Cornell Cooperative Extension | Cornell Vegetable Program

VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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The Time to Think About Irrigation is Before You Need It

Robert Hadad, Cornell Cooperative Extension, Cornell Vegetable Program

It's best to be prepared and ready to go before the pressure of actually doing the task is upon you. I'm not sure who said that but it rings true. Trying to work on all that's required of an irrigation system shouldn't be left until it is the 3rd day of an endless 90°F weather pattern.

You want to make sure pumps are in working order, pipes are accessible and cleaned out, and all of the connectors and other miscellaneous fixtures are in one place ready to go. When was the last time you changed the oil in the pump? Cleaned out the filters?

Another important aspect of irrigation is water quality. From Ohio State University VegNet Newsletter, May 1, 2021, Matt Kleinhenz covers some considerations in ***Irrigation Water Quality Testing***:

IRRIGATION WATER QUALITY TESTING

The active irrigation season is underway, so let's pause briefly to review why irrigation water quality testing is important, the value of proper sampling, and what to look for in test results. Links to seven resources on the topic follow this brief summary. Reviewing those and similar resources is a good idea.

To summarize, irrigation water can:

1. Have a mineral or chemical composition that damages soil, irrigation plumbing and equipment, or crops directly. That same composition may also lower the effectiveness or complicate the

Irrigating onions in 2019. *Photo by Christy Hoepting, 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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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 May 26, 2021.

COVID-19 Vaccines for Agricultural Employees

Julie Kikkert, Cornell Cooperative Extension, Cornell Vegetable Program

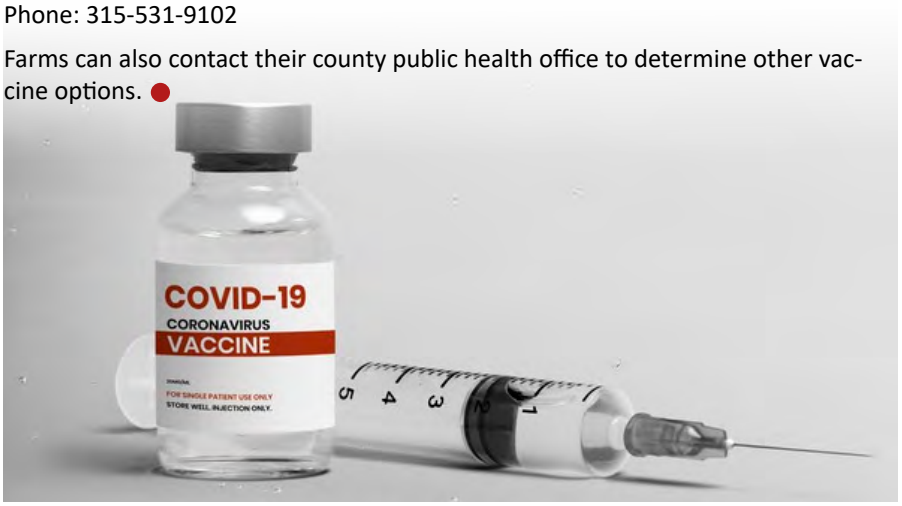
There are several resources for farms seeking information about employee vaccination for COVID-19. In an article from the Cornell Ag Workforce Program entitled Vaccination Questions, Requirements, and Policies for Employees, Rich Stup provides helpful clarifications and resources for asking employees if they are vaccinated and policies regarding vaccination for employment. Farm employers are taking different positions on how they handle employee vaccinations. Read the article at https://agworkforce.cals.cornell.edu

For those farms wishing to provide assistance to workers seeking vaccinations, there are health services which can provide COVID-19 vaccines to farm employees at their place of work.

Oak Orchard Health (Allegany, Genesee, Monroe, Orleans, Steuben, Wyoming Counties) offers a workplace vaccine clinic or organizing employees to come to a convenient Oak Orchard location. Phone: 585-637-3905

Finger Lakes Community Health (Cayuga, Ontario, Schuyler, Seneca, Steuben, Yates, Wayne Counties) can provide bilingual nurses for the vaccines if needed. Phone: 315-531-9102

Farms can also contact their county public health office to determine other vaccine options.



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use of other inputs such as fertilizers of crop protectants.

2. Contain plant pathogens. Of course, using the same water source to wash produce and/or fill spray tanks can raise additional unwanted possibilities. Regardless, the bottom-line is that irrigation water quality affects growers directly and indirectly and in the short- to long-term.

Testing the chemical and particulate (nonliving) composition or characteristics of water used for irrigation is relatively straightforward when major recommendations are followed. Keep the "garbage in-garbage out" principle in mind and collect, handle, and submit your water samples carefully. Also, be mindful that special steps are required for sampling surface (pond, stream/river) versus well water. Consult your testing service for specific guidance, if needed. Testing for plant and/or human pathogens is also important and consulting a plant pathologist and/or human health and food safety specialist is recommended. *[In the Cornell Vegetable Program region, contact Vegetable Specialists, Robert Hadad, at 585-739-4065, rgh26@cornell.edu. Another resource is the Produce Safety Alliance. ed. A. Ochterski, CCE CVP]*

Test results of the chemical characteristics will often include the levels of: pH, total alkalinity, hardness, electrical conductivity, total dissolved solids, and multiple elements. The importance of and acceptable ranges for each are outlined in resources linked below and other publications.

Soil and plant testing are common – consider testing irrigation water, too!

Related Resources

Interpreting Irrigation Water Tests

Using Irrigation Water Tests to Predict and Prevent Clogging of Drip Irrigation Systems

Understanding Your Irrigation Water Test Report

Testing Irrigation Water for Pathogens

Understanding Irrigation Water Test Results and Their Implications on Nursery and Greenhouse Crop Management
Focused on nursery and greenhouse crop management but also a good reference for vegetable growers.

Irrigation Guide from USDA, URCS

Knott's Handbook for Vegetable Growers can be purchased. It includes five pages of handy reference tables on irrigation water quality, including regarding crop tolerance to various characteristics of irrigation water.

2021 Vegetable Pesticide Updates

Christy Hoepting and Sarah Caldwell, Cornell Cooperative Extension, Cornell Vegetable Program

Changes in pesticide registrations occur constantly and human errors are possible. Read the label before applying any pesticide. No endorsement of companies is made or implied. Other pesticide updates that we missed are welcome. Information was last updated on May 12, 2021. Updates after this date may be posted in future issues of VegEdge.

Note: We only included the uses that pertain to vegetables. Several labels include uses in fruit and field crops as well.

NEW REGISTRATIONS (I.E. NEW EPA NO.)

GATTEN Fungicide: (FRAC U13; EPA No. 11581-6-71711; a.i. flutianil; Nichino America Inc). For control of powdery mildew in melon, cucumber, and squash. Restricted use in NYS.

HOWLER Biological Fungicide: (FRAC BM02; EPA No. 91197-3-92488; a.i. *Pseudomonas chlororaphis* ssp. *aurantiaca* strain AFS009; AgBiome Innovations Inc). For control of *Rhizoctonia, Pythium, Fusarium, Phytophthora, Sclerotinia, Colletotrichum*, and *Botrytis* in bulb crops (onion, garlic, etc.), cucurbit vegetables (cucumber, melon, squash, etc.), fruiting vegetables (eggplant, peppers, tomato, etc.), leafy vegetables (lettuce, spinach, etc.), Cole crops (broccoli, cabbage, kohlrabi, etc.), beans, peas, asparagus, and root/tuber vegetables (potato, carrots, etc.). This is an **OMRI-listed organic fungicide** option: (https://www.omri.org/mfg/afp/certificate/6695).

PROVYSOL Fungicide: (FRAC 3; EPA No. 7969-411 a.i. mefentrifluconazole; BASF Corporation). For control of Alternaria, powdery mildew, and rust in legume vegetables (succulent and dry beans and peas), control of Alternaria and black dot in tuberous vegetables (potato, sweet potato, etc.). Supplemental label includes control of Gummy stem blight and powdery mildew in cucurbits (cucumber, melon and squash, etc.) and for control of Anthracnose, Alternaria and powdery mildew in fruiting vegetables (tomato, pepper, eggplant, etc.). Restricted use in NYS.

REVYTEK Fungicide: (FRAC 3 + 7 + 11; EPA No. 7969-406; a.i. mefentrifluconazole, fluxapyroxad, and pyraclostrobin; BASF Corporation). For control of Anthracnose, rust, and other fungal diseases in sweet corn. For control of Alternaria leaf and pod spot, Botrytis gray mold, powdery mildew, and rust in legume vegetables (succulent and dry beans and peas). Restricted use in NYS.

VELTYMA Fungicide: (FRAC 3 + 11; EPA No. 7969-409; a.i. mefentrifluconazole and pyraclostrobin; BASF Corporation). For control of Anthracnose, rust, and other fungal diseases in sweet corn, control of Alternaria leaf and pod spot, Cercospora leaf spot, powdery mildew, and rust in legume vegetables (succulent and dry beans and peas), control of black dot, Alternaria and powdery mildew in potato and other tuberous vegetables. For suppression of late blight in potato. Restricted use in NYS.

LABEL EXPANSIONS AND SUPPLEMENTAL LABELS (NEW PESTS ADDED TO UPDATED VERSION OF LABEL)

SENSTAR Insecticide: (IRAC 23 + 7C; EPA No. 59639-243; a.i. spirotetramat + pyriproxyfen; Valent USA). Label expanded to include control of aphids and whiteflies and suppression of leafminers and thrips in dry and succulent beans and peas.

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FIFRA 2(EE) RECOMMENDATIONS (UNLISTED PEST FOR CROP ALREADY ON LABEL)

HOWLER Biological Fungicide: (FRAC BM02; EPA No. 91197-3-92488; a.i. *Pseudomonas chlororaphis* ssp. *aurantiaca* strain AFS009; AgBiome Innovations Inc). For control of Ascochyta blight in beans, peas, and dry pulses, and control of gummy stem blight in cucurbit vegetables. For suppression of *Alternaria*, downy mildews, *Pestalotiopsis*, and powdery mildews in all labeled crops.

SPECIAL LOCAL NEEDS (SLN)

None

PRODUCTS BEING PHASED OUT/DISCONTINUED

GRAMOXONE SL 2.0 Herbicide: (WSSA 22; EPA No. 100-1431; a.i. paraquat dichloride; Syngenta). **After December 31 2020, only packaging with closed systems will be allowed**. Gramoxone SL 2.0 2.5 gal jugs are not a closed system. **Gramoxone SL 3.0 2.5 gal jugs with closed system packaging will be introduced mid-2021, and all Gramoxone SL 3.0 2.5 gal jugs will be closed-system.** Gramoxone products currently in the marketplace include:

- **Gramoxone SL 2.0** 2.5 gal jugs **registration date 11/18/2019 (new product)**: Not a closed system. Label has requirements for 1) EPA paraquat training, and 2) Certified Applicator license for mixers, loaders, applicators and clean-out.
- **Gramoxone SL 2.0** 2.5 gal jugs registration date 4/5/2017 (old product/label): Does not require additional training and licensing. Applicators can operate under supervision of a Certified Applicator. However, if you buy and mix new product with old product, all applications are required to adhere to the standards of the newest label (EPA training and only Certified Applicators).

CERTIFIED APPLICATOR TRAINING

Applicators must complete an EPA-approved paraquat training listed on the the following website:

https://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators

The training must be completed a minimum of every three years.

- **Gramoxone 3.0 Bulk**. There are bulk tanks filled with the new 3.0 which has i) the higher a.i. load (3lbs vs 2lbs) and ii) does have the new language requiring online training and certified applicator licensing for a user.

Everyone is encouraged to complete the EPA paraquat required training now and to have appropriate personnel obtain the Certified Applicator license since there will be a mix of brands/labels in the market in 2021. The required EPA training for Gramoxone is good for three years.

Use of a.i. CHLORPYRIFOS Insecticides Canceled July 31, 2021. Following cancellation, these pesticides can no longer be sold, distributed, or used in New York State. In addition, these canceled pesticides cannot be stored after the manufacturer's container has been opened.

Chlorpyrifos-containing pesticides with vegetable uses that will be cancelled on July 31, 2021:

- **DREXEL CHLORPYRIFOS 4E-AG Insecticide**: (EPA No. 19713-520; a.i. chlorpyrifos; Drexel Chemical Company).
- **DREXEL LAMBDAFOS Insecticide**: (EPA No. 19713-671; a.i. chlorpyrifos + lambda-cyhalothrin; Drexel Chemical Company).
- **BOLTON Insecticide**: (EPA No. 279-3581; a.i. chlorpyrifos + gamma-cyhalothrin; FMC Corporation).
- **WARHAWK CLEARFORM Insecticide**: (EPA No. 34704-1077; a.i. chlorpyrifos; Loveland Products).
- **WARHAWK Insecticide**: (EPA No. 34704-857; a.i. chlorpyrifos; Loveland Products).
- **LORSBAN 4-E Insecticide**: (EPA No. 62719-220; a.i. chlorpyrifos; Corteva Agriscience).
- **HATCHET Insecticide**: (EPA No. 62719-220; a.i. chlorpyrifos; Corteva Agriscience).
- **YUMA 4-E Insecticide**: (EPA No. 62719-220-1381; a.i. chlorpyrifos; Winfield Solutions).
- **WHIRLWIND Insecticide**: (EPA No. 62719-220-5905; a.i. chlorpyrifos; Helena Agri-Enterprises).
- **LORSBAN 75WG Insecticide**: (EPA. No. 62719-301-10163, a.i. chlorpyrifos; Gowan Company).
- **LORSBAN ADVANCED Insecticide**: (EPA No. 62719-591; a.i. chlorpyrifos; Corteva Agriscience).
- **COBALT ADVANCED Insecticide**: (EPA No. 62719-615; a.i. chlorpyrifos + lambda-cyhalothrin; Corteva Agriscience).
- **CHLORPYRIFOS 4E AG Insecticide**: (EPA No. 66222-19; a.i. chlorpyrifos; Makhteshim Agan of North America D/B/A Adama).
- **QUALI-PRO CHLORPYRIFOS 4E Insecticide**: (EPA No. 66222-19; a.i. chlorpyrifos; Makhteshim Agan of North America D/B/A Adama).
- **VULCAN Insecticide**: (EPA No. 66222-233; a.i. chlorpyrifos; Makhteshim Agan of North America D/B/A Adama).

Note: Users must have a copy of both the approved SLN, 2(ee) or supplemental label, AND the primary label in their possession at the time of application. See section on how to look up pesticides labeled in New York.

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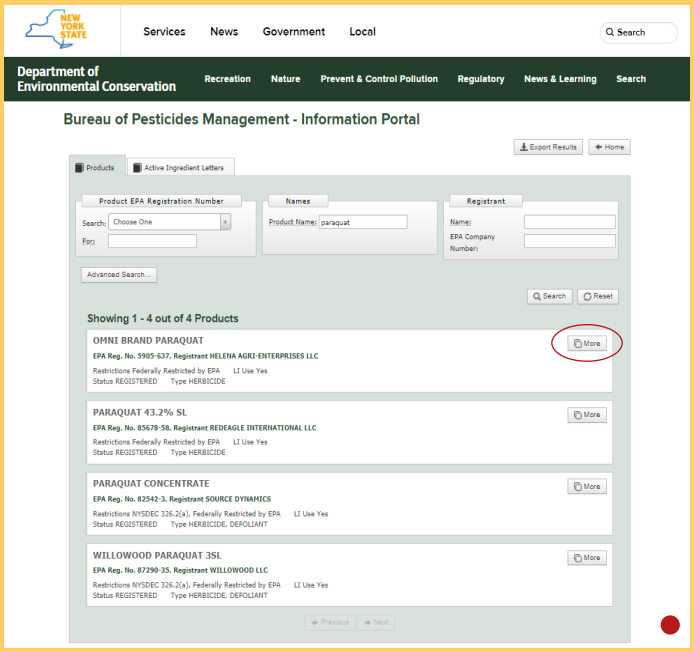
HOW TO LOOK UP LABELS FOR PESTICIDES REGISTERED IN NEW YORK

You can find all the labelling information you need at New York State Pesticide Administration Database (NYS-PAD) portal. It is available at http://www.dec.ny.gov/nyspad/products.

On the top of your screen, you can search by EPA registration number, Product name, or Registrant. In the Advanced Search, there are also options to search by Pesticide Use/Type, Restriction, Formulation, Registration Status, etc.

Enter the information that you are looking for and click "Search". A list of products will come up with some basic information including full product name, EPA registration number, manufacturer and restrictions. For the product that you are interested in, click the "More" button to access a list of the active ingredient(s) and labels. All label types will be presented including primary, supplemental, 2(ee), and 24 (c) labels. The most recent label will be at the top of that list.



Concerns for Seedlings and Transplants in Cold, Wet Soils

Elizabeth Buck, Cornell Cooperative Extension, Cornell Vegetable Program

Hi folks. I get that this cold, wet weather during planting is frustrating, and rightfully so. Field operations are behind, plants are getting too big, cropping schedules are getting off, and the next couple weeks are shaping up to be even more of a frenzy of activity than usual. And to top it all off, the early plantings are out there shivering in their roots, more or less sitting still and awaiting better conditions.

If you'll bear with me, I'd like to pull your attention for a few minutes to focus on those little plants that have been in the cold soils. Aside from direct cold damage (I won't say that 5-letter F word that happened this week), I'm recognizing there's potential for problems with root rot caused by Pythium.

PYTHIUM

Pythium is a rude jerk that thrives by adding insult to injury. Cold, wet, gray conditions giving seedlings a hard time developing and feeding their roots? Roots roughed up and abraded or torn from transplanting? Maybe a bit of herbicide injury or insect root feeding? "Perfect!" says pythium.

Pythium is a widespread, common soilborne oomycete that feeds happily on decaying material. It can come from soil and water and it can be present in greenhouses as well as the field. Pythium can persist pretty much everywhere you find plants, so you should always have it in mind when establishing new plantings both inside and in(to) the field.

Pythium is just about as good at taking advantage of injured and stressed roots as botrytis gray mold is at taking advantage of weakened leaves, flowers, and fruit. Much like botrytis, pythium is opportunistic and problems are highly tied to the weather and environmental conditions. Both thrive under wet conditions and are conceptualized as cool weather diseases. Both can cease to be destructive when the environment dries or gets hot. Both pythium and botrytis have a nasty habit of returning in an affected planting once conditions get wet and cool again.

Unlike botrytis, pythium is first and foremost a root rot. Also unlike botrytis, pythium is not a true fungus but an oomycete. **Oomycetes have swimming spores and more pragmatically, often respond poorly to many fungicides.** Other oomycetes are downy mildews of cucurbits, basil, brassicas, and onions, late blight, and phytophthora blight. All of those also tend to respond to many classes of fungicides poorly, which makes sense since they aren't truly fungi.

Because pythium losses:

- are tightly tied to the combination of favorable environment and stressed plants,
- happen below ground so we tend to miss early symptoms and don't catch until it is severe,
- are tough to stop with most fungicides, and
- happen in roots, which are a very difficult target to cover well with fungicide after planting,

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prevention of pythium is far simpler and more effective than trying to control the weather or having to rescue pythium-plagued plantings.

HOW TO PREVENT PYTHIUM

1. Remediate compaction and improve your field drainage.
2. Use raised beds.
3. Use treated seed. Seed fungicide treatments do provide real pythium protection to early roots.
4. Remember to turn off the sky faucet and fire up the golden orb of warmth.
5. Don't plant into ground that is too wet.
6. Don't over irrigate young plants.
7. Clean your transplant raising facility. No scuzzy water tanks, dirty benches, or unsanitized flats.
8. Use a root protectant during transplant production.
9. Inspect your transplants for root health during growth and/or upon delivery.
10. Keep transplant flats out of direct contact with the ground.
11. Avoid planting into cold ground that will only marginally support that crop's good growth.
12. Rotate fields with recent pythium histories to grain or corn.
13. Plan later planted crops in fields with recent pythium histories.

RECOGNIZING AND TREATING PYTHIUM

Pythium's signature is macerated roots that lose their outer coating and leave only the stringy center behind. You can tug gently on the roots to test whether the outsides slip off easily. If so, pythium is likely to be your culprit. Early on, roots stop having lots of nice bright white hairs and begin to discolor. As the disease progresses, roots die off, the stem constricts at the soil line, the stem may begin to slip off under light pressure, and soft dark brown to brownish-gray lesions may appear on the stem. Crops that have a natural tendency to grow adventitious roots will often try to throw new roots from the stem near the soil line in a desperate attempt to save themselves from the pythium-caused loss of their original root systems. If pythium enjoys favorable conditions long enough, plants eventually wilt, tip over and die. **Plants that survive a noticeable pythium problem will often be stunted or lack vigor and will be at higher risk for returning pythium issues while under heavy fruit load during the wetter fall conditions.**

Above ground symptoms are consistent with other root-associated issues and can be mistaken for water issues or nutrient deficiencies. It makes sense that you will see these symptoms because the roots aren't functioning, but you cannot feed your way through a pythium problem. **You win over pythium by correcting the environment, treating the pythium, and allowing the plant time and gentle support in growing new roots.**

Pythium can be preventively treated in greenhouse transplants by many biologicals. Biologicals include Rootshield, which has had a long history of use in the greenhouse industry, Actinovate, Mycostop, PlantShield, SoilGard, and Cease. **Choice of chemical fungicide depends on crop and treatment setting.** Examples of treatment setting include greenhouse, at transplant, in-furrow, and through irrigation water. **Check the label before use to see if your crop and setting is allowed.** Potential options include Previcur Flex, Ranman, Ridomil and generics, Orondis, and phosphites (group 33) materials. All of these materials can help control oomycetes.

Pythium symptoms: Roots are discolored and the outer portions have slipped off on several leaving just the stringy inside. The root ball is now only about 1/4 its size at transplanting. Further up the stem adventitious roots are developing as protrusions on the left. Higher up the stem and out of focus there is a brown, soft pythium lesion just above the soil line.

Pythium stem lesion on plant that is only showing mild wilting and lack of vigor as its only symptoms. This plant can likely be saved if the environment improves.

Pythium can cause wilting and foliar discoloration. Such symptoms can be mistaken for nutritional problems, but they are really a manifestation of a failing and infected root system that needs less moisture and an oomycete controlling fungicide, not more fertilizer and water.
Photos by E. Buck, Cornell Vegetable Program

2021 Cabbage, Dry Bean, & Processing Vegetable Crops Grants Awarded

Julie Kikkert, Cornell Cooperative Extension, Cornell Vegetable Program

The following projects were awarded by the respective industry funding programs for applied research and extension in 2021. Sincere thanks to the growers and processors who contributed to these funds and to those who served on the advisory committees/boards to review the project proposals.

Cabbage Research and Development Fund:

Researchers	Project Title	Award
L. Sosnoskie C. Hoepting	Optimizing Herbicide Weed Control and Crop Safety in Transplanted Cabbage	$13,500
D. Willett C. Filgueiras B. Nault	Insecticide Evaluation for Best Control of Onion Thrips in Cabbage	$9,500
	TOTAL AWARDS	**$23,000**

Dry Bean Endowment:

Researchers	Project Title	Award
P. Griffiths	Breeding, Evaluation and Development of Dry Bean Varieties that are Highly Adapted to NYS Growing Environments and Markets	$8,025
S. Reiners M. Rosato	Comparison of New and Standard Dry Bean Varieties at Cornell AgriTech (NYSAES)	$8,000
S. Pethybridge J. Kikkert M. Lund	Towards a Durable Management Strategy for White Mold in Dry Beans in New York (2020/21): Sclerotial Survival (PHASE 2)	$6,000
A. Seaman M. Zuefle M. Lund	Soybean Cyst Nematode (SCN) Sampling in Dry Beans	$2,000
M. Lund M. Zuefle K. Wise	Determine the Magnitude and Distribution of Western Bean Cutworm and the Risk to Dry Beans, in the Major Production Areas in New York	$3,400
A. Hamlin	Cool School Food: Encouraging the Use of Dry Beans in School Lunches, and Promoting the Health Aspects of Dry Bean Consumption	$2,000
	TOTAL AWARDS	**$29,425**

The New York Vegetable Research Association and Council (processing vegetables):

Researchers	Project Title	Award
B. Nault	Evaluating Insecticide Programs for Corn Earworm Control in Sweet Corn and a New Seed Treatment for Seedcorn Maggot Control in Snap Bean	$25,283
S. Reiners M. Rosato	NYS Processing Variety Trial Evaluations (Peas, Snap Bean, Corn)	$45,879
L. Sosnoskie A. Taylor	Improving Weed Control and Crop Safety in Snap Beans and Table Beets	$20,119
S. Pethybridge J. Kikkert	Management of Table Beet Growth and Health Through Plant Growth Regulators: PHASE 2	$22,408
S. Pethybridge J. Kikkert	Manipulating Carrot Growth Through Plant Growth Regulators: PHASE 2	$22,821
E. Grundberg L. Sosnoskie	Evaluating OMRI-listed Herbicides for Annual Broadleaf and Grass Management in Organic Carrot Production Systems	$5,800
	TOTAL AWARDS	**$142,310**

Got Bird Problems in Your Fresh Market Sweet Corn? Squawk to Us About Them!

If you grow fresh market sweet corn, researchers from the University of Rhode Island want to hear from you! You are eligible to take this short 5 minute online survey. The survey will gather information on growers bird damage levels to sweet corn and prevention methods used to deter bird damage. **Take the Bird Damage to Fresh Market Sweet Corn survey**.

If you have further questions or interest in this study, contact Dr. Rebecca Brown at brownreb@uri.edu

Muck Onion Herbicide Research Highlight, 2020: Which Would You Rather Use? Heavy Pre- or Post-Emergent Herbicides?

Christy Hoepting, Cornell Cooperative Extension, Cornell Vegetable Program

Would you rather use a "heavy" (= high rates) pre-emergent herbicide program sacrificing some crop safety so that you do not have any weed escapes that would necessitate post-emergent control? Or, would you rather sacrifice perfect pre-emergent weed control by using a "light" (= low rates) pre-emergent herbicide program to ensure excellent onion stand and vigor? When I ask growers this question, their answers are usually "neither". They do not want the pre-emergent herbicide program to result in reduced stand, stunted and/or weak onions, but they also do not want any weed escapes either.

BETTER WEED CONTROL/MORE CROP INJURY VS. LESS CROP INJURY/LESS WEED CONTROL

The benefit of improved weed control resulting from a "heavy" pre-emergent (PRE) herbicide program can result in some crop injury, but it can also reduce and delay weed escapes. If there are weed escapes in this situation, however, stunted and injured onions may have less tolerance for post-emergent (POST) herbicides and take longer to reach the 1.5-2 leaf stage when it is okay to apply them, which in turn buys the weed escapes time to get big fast. Weed escapes greater than 2 inches often require high rates or multiple applications of POST herbicides to control or escape control with POST herbicides and need to be hand weeded at great expense. Alternatively, a "light" PRE herbicide program will have less risk for onion injury and allow the onions to reach 1.5-2 leaf stage faster, be more vigorous and better equipped to withstand necrosis from post-emergent herbicides. But, weed control might not be as good resulting in more weed escapes that will need to be controlled with POST herbicides. Historically, weeds have been more likely to develop herbicide resistance to POST herbicides than to PRE herbicides.

"HEAVY" VS. "LIGHT" PRE-EMERGENT PROGRAM

Last year in a field trial I evaluated "heavy" (= high rates & tank mixes) POST applications of Chateau 2 oz/A alone and with bicyclopyrone 3.42 fl oz/A applied to 1.25-leaf onion, and Buctril 2EC 8 fl oz + bicyclopyrone 3.42 fl oz applied to 2-leaf onion following a "light" and a "heavy" PRE program. The trial ended up being **a nice demonstration of the trade-offs between "heavy" and "light" PRE herbicide programs and the subsequent effects on onion tolerance to "heavy" POST herbicide applications and weed control.**

The "heavy" PRE herbicide program consisted of high per acre rates of Buctril 2EC 1.5 pt + Prowl EC 2 pt + Outlook 11 fl oz (split rate) applied PRE-onion emergence followed by (fb.) Outlook 10 fl oz (split rate) + a high rate of Prowl EC 4 pt + barley-kill herbicide (Select) at flag+ (1st leaf same size as flag). The "light" PRE herbicide program consisted of low rates of Buctril 2EC 1 pt + Prowl EC 12 fl oz applied PRE-onion fb. low rates of Prowl EC 2 pt + Goal 2XL 0.25 fl oz with barley-kill herbicide at flag+ (Table 1). Spring 2020 was very cold, so there were extended periods of time between planting (Apr 2) and PRE-onion (Apr 20 = 18 days) and between PRE-onion and barley-kill (May 21 = 31 days) applications.

The "light" PRE program also received low rates of Prowl H2O 2 pt with the POST applications of bicyclopyrone (it was accidently left out of POST Chateau application) and Prowl EC 2.5 pt at 5-leaf. The "heavy" PRE program also received high rate Prowl EC 4 pt at 5-leaf (Table 2). All treatments were hand weeded 5 days prior to the final PRE applications of Prowl.

MORE CROP INJURY FOLLOWING "HEAVY" PRE

Just 4 days after the barley-kill herbicide application, temperatures sky-rocketed to 87-90 ^{o}F for 3 days, which caused sunscald injury to the 1.25-leaf onions. The treatments were evaluated a few days later on May 29, which was 7 days after barley-kill treatments were applied and 1 day after the 1.25-leaf "heavy" POST herbicide treatments were applied. There was more sunscald injury in treatments that followed the "heavy" PRE program than I those that followed the "light" PRE program. For example, "heavy" PRE fb. Chateau + bicyclopyrone had 14% sunscald compared to only 4% when it followed the "light" PRE program on May 29 (Table 1). Seven days after the 1.25-leaf POST applications on Jun 4, onion injury (11%) and vigor (49%) where Chateau + bicyclopyrone followed "heavy" PRE program was substantially worse than its counterpart that followed the "light" PRE program (injury – 0.8%; vigor – 4%, Table 1). Twelve days after the 1.25-leaf POST applications on Jun 9, Chateau + bicyclopyrone following "heavy" PRE program had fallen even further behind its counterpart following "light" PRE program with 5% more visual injury, 26% less vigor, 15% more stunting and 15% less stand (Table 2). The "heavy" PRE fb. Chateau also resulted in 19% less stand.

Onions treated with the "heavy" PRE program were thinner, shorter, weaker, suffered from Outlook "looping" injury and were possibly slightly behind their counterparts treated with the "light" PRE program (no Outlook), and were less equipped to tolerate being burned from the sun and POST contact herbicides (Fig. 1). Alternatively, the amount of injury caused by Chateau + bicyclopyrone applied at 1.25-leaf following "light" PRE program was totally acceptable (Table 1 & 2).

The "heavy" POST application of Buctril + bicyclopyrone to 2-leaf onion was under much less stressful conditions than 1.25-leaf POST application was, and resulted in less onion injury overall with only minor differences between treatments that followed "heavy" and "light" PRE programs (Table 2).

BEST WEED CONTROL WITH "HEAVY" PRE

At harvest, when you make side-by-side comparisons between "heavy" and "light" PRE programs for each of the three "heavy" POST treatments for each of four weed species and total broadleaf weed control, **of the 15 total comparisons, in 13 of them (= 87%) weed control was better with "heavy" PRE program** (Table 2). Overall

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broadleaf weed control was 90-95% in "heavy" PRE programs compared to 62-83% in "light" PRE programs. The absence of Outlook in the "light" PRE program was the reason this program had less control of spotted spurge than the "heavy" program. Similarly, although yellow nutsedge pressure was too inconsistent to evaluate int his trial, its lack of control in the "light" program without Outlook was certainly noted. In the "heavy" PRE program, inclusion of Outlook and heavy use of Prowl improved control of pigweed and Lady's thumb (LT) over the "light" PRE program, while its heavy use of Prowl controlled Lamb's quarters (LQ) almost perfectly.

The two exceptions where the "light" PRE program was the same as or better than the "heavy" PRE program was with Buctril + bicyclopyrone, because this combination (which I affectionately call the "new power couple") has excellent POST activity on LQ and LT (and also on ragweed and marsh yellowcress!). At these rates, this combination also provides effective PRE weed control.

EFFECT ON YIELD

I did not get as good yield data from this trial as I would have liked to, for a number of reasons. There were no significant differences among treatments (data not shown). The standard POST Chateau treatments yielded numerically the highest with no differences between "heavy" and "light" PRE programs, despite the former have more onion injury and the latter having more weed escapes. In the "light" PRE treatments, "heavy" POST bicyclopyrone + Chateau or Buctril had slightly lower yield by 6-9%. In the "heavy" PRE treatments, these POST bicyclopyrone treatments had lower yields by 19-26%, which was in part due to stand reduction. Although dead onions do not yield, sometimes the remaining onions in a reduced stand compensate by putting on more size and the treatment ends up yielding the same with fewer larger bulbs than their counterparts with normal stand and smaller bulbs. Ideally, "heavy" POST herbicide applications should not be made to injured 1.25 leaf onions.

Table 1. Effect of heavy (= high rates) vs. light (= low rates) of pre-emergent herbicide program in direct seeded onion 'Oracle' on onion vigor and injury. On-farm small-plot trial, Elba, 2020 (Hoepting *et. al.*).

PRE-EMERGENT HERBICIDE PROGRAM Product and rate/A	Heavy PRE	Light PRE
	Buctril 2EC 1.5 pt (PRE) + Outlook 11 fl oz (PRE) + Prowl EC 2 pt (PRE) Outlook 10 fl oz (flag+) + Prowl EC 4 pt (flag+) + Select 2 EC 1pt* (flag+)	Buctril 2EC 1 pt (PRE) + Prowl EC 12 fl oz (PRE) Prowl EC 2 pt (flag+) + Fusilade 1 pt* (flag+) + Goal 2XL 0.25 fl oz (flag+)
7 DAT flag+ (barley-kill) – May 29 (onions 1.5-leaf)		
	Sunscald Injury	
No POST-emergent herbicide	8.2%	5.0%
Chateau 2 oz POST (1.25-leaf)**	9.4%	4.0%
Chateau 2 oz + bicyclopyrone 3.42 fl oz POST (1.25 leaf)**	14.0%	4.0%
7 DAT 1.25-leaf (POST) – Jun 4 (onions 2-leaf)		
	Onion Vigor	
Chateau 2 oz POST (1.25-leaf)**	72%	77%
Chateau 2 oz + bicyclopyrone 3.42 fl oz POST (1.25 leaf)**	49%	83%
	Onion Injury	
Chateau 2 oz POST (1.25-leaf)**	4.5%	4.0%
Chateau 2 oz + bicyclopyrone 3.42 fl oz POST (1.25 leaf)**	10.8%	0.8%

DAT: days after treatment

*Barley-kill herbicide. Flag+: 1st true leaf same size as flag leaf. PRE: pre-emergent to onion, 18 days after planting.

**Post-emergent herbicides were applied to 1.25-leaf onion 1 day before this evaluation was made.

Colors add emphasis to findings: YELLOW ≥ 10% crop injury. ≤ 65% vigor. **GREEN** ≤ 5% crop injury. ≥ 95% onion vigor.

WHAT WOULD YOU RATHER DO?

The need or temptation to use a "heavy" PRE or POST program occurs mostly when weed pressure is heavy for fear of a potentially devastating out-of-control weed problem. The reluctance to not use a "heavy" herbicide program is for fear of devastating crop injury. Herbicides can reduce yields. But so can weeds. When I discuss weed management decisions with onion growers, I ask them what their tolerance for herbicide injury is, what kind of weed pressure they are facing and for POST control options, how big are the onions and the weeds? What are the consequences of not controlling the weeds? An expensive hand weeding ordeal or abandoning the crop? If the onions are going to get hurt, we better kill the weeds. And of course, mother nature always has a say!

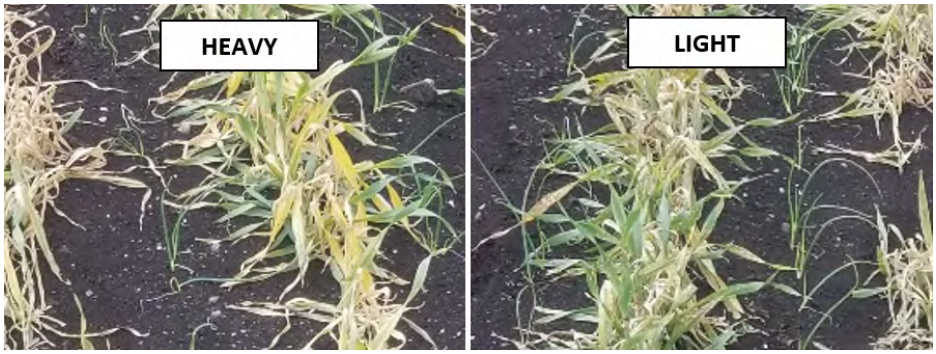

Figure 1. 1.5-leaf onions on May 29, 7 days after barley-kill herbicides were applied. Onions treated with a "heavy" (= high rates) pre-emergent herbicide program (left) were thinner, shorter, weaker, suffered from Outlook "looping" injury and were slightly developmentally behind onions treated with a "light" (= low rates) pre-emergent herbicide program (right). Onions treated with "light" pre-emergent program suffered less crop injury from subsequent "heavy" post-emergent herbicides, but overall weed control was not as good. *Photos: C. Hoepting, CCE CVP*

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Note, many of the herbicide applications made in this trial (e.g. rate per application, maximum use rates, tank mixes, onion stage at time of application, etc.) were not within the label restrictions and were for research purposes only. Bicyclopyrone is not currently labeled on onion. The label is the law.

Table 2. Effect of heavy (= high rates) vs. light (= low rates) of pre-emergent herbicide program in direct seeded onion 'Oracle' on subsequent onion tolerance for post-emergent herbicide application and weed control. On-farm replicated small-plot trial, Elba, 2020 (Hoepting *et. al.*).

PRE-EMERGENT* 12 DAT 1.25-leaf/7 DAT 2-leaf - Jun 9 (onions 2-3 leaf)	Visual Onion Injury		Plant Vigor		Plant Height		Stand	
	HEAVY	LIGHT	HEAVY	LIGHT	HEAVY	LIGHT	HEAVY	LIGHT
POST (1.25-leaf): Chateau 2 oz	5.3%	1.5%	75%	78%	8.2"	8.1"	3.8/ft (-19%)	4.7/ft
POST (1.25-leaf): Chateau 2 oz + bicyclopyrone 3.42 fl oz	6.0%	1.3%	57%	83%	7.3" (-15%)**	8.6"	3.8/ft (-15%)	4.5/ft
POST (2-leaf): Buctril 2EC 8 fl oz + bicyclopyrone 3.42 fl oz	6.8%	7.3%	70%	79%	8.4"	9.2"	4.5/ft	4.4/ft

PRE-EMERGENT* Harvest - Sep 11	Weed Control									
	Pigweed		Lady's Thumb		Lamb's Quarters		Spotted Spurge		Total Broadleaf	
	HEAVY	LIGHT	HEAVY	LIGHT	HEAVY	LIGHT	HEAVY	LIGHT	HEAVY	LIGHT
POST (1.25-leaf): Chateau 2 oz	92%	79%	73%	67%	100%	57%	97%	64%	90%	67%
POST (1.25-leaf): Chateau 2 oz + bicyclopyrone 3.42 fl oz	79%	58%	100%	30%	100%	84%	100%	75%	95%	62%
POST (2-leaf): Buctril 2EC 8 fl oz + bicyclopyrone 3.42 fl oz	88%	64%	87%	95%	98%	99%	92%	72%	92%	83%

DAT: days after treatment.

*See Table 1 for heavy and light pre-emergent herbicide applications. Additionally, "light" PRE program got Prowl H2O 2 pt at 1.25-leaf (May 28) with Chateau + bicyclopyrone and at 2-leaf (Jun 4) with Buctril + bicyclopyrone (accidently left out of POST Chateau treatment) and Prowl EC 2.5 pt at 5-leaf (Jun 24). "Heavy" PRE program also got Prowl EC 4 pt at 5-leaf. All treatments were hand-weeded on Jun 19 prior to 5-leaf Prowl applications were made.

Colors add emphasis to findings: **YELLOW** ≥ 10% crop injury. ≤ 65% vigor. ≤ 50% weed control. **GREEN** ≤ 5% crop injury. ≥ 95% onion vigor. ≥ 95% weed control.

** compared to "light" counterpart

Want to Order Cornell Guidelines?

Most Cornell Guidelines titles have been updated and released for 2021. Don't miss your chance to order the latest edition of these popular references for growers. You can order online through The Cornell Store or call 844-688-7620 to order via phone and pay with a credit card. Enrollees in the CCE Cornell Vegetable Program may use the order form below to place an order and be invoiced (to pay by check).

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2021	Field Crops		$32		$32		$45	
2021	Grapes		$32		$32		$45	
2021	Greenhouse Crops and Herbaceous Ornamentals		$42		$42		$59	
2018	Hops		$32		$32		$45	
2021	Tree Fruit		$42		$42		$59	
2021	Tree and Shrub		$32		$32		$45	
2021	Vegetable Crops		$42		$42		$59	
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The Multiple Ways to Get Your Growing Degree Days (GDDs)

Julie Kikkert, CCE Cornell Vegetable Program

Many of you are already using Growing Degree Days (GDD) to forecast crop and pest development. GDD are a measure of heat units accumulated during a growing season. GDD are more useful for pest forecasts than are calendar days because temperature varies from day to day and year to year. If you need additional information, Cornell Agronomy Fact Sheet Series, Fact Sheet #112: Growing Degree Days (GDDs) is a good place to start. Download the PDF or you can request a copy from our office.

There are three ways to obtain GDD for your farm or area:

1. We will provide a weekly summary for a number of weather stations in our area (see chart below).
2. You can use the GDD Calculator on the Network for Environmental and Weather Applications (NEWA) for weather stations in your area at http://newa.cornell.edu/index.php?page=degree-day-calculator.
3. The Cornell Climate Smart Farming GDD Calculator allows you enter in a specific field location. This is a good tool if you do not have a weather station nearby. The tool tracks weather conditions on a highly refined 2-mile grid and provides a historical recap of GDD accumulation and first/last frost dates for that location. Elizabeth Buck from our program wrote a detailed article on the use of this tool in the 4/3/19 VegEdge available at https://rvpadmin.cce.cornell.edu/pdf/veg_edge/pdf158_pdf.pdf

Accumulated Growing Degree Days (AGDD)
Base 50°F: April 1 - May 11, 2021

Location**	2021	2020	2019
Albion	83	29	74
Arkport	100	19	94
Bergen	97	27	88
Brocton	129	34	111
Buffalo*	124	29	82
Burt	41	27	56
Ceres	119	17	142
Elba	88	24	77
Fairville	88	31	80
Farmington	99	31	82
Fulton*	98	35	89
Geneva	101	33	90
Hammondsport	106	30	95
Hanover	119	30	107
Lodi	110	35	107
Niagara Falls*	81	19	61
Penn Yan*	116	34	109
Rochester*	96	32	115
Sodus	94	32	80
South Bristol	104	31	99
Varick	118	38	109
Versailles	127	27	121
Williamson	68	33	70

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

Cornell Cooperative Extension
Cornell Vegetable Program

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VEGEdge
YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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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 Vegetable Program

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