungicides is short pre-harvest intervals (PHIs) and re-entry intervals (REIs). All five of the products we're studying have a 0 day PHI and a 4 hour REI. But they all still require personal protective equipment (PPE) when handling and applying them. Read and follow those labels!
- **Tank mixing best practices still apply.** The table at the end of this post has details about biological compatibility of these products in tank mixes, as reported by the manufacturers. But just like other pesticides, you need to follow the label instructions for mixing. If you have questions about a specific tank mix partner, confirm compatibility with a company rep. Do a "jar test" if you are mixing two products for the first time and want to know if they are physically compatible.

Biopesticides (especially those that contain living microorganisms) often need to be handled and used differently than chemical pesticides. They may be more sensitive to temperature, moisture, or UV light, which may impact the best time or place to apply them. And of course you don't want to tank mix a living microorganism with something that will kill the good microbe. (Cleaning your tank well between sprays is always recommended, whether or not you are using a biopesticide.) The table *[appearing on page 6 of VegEdge]* summarizes details for the five products we're studying provided by the manufacturers – from product labels, company websites, and conversations with company reps. We have not personally tested this information.

We've created handouts that summarize the designs of both the cucurbit powdery mildew and the white mold trials, the modes of action of the five biofungicides we're testing, and the best practices information presented above.

cucurbit powdery mildew biofungicide trial summary

white mold biofungicide trial summary

Stay tuned for Part 3 of this post – results from our first year of field trials!

Thank you to the New York Farm Viability Institute for funding.

continued on page 6

continued from page 5 – How do Biofungicides Work and How do I Use Them? Part 2

Table 2. Exactly how should you use these biofungicides to maximize their efficacy? This table summarizes best practices (as reported by the manufacturers) for each of the five fungicides tested in this trial.

Product	Active ingredient	FRAC	Where to apply	When to apply	Temperature tolerance in field
Contans	*Paraconiothyrium minitans* strain CON/M/91-08 (formerly *Coniothyrium minitans*)	none	soil	Apply to soil (or crop residue) in fall 1-3 days before incorporating into top 2" of soil OR before 0.5-1" rain/irrigation; Spring application is also possible, but 90 days required to destroy sclerotia	Optimal soil temperature: 59-77 °F (tolerates 41-86 °F); sufficient soil moisture essential
Double Nickel	*Bacillus amyloliquefaciens* strain D747	44	foliage, soil, pre-plant dip	Any time	Any temperatures typical of NY growing season
LifeGard WG	*Bacillus mycoides* isolate J	P06	Healthy, actively growing foliage	≥ 3-5 days before disease onset; any time of day	Any temperatures typical of NY growing season
Regalia	*Reynoutria sachalinensis* (giant knotweed plant) extract	P05	Foliage, soil, pre-plant dip	≥ 48 hrs before disease onset; first application requires 48 hrs for full plant defense activation, subsequent applications take 3-4 hrs	Any temperatures typical of NY growing season
Serifel	*Bacillus amyloliquefaciens* MBI 600	44	Foliage; not greenhouse or transplant production	4 days before disease onset in cool weather (50's °F); 1 day in warm weather (70's °F)	50-120 °F

Product	Rainfastness	UV tolerance	Tank mix compatibility	How to store	Shelf life
Contans	NA; rain can help move spores into soil after application	Sensitive to UV light and drying out; incorporate into sufficiently moist soil	Do not tank mix with fungicides (or use within 7 days of application); do not tank mix with fertilizers; tank mix compatible with many herbicides (check with supplier/manufacturer); when tank mixing with herbicides, do not allow to sit in the tank > 4 hrs	Cool dry place, at or below 39 °F; apply as soon after delivery as possible, or store frozen	2 years if stored <39 °F
Double Nickel	Once dry, similar rainfastness to other pesticides	7 days on foliage	Do not tank mix with antibiotics, peracetic acids, or hydrogen peroxides; generally biologically compatible with fertilizers, insecticides, herbicides, and fungicides. Avoid silicon spreaders.	Store at room temperature, away from extreme heat	Dry formulations can be stored for 2 years, 3 years if stored away from extreme heat
LifeGard WG	Bacteria need to be on the leaf for 3 hrs to induce plant resistance	Not a concern, since bacteria only need to stay alive for 3 hrs	Do not tank mix with antibiotics, peracetic acids, or hydrogen peroxides; compatible with many fertilizers, insecticides, herbicides, and fungicides. Avoid silicon spreaders.	Below 77 °F	2 years if exposed to extreme heat; 3 years at room temperature
Regalia	Needs 3-4 hrs to dry and works best with a spreader sticker	Not a concern	Compatible with many commonly used pesticides, fertilizers, adjuvants, and surfactants; keep pH of spray mixture between 6 and 8	35-100 °F	At least 3 years when stored at 35-100 °F
Serifel	Within 3 hrs	Up to 7 days; prefers low UV exposure	Do not tank mix with metalaxyl/mefenoxam, ethylene bisdithiocarbamates (e.g., mancozeb), or chlorothalonil	Cool dry place (room temperature)	3 years if unopened and stored correctly

See page 9 for more details or visit https://cvp.cce.cornell.edu/event.php?id=1083

Mid-Winter High Tunnel Nitrogen and Cover Crop Update

Judson Reid, CCE Cornell Vegetable Program

Vegetable farming with high tunnels in the Northeast can be divided into cold season and warm season crops. In both situations there are varied approaches to managing nitrogen. The Cornell Vegetable Program is working with cooperating farmers and the ENY Commercial Horticulture team to develop improved practices.

The question of how much nitrogen to apply to winter grown spinach and in what form is particularly poorly understood. Anecdotally, the project team has reports from farmers of applications from 200-600 lbs of N per acre in winter high tunnels. Is this too much?!

To begin to answer this question we grew spinach with two transplant dates (Sep 20 and Oct 6 2017) in a 22'x48' tunnel with one layer of plastic and no supplemental heat. There were 4 treatments and 4 replications of each treatment at the two planting dates.

Treatments:

- Urea (46-0-0) – 65 lbs pre-plant incorporated then 65 lbs side-dressed March 4
- Blood Meal (12-0-0) – same rate and timing as urea
- Alfalfa Meal (2.5-0.5-2.0) –applied 130 lbs N pre-plant
- Control – no nitrogen applied

We compared the nitrogen uptake in leaf tissue and the yield between the 4 treatments.

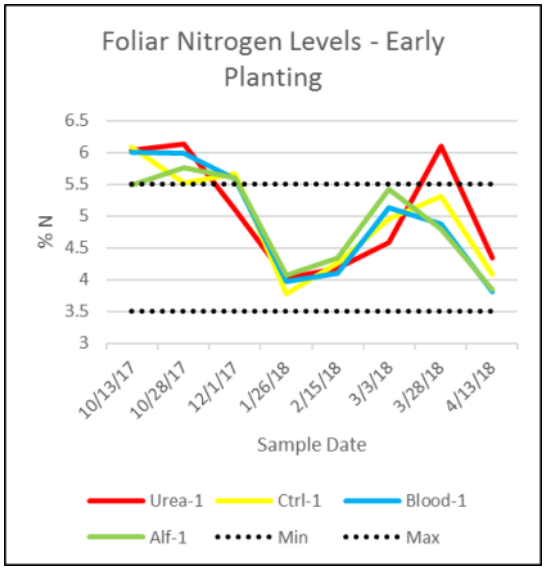

Figure 1. Nutrient levels over time in winter spinach plantings. Sidedressing of urea and blood meal on March 5. Horizontal dotted lines show minimum and maximum levels of %N. At no time did any of the treatments drop below recommended levels.

Our results from that first year trial were surprising.

- The lowest yields were in the alfalfa and control treatments.
- The highest yields were in the blood meal and urea treatments.
- In the early planting:
  - Urea had a 29% **greater** yield than the control.
  - Blood meal had a 24% **greater** yield than the control.
  - Alfalfa had a 2% **lower** yield than the control.
- In the late planting:
  - Urea had a 17% **greater** yield than the control.
  - Blood meal had an 11% **greater** yield than the control.
  - Alfalfa had a 12% **lower** yield than the control.

Early planted spinach responds to 3 sources of nitrogen and none at all (control).

However, our analysis does not show consistent differences between unfertilized plots and 130 lb applications of alfalfa-based nitrogen! Initial impressions are that alfalfa meal may not be the ideal nitrogen source, and higher rates of preplant N unjustified. This winter we are looking at yields under different rates of N.

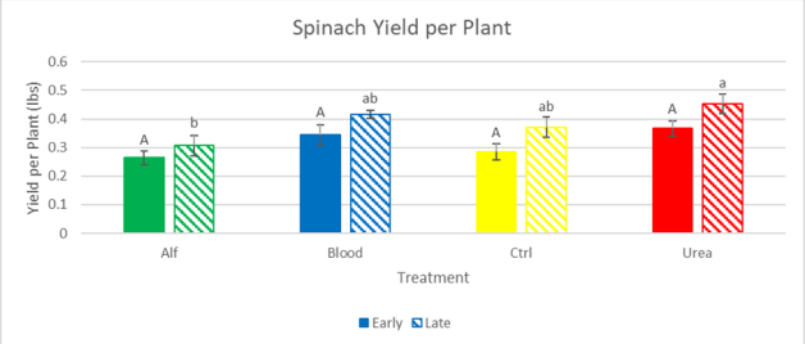

Figure 2. Yields were similar across nitrogen sources.

Our parallel approach is to improve productivity and quality of warm season crops, specifically tomatoes, is through research of winter cover crops. We seek to explore species selection and timing of planting, and the subsequent nitrogen contribution provided to the soil. Integration of winter cover crops into high tunnel systems could decrease nitrogen demand of the summer crop, leading farmers to apply less fertilizers and/or compost. This winter we have plots of triticale, triticale and Austrian winter peas, and fallow plots; with and without row cover; sown on two dates.

It is too early to make any conclusions on the cover crop portion of this work, but we do note considerable visible increase in biomass from earlier plantings. With our recent cold temperatures, the value of row covers is being put to the test! We'll have more updates soon.

This work includes contributions from several farmers and Amy Ivy, Andy Galimberti, Elisabeth Hodgdon, Ethan Grundberg (all from CCE ENY Commercial Horticulture Program), with funding provided by Federal Capacity Funds, NNYADP and NESARE.

Assessing Barriers to Wholesaling for Small-Scale Vegetable Growers

Robert Hadad, CCE Cornell Vegetable Program

Through an USDA-AMS funded grant project, we surveyed fresh produce growers across the state to provide feedback on their experiences with wholesale marketing. Nearly 200 farmers responded and provided enlightening information on how and why growers tried wholesaling, why some stayed in it while others left that marketplace, and why some farmers are apprehensive about trying. A little more than half of the growers told us they were currently doing some wholesaling (53%). Some growers tried wholesaling but went back to selling retail (16%). The remainder, nearly a third, hadn't gone into the wholesale market.

The survey gave us answers to a group of questions as to years of experience, size of operation, types of crops grown, and other insights into the opportunities and barriers as seen by growers. From the survey, we asked for volunteers to be in several focus groups for the study to dig a bit deeper. From the focus groups, 8 farms volunteered for deeper discussions which we call "case studies". The farms fell into two categories. The farms that continue to wholesale and the other were farms that hadn't ventured into that market at all.

The combined conclusions and further actions are as follows:

- Farms need to have a firm handle on their financials.
- Cost of production is boring and time-consuming to pull together but provides invaluable information for making calculated business decisions.
- To wholesale more profitably, focus should be on a small number of crops grown well.
- Understand the buyers' demands.
- Smaller growers don't seem to trust bigger buyers or food industry.
- Be flexible.
- Grow top quality produce for buyers.
- Be consistent with quality.
- Be available when buyers call and place an order.
- Be on top of farm food safety practices.
- Meet packaging demands.
- Labor needs are a major issue.
- Becoming more efficient to reduce costs – need to have training on methods of implementing farm efficiencies.
- Extension or other programs can create educational training to cover the needs of growers investigating wholesale.
- Extension or other programs can help organize farmer work groups so that farmers can share experiences, learn from each other, and help teach each other.

The study's overview, results, and recommendations have all been put into two presentation videos. The presentations can be found posted on our YouTube channel: https://www.youtube.com/user/ccecvp or on our website (cvp.cce.cornell.edu), under the Business tab…

What's Up with Wholesaling?: https://cvp.cce.cornell.edu/submission.php?id=620&crumb=business|business

Wholesale Barriers: Case Studies Overview: https://cvp.cce.cornell.edu/submission.php?id=621&crumb=business|business

2019 Cornell Commercial Vegetable Guidelines Available

Pesticide Management Education Program (PMEP), Cornell University

The 2019 Cornell Integrated Crop and Pest Management Guidelines for Commercial Vegetable Production are now available!

Written by Cornell University specialists, this publication is designed to offer producers, seed and chemical dealers, and crop consultants practical information on growing and managing vegetable crops in New York State. Topics include general culture, nutrient management, transplant production, postharvest handling, organic production, and managing common vegetable crop pest concerns. A preview of the Vegetable Guidelines can be seen online.

Highlighted changes in the 2019 Vegetable Guidelines include:

- Updated pesticide options for economically important vegetable crop pests.
- New pests: beet armyworm in beets; cabbage looper and tarnished plant bug in lettuce and endive; allium leafminer in onions; and Cladosporium, Cercospora, and Stemphylium leaf spots in spinach.

Cornell Crop and Pest Management Guidelines are available as a print copy ($41), online-only access ($41), or a package combining print and online access ($57.50). Shipping charges will be added to your order. Cornell Guidelines can be obtained through many local Cornell Cooperative Extension offices, or from The Cornell Store at Cornell University or call (844) 688-7620.

Upcoming Events

view all Cornell Vegetable Program upcoming events at CVP.CCE.CORNELL.EDU

Produce Safety Regulations (FSMA) 1-Day Grower Training Courses

February 13, 2019 | 8:30 AM - 5:00 PM
CCE Orleans County, 12690 State Route 31, Albion, NY 14411

March 21, 2019 | 8:30 AM - 5:00 PM
CCE Wayne County, 1581 Route 88 North, Newark, NY 14513

Do you need to be implementing farm food safety practices? Does your farm need certification to meet compliance with the new federal food safety regulations for the 2019 growing season? Two upcoming trainings opportunities are for you. Cost and registration TBD. For more information, contact Robert Hadad at rgh26@cornell.edu or 585-739-4065.

Yates County Soil Health and Nutrient Management Workshop

February 13, 2019 | 8:30 AM - 3:00 PM
Finger Lakes Produce Auction barn, 3691 Route 14A, Penn Yan, NY 14527

The Town of Milo Agricultural Committee, Yates County Soil & Water Conservation District, and Yates County Cornell Cooperative Extension are hosting a workshop that will cover a variety of topics including soil health and resiliency, nutrient management, weather events and changing climatic conditions, agricultural invasive species, white mold control in soybeans, harmful algal blooms, and watershed health. Topics covered in the workshop provide the opportunity to receive pesticide credits.

Cost is $5/person pre-registered or $10 day of the event. **RSVP required by February 1st** to ensure meal availability. Register in person at the Yates County Soil & Water Conservation District (YCSWCD) or at the Himrod Farm Supply Store or by mailing a registration form with check or cash to YCSWCD, 417 Liberty St, Suite 1034 Penn Yan, NY 14527. For more information or to register for the workshop, call YCSWCD at (315) 536-5188. Pre-registration is required.

WNY Tick Awareness Forum

February 16, 2019 | 1:00 PM - 3:00 PM
Live event: Frank W Bratt Agricultural Center; 3542 Turner Road; Jamestown, NY. Contact Katelyn Walley-Stoll, CCE-Chautauqua County, at kaw249@cornell.edu or 716-664-9502 ext. 202. Register by Feb. 8 to get a tick removal kit.

Satellite viewing: Cornell Cooperative Extension of Orleans County (Trolley Building), 12690 State Rt. 31, Albion, NY 14411. Contact Katie Oakes at 585-798-4265 or klo54@cornell.edu. Register by Feb. 8 to get a tick removal kit.

Lyme disease and several other devastating tick-borne diseases are on the rise in New York due to an increase in the prevalence of ticks and human-tick encounters. Governor Cuomo and the State Legislature have deemed Lyme and other tick-borne diseases a public health priority and are working to raise awareness about ticks, tick avoidance and management. Join us at a regional forum, featuring a presentation from Lynn Braband of NYSIPM, health department officials, and a panel of community leaders.

You can participate live in Chautauqua County or via satellite viewing at CCE Orleans County. Register for the live event online by visiting www.cce.cornell.edu/chautauqua. Contact the local Cooperative Extension office to register for the live stream event.

Attendees who register for one of these events, at least one week in advance, will receive a FREE tick removal kit. There will also be an opportunity to participate in a question and answer session. The fee is $5/person.

This event is brought to you by the New York State IPM Program and Cornell Cooperative Extensions of Chautauqua, Erie, Orleans, Genesee, Wyoming, and Cattaraugus Counties.

Fresh Market Vegetable Grower Meeting

February 21, 2019 | 1:00 - 3:30 PM
CCE Wayne County, 1581 Route 88 North, Newark, NY 14513

This course will educate fresh market growers on current pest management, food safety, and marketing issues in fresh market crops. Specific topics covered include: managing the weed seedbank, Farm to School marketing opportunities, late blight updates, FSMA On-Farm Readiness Reviews, biopesticides and biostimulants and how they work, wash line equipment cleaning checklist, and a discussion of production problems throughout the 2018 growing season. 1.0 DEC pesticide applicator recertification credits (categories 1a and 23) and 0.5 credits (category 22) will be available.

Cost: $15/person, pre-registration requested by February 18th. Register online at https://cvp.cce.cornell.edu/event_preregistration.php?event=1083 Walk-ins accepted. For more information, contact Elizabeth Buck at 585-406-3419 or emb273@cornell.edu

Upcoming Events

view all Cornell Vegetable Program upcoming events at CVP.CCE.CORNELL.EDU

Webinar: Spotted Lanternfly Basics for Hops, Berry and Vegetable Growers

February 26, 2019 | 10:00 AM - 11:00 AM

This webinar was developed to provide information on Spotted Lanternfly, an invasive pest that has been found to feed on 70 species of plants in both the agricultural and urban segments of the Northeastern United States. The Spotted Lanternfly is an excellent hitchhiker and moves primarily through human movement giving it the potential to show up anywhere in the United States. It is important to know how to properly identify this pest and report is sighting. The webinar will be one hour in length and cover: overview of SLF –biology and identification; overview of hosts; monitoring and management strategies; regulatory update; questions from participants will be encouraged. Co-presented by NYS IPM, NYS Dept of Ag & Markets, and Northeastern IPM Center. For more info and registration links, go to: http://neipmc.org/go/mYey

Designing a Safe and Sanitizable Packing Line

March 6, 2019 | 9:00 AM - 12:00 PM
Hunt County Vineyards, 4021 Italy Hill Rd, Branchport, NY 14418

Join Robert Hadad, CVP vegetable specialist, to learn about how to design a produce packing line that fits your budget and maximizes efficiency and food safety. This workshop will cover what you need to take into account when designing your line, along with how you can modify an existing system to for increased sanitation and efficiency. Robert will also discuss how packing line and packing house design fits in with the new Food Safety Modernization Act requirements.

This event is hosted by CCE Yates County. Cost: $5/person; $10/farm. Pre-register by March 1st. For more information and to register, contact Caroline Boutard-Hunt, Agricultural Educator, CCE Yates County, 315-536-5123 x4375, cb239@cornell.edu.

Soil Health Workshop

March 7, 2019 | 9:00 AM - 2:00 PM
King's Catering, 4031 State Route 5&20, Canandaigua, NY 14424

For full agenda and to register, visit http://www.canandaigualakeassoc.org/get-involved/soil-health-workshop/ or call the Canandaigua Lake Watershed Association at 585-394-5030 or info@canandaigualakeassoc.org by February 21.

Pre-Exam Pesticide Applicator Training and Certification Exam

March 12 and March 14, 2019 (Exam March 15, 2019) | 12:00 PM - 4:30 PM
CCE Wayne County, 1581 Rt 88 N, Newark, NY 14513

For costs and other details, contact Judy Glann at 315-331-8415 x117.

Baskets to Pallets: A Comprehensive Two-Day Introduction to Selling Wholesale

March 14-15, 2019 | 10:00 AM - 4:00 PM
Irondequoit Conference Center, Rochester, NY

The Cornell Small Farms Program 'Baskets to Pallets' course is designed for farmers of all enterprises and will cover building relationships with buyers, customer management and record keeping, pricing, grading and packaging, uniformity and consistency, and food safety, among many other topics! $35 per person includes breakfast refreshments and lunch each day; space is limited. For more information and to register, visit http://smallfarms.cornell.edu/projects/wholesale/

2019 NYS Dry Bean Meeting and Variety Evaluation

March 15, 2019 | 8:30 AM - 12:30 PM
Cornell AgriTech at the NYS Ag Experiment Station, Food Research Lab Conf Rm, 665 W North St, Geneva, NY

Join us for updates on dry bean production and marketing, Western bean cutworm activity, white mold management, breeding, varieties, and the use of dry beans in school lunches. We will also review research priorities and gather suggestions for future educational programs. The second half of the program will feature evaluation of the Cornell dry bean variety trial with 56 dry bean cultivars that were canned by Furmano Foods on display for taste and visual appearance. DEC and CCA credits have been applied for.

Cost: $10 per person, includes lunch. Pre-registration is required by March 12th as space is limited. To pay via credit card, register online at https://cvp.cce.cornell.edu/event.php?id=1116. Or, call Julie Kikkert at 585-394-3977 x404 to reserve a spot and pay with cash or check at the door. For more information or special needs, contact Julie Kikkert.

--> The Food Research Lab is located at the corner of W. North St. and Pre-Emption Rd. From Pre-Emption Rd., enter on Collier Drive, park along Collier Drive or in the rear parking lot and use the Pilot Plant entrance. GPS Coordinates: 42.876667, - 77.009742

Upcoming Events

continued...

Orleans Regional Vegetable Meeting

March 19, 2019 | 1:00 PM - 3:30 PM
CCE Orleans, 12690 NY-31, Albion, NY 14411

Topics will include tomato production, sweet corn weed and pest control, soil borne disease management, and wash/pack line sanitation. 1.75 DEC credits requested in categories 1a and 23. Further details available online or by calling Elizabeth Buck at 585-406-3419.

2019 Garlic School

March 20, 2019 | 9:00 AM - 2:30 PM
First United Methodist Church, 8221 Lewiston Rd (Rt 63), Batavia, NY 14020

Save the date for the 2019 Garlic School! Hear about the latest research trial results and insect and disease issues. Open discussion encouraged! Cost: $15 CVP enrollees; $25 all others. Registration is available online at https://cvp.cce.cornell.edu/event.php?id=1099. Lunch included. For more information, contact Christy Hoepting at cah59@cornell.edu, 585-798-4265 x38, or Robert Hadad at rgh26@cornell.edu or 585-739-4065.

Erie/Niagara Regional Vegetable Meeting

March 26, 2019 | 8:30 AM - 12:30 PM
Newell-Faulkner American Legion Post 880, 2912 Legion Drive, Eden, NY 14057

Topics will include the results of a promising broccoli alternaria trial, precision irrigation scheduling, weed seed bank management, and tarping for weed control in organic settings. There will be a special focus on marketing opportunities, with a comprehensive grower and buyer Farm-to-School panel. Online pre-registration ($15) required by March 24th. Walk-ins accepted. Those with limited internet access may call 585-406-3419 to pre-register.

Produce Safety School

March 27, 2019 | 9:00 AM - 4:30 PM
Cornell AgriTech at the NYS Ag Experiment Station, Jordan Hall, 630 W North St, Geneva, NY 14456

This is a full-day program focusing on putting farm food safety into daily production practices. Topics:

- Surface water testing (how-to) and understanding the results (then what?)
- How to conduct farm assessments (wildlife, pre-harvest, post-harvest…), why, and next steps
- Wash/pack line set up
- Wash equipment and food contact surface clean up
- Using sanitizers in the wash line

And much more! Stay tuned for further updates. Cost: $20 CVP enrollees; $30 all others. Register online at https://cvp.cce.cornell.edu/event_preregistration.php?event=1084 Lunch included. For more info, contact Robert Hadad at rgh26@cornell.edu or 585-739-4065.

Cornell Cooperative Extension
Cornell Vegetable Program

480 North Main Street
Canandaigua, NY 14424

VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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VegEdge is the award-winning 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 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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onions, cabbage, potatoes and pesticide management

Julie Kikkert | 585-313-8160 cell | 585-394-3977 x404 office | jrk2@cornell.edu
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Cornell Cooperative Extension
Cornell Vegetable Program

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