Learn about the optimum timing for weed management based on weed height. Cultivation tools and herbicides options are discussed.

PAGE 1

Using plastic mulch? What should you do about weed control in plastic mulch beds and between the rows? Here are some considerations and options.

PAGE 5

Read the highlights from our 2017 onion pre-emergent muck herbicide trials.

PAGE 6

There are two primary early-season pathogens of table beets. Provided is a listing of cultural practices and fungicides available to manage these pathogens.

PAGE 10

VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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Photo: Judson Reid

Cornell Cooperative Extension
Cornell Vegetable Program

Weed Size Influences the Effectiveness of Your Weed Management Program

Darcy Telenko, CCE Cornell Vegetable Program

A good weed management program should consist of mechanical, cultural, and biological (if available) tactics in addition to herbicides. A combination of diverse tactics will reduce selection pressure imposed by any single practice, such as the exclusive use of one herbicide, and reduces risk of selecting difficult to control weeds, such as herbicide-resistant weeds. Mechanical weed control tactics includes pre-plant tillage, strip or zone tillage, in-crop cultivation, post-harvest mowing and/or tillage, and hand-weeding before seed set. Cultural weed control tactics include crop rotation, choice of hybrid or variety, early or late planting, nutrient management, row spacing and plant populations, seed bed preparation (stale-seed bed), harvesting techniques, and cover crops. Herbicide tactics should utilize multi-

Photo: D. Telenko, CCE CVP

continued on page 3

VegEdge newsletter is exclusively for enrollees in the Cornell Vegetable Program, a Cornell Cooperative Extension regional agriculture team, serving 13 counties in Western New York.

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.

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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 will be May 23, 2018.

UPCOMING EVENTS

view all Cornell Vegetable Program upcoming events at cvp.cce.cornell.edu

Produce Safety for Broccoli Producers

May 14, 2018 | 2:00 PM
webinar

UVM Agricultural Engineer Chris Callahan, Produce Safety Alliance Director Elizabeth Bihn, and their colleagues will present a free webinar which will include an overview of food safety regulations (coverage thresholds and compliance dates, FSMA, Produce Safety Rule) and broccoli-specific considerations, plus an overview of educational materials being developed through the Eastern Broccoli Project.

Broccoli growers have particular sanitation challenges during cooling and icing, and all vegetable growers are looking for good water management and surface sanitation. Growers considering adding broccoli to their mix may need to make an investment in cooling equipment that meets recent sanitation requirements; this should be an excellent guide for making that investment effectively.

You can find more details about the webinar and a registration form on the Eastern Broccoli Project blog at this link: https://blogs.cornell.edu/easternbroccoliproject/2018/04/24/produce-safety-webinar-for-broccoli-producers/#.Wt991uJmF04.twitter. Those registering specify issues they would like to see addressed.

continued from cover – Weed Size Influences the Effectiveness of Your Weed Management Program

ple herbicides with different mechanisms of action, mixes, sequences, and variability across seasons.

Weeds may escape management for several reasons. These may include the improper selection of a herbicide or tool resulting in marginal activity on the population of weeds in a field, or **poor timing of an application or tool** either the weeds were too large or the seeds escaped exposure to the application and germinated. Environmental factors may also reduce effectiveness. Soil moisture, a rain event, and soil characteristics (pH, texture and amount of organic matter) all can influence herbicide activity or degradation of weeds after cultivation. Finally, application issues such as sprayer skips, improper calibration, and poor spray coverage can lead to weed escapes in a field. In addition to everything that could go wrong, a number of weed species have adapted special reproductive characteristics that make them difficult to control.

Proper timing is extremely important for any weed management program. In general, Pre Plant Incorporated (PPI) and Pre-emergence herbicides need to be in place prior to weed seed germination. Post herbicides are applied after the weed has emerged, and depending on the herbicide mode of action, generally will be effective on weeds up to 4 inches tall (read label for specific information). Cultivation tools also have optimum weed sizes (Table 1). Rotary hoes and flex-tine weeders will not be able to effectively manage 4 -inch tall weeds. They need to be used when weeds are 1.0 inch or less in height. Instead you should use a sweep cultivator to go after these larger weeds (Fig. 1).

When choosing herbicides for management of weeds that have escaped your pre-emergence program keep in mind most herbicides have been designed to control weeds at an **optimum size range**. Once weeds have grown past that range herbicide effectiveness will be reduced. It is critical to follow herbicide label recommendations on crop, rate and timing, weed species, and use

Figure 1.

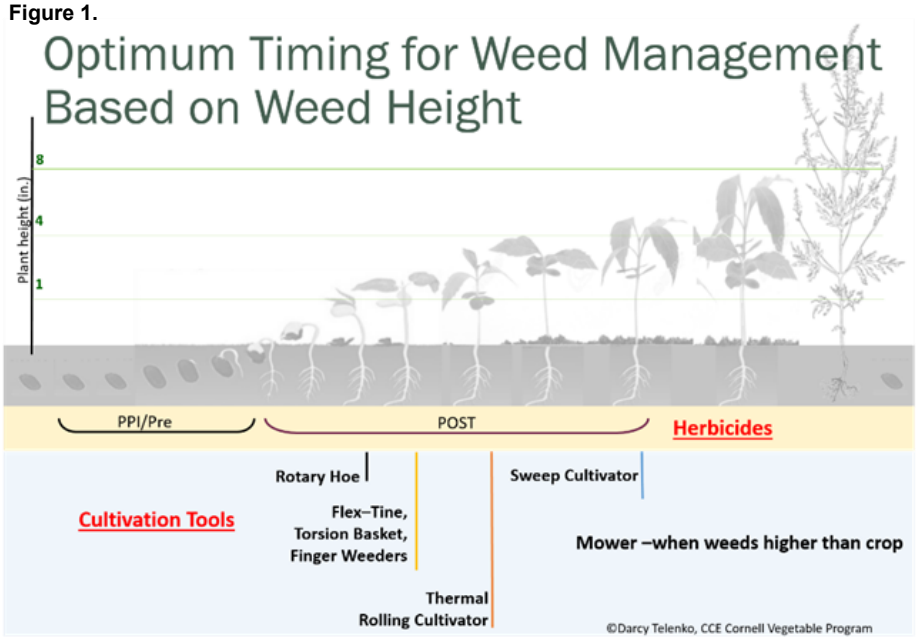

Table 1. Optimum Crop and Weed Size for Cultivation Tools

Tool		Crop Size	Weed Size
Flex-tine weeder		Not emerged; Emerged	1 inch or less
Rotary hoe		Not emerged; Emerged	0.5 inch or less
Sweep cultivator		2.5 inches and greater	Less than 4 inches
Rolling cultivator		10 inches or less	Less than 2.5 inches
Torsion weeders		10 inches or less	1 inch or less
Basket weeders		10 inches or less	1 inch or less
Finger weeder		Emerged	Less than 1 inch
Flexible finger weeder		Emerged	Less than 1 inch
Mower		Emerged with tall weeds	Weeds taller than crop canopy
Flame cultivation		Various stages depending on crop	Broadleaf weeds less than 2 inches

Source: Finney, D. M. and Creamer N. G. 2008. Weed Management on Organic Farms. North Carolina Cooperative Extension Service. 01/2008-BS E06-45788

continued on page 4

continued from page 3 – Weed Size Influences the Effectiveness of Your Weed Management Program

of spray additives. Optimum efficacy will be based on rate and timing of application, the weed size, and environmental conditions. Table 2 lists commonly used post-emergence herbicides and the optimum weed size for control.

Observant records on weed populations, including their distribution and density, will aid in documenting if changes are occurring in a field and allow for you to make necessary adjustments for future weed management plans.

Table 2. Post-emergent herbicides available in vegetables and the general size range of weeds they control

Trade name	Common name	Optimum weed size for post emergence control
AAtrex + Oil	atrazine	broadleaf weeds up to 4 inches tall and pigweed and lambsquarters up to 6 inches tall
Aim EC	carfentrazone	selective broadleaves up to 4 inches tall
Assure II	quizalofop	annual grasses 2-6 inches tall depending on species; perennial grasses 3-24 inches with split applications depending on species.
Basagran	bentazon	2 to 10 leaf stages and 1-10 inches tall depending on species
Callisto	mesotrione	when applied alone weeds < 5 inches
Clarity	dicamba	annual weeds less than 6 inches tall, biennial weeds in rosette stage and perennial weed re-growth in late summer for following mowing or tillage treatment
Fusilade	fluazifop-*p*-butyl	grasses from 1 to 6 inches and not to exceed 3 to 6 leaves depending on species
Goal	oxyfluorfen	weed seedlings up to 4 to 6 true-leaf stage
Gramoxone	paraquat	small annual weeds (broadleaf and grasses); suppresses perennial weeds by destroying green foliage; grasses prior to tillering or after boot stage
Impact	topramezone	maximum weed size range from 4 to 8 inches for broadleaf weeds and 3 to 5 for grasses depending on species
Laudis	tembotrione	broadleaf weeds less than 6 inches and actively growing and grasses prior to tillering and when actively growing
Lorox	linuron	broadleaf weeds up to 6 inches and annual grasses 2 inches tall
Matrix	rimsulfuron	grasses 1 to 2 inches and broadleaves 1 to 3 inches
Poast	sethoxydim	maximum heights 4 to 8 inches depending on species
Raptor	imazamox	maximum size 3 inches
Reflex	fomesafen	maximum growth stages 2 to 8 leaves depending on species
Roundup	glyphosate	low rate weeds up to 6 inches; high rate weeds greater than 6 inches
Sandea/Permit	halosulfuron	actively growing broadleaf weeds 1-3 inches, nutsedge at 3 to 5 leaf stage
Select	clethodim	grass height 2 to 10 inches depending on species
Stinger	clopyralid	most broadleaf weeds up to 5 leaf; wild buckwheat 1-3 leaf; nightshades 2-4 leaf; perennials rosette to bud stage
2,4-D	2, 4-D	young and actively growing weeds

Chlorothalonil/Bravo Shortage

Chuck Bornt, CCE Eastern NY Commercial Horticulture Program; from Vegetable News, 4/26/18

Did you hear about this shortage? Many of you that attended winter meetings probably were made aware that there will be a global shortage of fungicide chlorothalonil or what you may know more typically as Bravo and various other trade names. The shortage is due in part to the manufacturing facilities in China where this product is made have been shut down for various reasons. Chlorothalonil is a broad spectrum protectant used on many crops and also used commonly as a mixing partner with many of our other fungicides as a tool for resistance management.

What do I do? There are other protectants out there such as copper and mancozeb (active ingredient in Dithane, Manzate etc.) but their labels vary by crop and diseases compared to chlorothalonil products. We will do our best to note these differences during the season in the various vegetable crops that we cover in this newsletter and when in doubt, please call one of us to help. The last I heard, there was a little bit of "Bravo" or chlorothalonil containing products in the supply chain, but I can't be sure what's left. Keep in mind that there are a fair number of products (this is not a complete list) out there that are a combination of chlorothalonil and another fungicide such as Quadris Opti (the "Opti" portion indicating that it contains chlorothalonil), Catamaran (chlorothalonil plus potassium phosphite), Elixir (chlorothalonil plus mancozeb) and Ariston (chlorothalonil plus Curzate). However, please be sure to check the labels to make sure the product is labeled for the vegetable crop you are treating. Some of these pre-mixes are good options as they are probably products you would be adding to your tank mix with chlorothalonil anyway.

Weed Control and Plastic Mulches

Chuck Bornt, CCE Eastern NY Commercial Horticulture Program

As the weather warms up and plastic mulches are being applied to get ready for our summer crop plantings, the question of what to do about weed control in the beds and between the beds is a common one that I get. Unfortunately, I don't have a silver bullet for you but have a couple of thoughts. First, there are a few herbicides that are labeled for use under the plastic on a few crops. However, the recommended use is to make the beds first, apply the herbicides and then lay the plastic mulch which is not usually how we manage our plasticulture systems – as we normally like to bed and mulch all in the same pass. And I have yet to see anyone modify their mulch layer to apply herbicides while laying their mulches (if anyone has, please let me know I would love to see it!). The other thing to consider is that many of these products are very sensitive to moisture and often require it to activate them. Lastly, I worry about injury to our crop when using these herbicides, especially as many of you are using water-wheel transplanters which could in theory reactivate the herbicide and concentrate it around the rootball. I think educating your employees planting to make the smallest hole possible and making sure that plant gets off to a good start may be just as good as the pre-plant herbicides! However, if you want to try some herbicides under mulches this is what is labeled to my knowledge:

Herbicides Labeled for Use Under Plastic Mulch	
Herbicide	**Crop(s)**
Devrinol	Tomatoes, Peppers, Eggplant
Prefar	Eggplant, Peppers, Cucumbers, Melons, Squash
Sandea	Tomatoes, Cucumbers, Melons, Squash, Watermelon (need to wait 7 days after application to plant crop)
Prowl H2O	Eggplant

The other question that comes up is how to control weeds between the rows and again, I don't have a silver bullet, but there are certainly more options! The first thing that I would tell you is I do not recommend applying any of these materials broadcast over the top of your mulch before planting! I think you are taking a risk that even after a couple of rains, some of the herbicide may remain on the plastic and with a rain could become concentrated in the planting hole after you've planted – especially in cases where beds are not uniformly full and you have dips in your beds where water can gather on the plastic. I think the best method is to fit the field, lay your plastic and then using either very directed sprays or better yet, a shielded sprayer, apply the herbicides between the beds, just letting the spray contact the shoulders of the bed. I've seen some homemade shielded units made from plastic totes to old wooden apple crates!

My rule of thumb for row middle applications is, if the material is labeled on the crop, then it can be used in the row middles too unless otherwise specified on the label that it **cannot** be used between the rows. Using a pre-emergent or combination of pre-emergents before transplanting is the best strategy in my mind as you minimize the risk of drift and hitting your crop. However, if you can't get right in there to apply them after laying your mulch or planting and weeds are already starting to grow, I would recommend tank mixing in a contact herbicide such as Gramoxone (or other formulations of the active ingredient paraquat) to your pre-emergent materials as a shielded, directed spray. Why paraquat instead of glyphosate (Round-Up etc.)? Paraquat will only kill what it comes in contact with (so coverage is essential). So if a little drift moves onto your plant, it will only kill the area that it comes in contact with and leave some tan spots. Whereas a small amount of glyphosate will translocate and potentially kill or really hurt your crop and I'd rather be safe than sorry.

Photo: J. Reid, CCE CVP

Below is a list of some herbicides that could be used between rows of plastic mulch on various crops. This is not to be used in place of a label as in some instances a product may be labeled on some but not all crops in the same family (for example when I say brassicas, that includes cabbage, broccoli, etc., but these products may not be labeled on all members of the brassica family so please read the label before using).

Herbicides Labeled for Between Rows of Plastic Mulches on Various Vegetable Crops	
Herbicide	**Crop(s)**
Dual Magnum (metolachlor)	Tomatoes, Peppers, Cucurbits, some Brassicas, Lettuce, Onion
Prefar (bensulide)	Eggplant, Peppers, Cucumbers, Melons, Squash, Brassicas, Lettuce
Sandea (halosulfuron)	Tomatoes, Cucumbers, Melons, Squash, Watermelon, Peppers, Eggplant
Prowl H2O (pendimethalin)	Eggplant, Pepper, Tomato, Onion, Brassicas
Reflex (fomesafen)	Tomatoes, Peppers, Eggplant
Dimetric, Sencor (metribuzin)	Tomatoes
Strategy (clomazone + ethalfluralin)	Cucumber, Melon, Pumpkin, Squash

Highlights from 2017 Onion Pre-Emergent Muck Herbicide Trials

Christy Hoepting, CCE Cornell Vegetable Program

Prowl EC vs. H2O – First Year Results

Even though Prowl H_2O has been labeled in onions for several years, onion growers have generally stayed with EC formulation, because it is believed that it also has POST control of tiny newly emerging weeds. In 2017, we compared single applications applied pre-emergent to direct seeded onions of Prowl EC 2.4 pt, 3.6 pt and 4.8 pt to Prowl H_2O 4 pt (only rate on label).

Prowl EC 2.4 pt vs. 3.6 pt vs. 4.8 pt: rate matters depending on weed species

- There was no difference in weed control between Prowl EC 3.6 pt and 4.8 pt for control of smartweed (SW), marsh yellowcress (MYC) or Lamb's quarters (LQ).
- For hairy galingsoga (HG), only the 4.8 pt rate provided greater than 50% control.
- For pigweed (PW), control increased as rate of Prowl EC increased with only the high rate providing adequate control (79%).
- None of the rates of Prowl EC resulted in significant visual injury or stand reduction.
- Only the high rate of Prowl EC 4.8 pt resulted in significant stunting at the 2-3 leaf onion stage of 0.9 – 1.3 inches compared to the healthiest treatments in the trial. This is comparable to our previous results.

Prowl EC vs. Prowl H2O: H2O safer, but not as good weed control

- In the Wayne Trial I, there was no difference between Prowl EC 4.8 pt and Prowl H2O 4 pt for control of ragweed (RW), which was poor anyway, or SW, which was excellent.
- In Oswego trial, Prowl EC 3.6 pt and 4.8 pt had numerically better control of SW and MYC than H2O by about 15-20%.
- Prowl H2O 4 pt is equivalent to Prowl EC 4.6 pt. Prowl H2O 4 pt stood out as being safer than Prowl EC 4.8 pt, which was significantly 1-1.3" stunted compared to Prowl H2O. Statistically, there were no differences in visual injury or stand, although numerically Prowl H2O was safer on the onions in these categories as well.
- **2017 was a very wet spring. Prowl H2O may perform better when exposed to wetting and drying cycle to release active ingredient. More trials are underway in 2018.**

Table 1. Prowl 3.3EC vs. Prowl H2O – First Year Results, 2017.

% Weed Control

Treatment Product and Rate/Acre *(applied PRE-emergent to onion)*	Wayne Trial I c.v Montclair 19 DAT (Jun-7) onions 2-leaf		Oswego Trial c.v. Fortress 29 DAT (Jun-14) onions 2.5-leaf		Wayne Trial II c.v. Safrane 30 DAT (Jun-23) onions 3-leaf			
	RW[1]	SW	SW	MYC	MYC	LQ	PW	HG
Prowl EC **2.4** pt			83 a[2]	78 abc	20 b	36 d	33 b	38 d
Prowl EC **3.6** pt			92 a	87 a	48 b	86 abc	52 b	27 d
Prowl EC **4.8** pt	8.2 e	97 a	95 a	86 ab	53 b	77 bc	79 a	65 c
Prowl **H2O** 4 pt *(= 4.6 pt EC)*	10.0 e	95 a	75 b	60 bcd				
Prowl EC **2.4** pt *(= 2.1 pt H2O)* + Chateau 1.0 oz			92 a	90 a	93 a	63 cd	82 a	69 bc
Prowl **H2O** 4 pt + Chateau 1.0 oz			80 a	77 abc	50 ab	83 ab	97 a	63 c
Chateau 1.0 oz			37 cd	19 fg				
Chateau 3.0 oz			97 a	79 abc				

[1]RW: Ragweed; SW: Smartweed; MYC: Marsh yellowcress (annual mustard); LQ: Lamb's quarters; PW: pigweed; HG: Hairy galinsoga.
Highlights: Green: 90-100% control; light green: 80-89% control; yellow: <50% control.

Crop Tolerance

Treatment Product and Rate/Acre *(applied PRE-emergent to onion)*	Wayne Trial I c.v Montclair 19 DAT (Jun-7) onions 2-leaf			Oswego Trial c.v. Fortress 29 DAT (Jun-14) onions 2.5-leaf			Wayne Trial II c.v. Safrane 30 DAT (Jun-23) onions 3-leaf	
	% Visual Injury	Stand (/3 ft)	Plant Height (inch)	% Visual Injury	Stand (/3 ft)	Plant Height (inch)	% Visual Injury	Plant Height (inch)
Prowl EC **2.4** pt				4 cde[2]	17 a-e	7.8 cd	2 f	10.8 b
Prowl EC **3.6** pt				5 cd	18 a-d	7.9 bcd	7 de	9.7 cd
Prowl EC **4.8** pt	2.5 d	15.4 abc	6.8 cd (-0.9")	6 cd	17 a-e	7.2 d-g (-1.3")	1 f	10.3 bc
Prowl **H2O** 4 pt	1.2 d	16.0 abc	7.7 a	3 de	18.3 a-d	8.5 b		
Prowl EC **2.4** pt + Chateau 1.0 oz				18 ab	15.5 def	6.9 fgh (-1.6")	17 cd	9.4 de
Prowl **H2O** 4 pt + Chateau 1.0 oz				9 bcd	15.2 def (-21%)	7.5 def (-1")	12 cde	10.3 bc
Chateau 1.0 oz				3 ef	14 efg (-27%)	7.7 cde		
Chateau 3.0 oz				18 a	10.8 gh (-44%)	6.4 h (-2.1")		

Highlights: Green: statistically as good as the best treatment; yellow: statistically same as worst treatment.
[2]Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, p>0.05.

Prowl H2O + Chateau:

Now that Chateau has been adopted as part of the standard herbicide program in onions, its early applications often coincide with Prowl EC, Outlook and Select EC, which have "greasy" formulations that are ECs (emulsifibale concentrate) or contain petroleum distillates, which cannot be tank mixed with Chateau or else detrimental onion injury can occur. Prowl H2O is the only herbicide allowed by Chateau label to be tank mixed with Chateau.

- Alone, Chateau 1 oz provided poor control of SW (37%) and MYC (19%).

- **Generally, Prowl H2O 4 pt + Chateau was not as good as Prowl EC for weed control:**
  - Numerically, in Oswego for SW and MYC, Prowl H2O 4 pt + Chateau 1.0 oz was similar to Prowl EC 2.4 pt alone (= 2.1 pt H2O), slightly better than Prowl H2O 4 pt alone (by 5-17%), and 8-15% worse than Prowl EC 4.8 pt.
  - In Wayne, Prowl H2O 4 pt + Chateau 1 oz was similar to Prowl EC 3.6 and 4.8 pt for MYC and LQ, similar to Prowl EC 4.8 pt for HG and better than Prowl EC 4.8 pt for PW.
- Chateau 3 oz was as good as Prowl EC 4.8 pt for SW (97%) and MYC (79%) control. **It is interesting how "touchy" Chateau is with respect to rate for its PRE-emergent weed control.**
  - Where does Chateau 2 oz lie?
  - Does Chateau 2.0 oz followed by 1.0 oz a week later provide the same PRE control as 3.0 oz all at once?
  - Does Chateau offer similar weed control as Prowl to the extent that an application of Prowl may be delayed or skipped?
  - Answers to these questions are being pursued in 2018 trials.

Chateau PRE-Emergent to onion:
In Michigan, Dr. Bernie Zandstra has been hoping to get Chateau labeled for application PRE-emergent to onion. Previously, in New York, Chateau applied PRE-emergent to onion has worked.

- In Oswego, applying Chateau 1 oz PRE-emergent to onions resulted in 21-27% stand reduction.
- When Chateau 1 oz was added to Prowl H2O 4 pt + Outlook 11 fl oz + Buctril 2EC 1.5 pt PRE-onion emergence, it resulted in unacceptable crop injury: 45% visual injury, 52% stand reduction, 2.7" stunting and 34% yield reduction.
- **Chateau PRE-emergence to onion emergence will no longer be pursued. However, we continue to understand its PRE activity in hopes that rates of other PRE-emergent herbicides may be reduced.**

Buctril 2EC 1.5 pt PRE-emergent to Onion Emergence

In 2015 and 2016 studies, Buctril 2EC **12 fl oz** was always used PRE-emergent to onion. Compared to Prowl EC 4.8 pt, Outlook 21 fl oz and Outlook 11 fl oz/10 fl oz split application, this treatment always stood out has giving the poorest weed control (except for some activity on RW) with the shortest residual (completely "out of gas" by 5 weeks), but also the best crop safety.

In 2017, Brox 2EC (= Buctril 2EC) **1.5 pt** was used. Again, it had the poorest weed control of the three single actives. But, **Brox 2EC 1.5 pt was still perfectly safe on the onions.** In the trial, in an attempt to "hold back" weed emergence to create POST-Emergent trial plots, Buctril 2EC **1.5 pt** + Outlook 11 fl oz was applied PRE-onion, followed by Prowl EC 2 pt with barley-kill herbicide. The only escapes that came through this program was SW and there was no MYC! There were lot's of MYC escapes in the grower field around the trial, and when I compared notes (Table 2), the big difference was the rate of Buctril 2EC (12 fl oz vs. 1.5 pt) and Prowl EC (1 pt vs. 2 pt). **Three years in a row, I have not found onion injury with Buctril PRE and from now on I will use 1.5 pt rate PRE-onions.** Investigation of herbicide synergy and timing for improved weed control and crop safety is ongoing.

Table 2. PRE-emergent herbicide programs resulting in some and no escapes of marsh yellowcress.

	PRE-emergent to onion	At barley-kill	Results
Grower	**Buctril 2EC 12 fl oz** + Outlook 12 fl oz	**Prowl EC 1 pt** + Outlook 11 fl oz + Goal 2XL rate?	Marsh yellowcress (MYC) **escapes**
Cornell	**Buctril 2EC 1.5 pt** + Outlook 11 fl oz	**Prowl EC 2 pt**	**No MYC escapes** Smartweed escapes

Outlook Timing and Rate for Yellow Nutsedge Control

Outlook is the first line of defense for controlling yellow nutsedge in season in muck-grown onions.

- In 2017, just as we see with broadleaf weeds, best control of YNS (78%) was with Outlook 21 fl oz applied PRE-onion, which was numerically ~20% better compared to the split app (60%).
- Usually, we see more onion injury with Outlook 21 fl oz PRE compared to the split app. In this trial, there were no differences in visual onion injury or stand, but the split app resulted in stunted plants by 1.3 inch.
- Although the safest treatment on the onions, applying Outlook even at high rates late (2-leaf stage) significantly reduced control of YNS by 17 to 38% to an unacceptable level (43%).
- **Effective control of YNS in muck-grown direct seeded onions inevitably results in some crop injury.**

Table 3. Effect of rate and timing of Outlook on control of yellow nutsedge and crop safety.

Wayne Trial II c.v. Safrane 6 DAT 2-leaf (Jun-23; onions 3-leaf)		Crop Tolerance			% YNS Control
Treatment[1] Product, Rate/A	Timing (Crop Stage)	Visual Onion Injury (%)	Stand (No./3 ft)	Plant Height (inch)	
Outlook 11 fl oz Outlook 10 fl oz	PRE[2] Flag+[3] (barley kill)	15 cde	13.8 b-e (-17%)	8.4 ghi (-1.7")	60 abc
Outlook 21 fl oz	PRE	11 cde	14.5 bcd (-13%)	9.7 cd	78 a
Outlook 21 fl oz	2-leaf	6 e	16.6 ab	10.1 c	43 bcd

[1]All Outlook treatments part of program with Prowl and Buctril.
[2]**PRE:** pre-emergent to onion, onions just starting to poke through surface.
[3]**Flag+:** first true leaf same size as flag leaf.
Highlights: Green: statistically as good as the best treatment; yellow: statistically same as worst treatment.

Pre-Emergent Weed Control Options for Onions Grown on Mineral Soil

Christy Hoepting, CCE Cornell Vegetable Program

The beauty of growing onions from bare root transplants is that excellent weed control can be achieved by applying high rates of herbicides within days of transplanting, because the onions are in a dormant stage and much more tolerant to herbicide injury compared to actively growing plants. Seasoned onion growers are generally aggressive with weed control because onions are very poor competitors with weeds. Outlook, Prowl and Goal are the most commonly used PRE herbicide apps in bare root transplanted onions. They are applied to dormant plants after the soil has settled, preferably after rainfall or irrigation. Risk for injury is higher when conditions are cold and wet, because herbicides can be washed into the root zone, and the onions are not as actively growing to metabolize the herbicide into non-toxic metabolites.

Outlook
Active ingredient: dimethenamide
WSSA Group: 15
Weeds controlled: Annual grasses, nutsedge and select broadleaf weeds such as hairy galingsoga, pigweed, some species of mustards and common groundsil.
Crop Stage: minimum 2-leaf
Rates: May be applied as a single application of 21 fl oz (maximum of 18 fl oz on coarse soil) or as a split application of 10 to 14 fl oz for the first application followed by 7 to 11 fl oz **14 days** later.
Maximum use rate per season: 21 fl oz
PHI: 30 days

Prowl 3.3EC
Active ingredient: pendamethalin
WSSA Group: 3
Weeds controlled: Controls annual and perennial grasses, and selected broadleaf weeds such as lamb's quarters, pigweed, Shepherd's purse, velvet leaf and chickweed.
Crop Stage: 2 to 9 leaf (loop stage allowed in CO, KA and NE)
Rates: Coarse soil – 1.8 pt; Medium soil – 2.4 pt; Fine soil – 3.6 pt
Maximum use rate per season: 14.4 pt
PHI: 60 days
Notes: Sequential applications may be made every 4 to 6 weeks.

Prowl H2O
Active ingredient, WSSA Group, Weeds controlled and Crop Stage: same as Prowl EC
Rates: Coarse soil – 1.5 pt; Medium soil – 2.0 pt; Fine soil – 3.2 pt
Maximum use rate per season: 12.6 pt
PHI: 45 days
Notes: H2O is a safer formulation than EC with respect to crop injury and tank mix compatibility.

Goal 2XL
Active ingredient: oxyfluorfen
WSSA Group: 14
Weeds controlled: Broad-spectrum control of broadleaf weeds including pigweed and lamb's quarters.
Crop Stage: minimum 3-leaf (2-leaf allowed outside of Northeast US)
Rates: 2 to 4 fl oz in NE (up to 2 pt in all other states)
Maximum use rate per season: 2 pt
PHI: 45 days
Notes: Multiple applications may be made. Can be tank mixed with Outlook and Prowl H2O.

Goaltender
Active ingredient, WSSA group, Weeds controlled, Crop stage and PHI: same as Goal 2XL
Rates: 1 to 2 fl oz in NE (up to 1 pt in all other states)
Maximum use rate per season: 2 pt
Notes: GoalTender is a safer formulation than Goal 2XL with respect to crop safety and tank mix compatibility.

For plug transplants: Outlook and Prowl may be applied in the same manner as for bare root transplants, but do not use Goal. High rates of Goal can be injurious to actively growing plants.

Possible Strategy:
Post-planting: Prowl H2O 4 pt + up to Goal 2XL 1 pt (use lower rates if wet and cold)
If you are concerned about yellow nutsedge (YNS): Outlook 21 fl oz/Dual Magnum 1.33 pt (lower rates on coarse soils) + Prowl H2O 2 pt + Goal 2XL 8 fl oz (lower rates of Prowl and Goal when tank mixed with Outlook/Dual Magnum). If conditions are wet and/or soils are light, use lower rates of Outlook or Dual Magnum. Note, you may see some stunting with these treatments, but it should give pretty good weed control. To improve safety, rates may be reduced or product applications separated. For YNS control, Outlook or Dual Magnum need to be applied first. Prowl H2O is suggested for improved crop safety in a tank mix.

4-6 weeks later: Second application of Prowl H2O 4 pt/ Prowl EC.

4-5 weeks after that: Another Prowl H2O 4 pt/Prowl EC. Make sure this app is within PHI.

Goal 2XL/Goaltender may be used to clean up broadleaf weed escapes, make sure they are less than 2 inch tall/ diameter for effective control.

On a small-scale, growing onions on plastic mulch is an excellent means of achieving weed control. Although there is the added cost of the plastic mulch and onions have to be hand-harvested, Cornell studies have shown that onions grown on plastic mulch yield higher than those grown on bare ground. Weeds do grow through the holes in the plastic and will have to be pulled by hand. Weeds between the plastic beds should be managed, via hand weeding, cultivation or with herbicides. Some growers spread straw mulch between the beds of plastic to keep weed pressure down.

For weed control between rows of onions on plastic, typically, growers apply Prowl and/or Dual Magnum for PRE-emergent weed control. For the broadleaves that escape, Roundup is a common choice. Goal, Buctril and Chateau can also be used. Do not use herbicides that are not labeled for onions or for row middles, and follow label directions to use spray shields, etc. as drift may be harmful to onions. Cultivation is also an option. Heavy weed pressure between plastic rows can compete with onions for nutrients and reduce ventilation creating conditions more favorable for leaf diseases to develop.

Welcome New Precision Agriculture Specialist, Ali Nafchi

Peter Landre, Cornell Cooperative Extension; edited by Julie Kikkert, CVP

On behalf of Cornell Cooperative Extension Director, Dr. Chris Watkins, I am pleased to announce the appointment of Dr. Ali Nafchi to the position of Precision Ag Specialist. Dr. Nafchi will be working with the Cornell Vegetable Program and the Northwest NY Dairy, Livestock and Field Crops Team to help growers implement and/or optimize precision ag tools in their farming operations.

Ali Nafchi has joined the Cornell Vegetable Program and Northwest NY Dairy, Livestock, and Field Crops Team as a Precision Ag Specialist. *Photo provided.*

Ali grew up on a family vegetable and crop farm and was actively involved in all aspects of farming and management. He earned a B.S., M.S. and Ph.D. in agricultural engineering with a focus on precision agriculture. He has held postdoctoral research and extension positions at the University of Florida and Clemson University, focused on precision ag. During the past 5 years, Ali has been involved in a variety of projects dealing with sensor-based, site-specific crop input management and harvesting equipment. For example, he developed and adapted tools for variable rate nutrient management; a variable-depth tillage system for managing soil compaction; hardware for variable-rate fertigation equipment for center pivot irrigation systems; and a new soil moisture sensor. He has also work closely with both research and extension personnel in and out of his discipline to bring precision ag solutions to farms. Most recently, he coordinated two research and extension projects at Clemson University, one funded by USDA-CIG and the other by NASA. Ali began his position May 1st and is working out of the CCE-Genesee Co. office in Batavia, NY.

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(585) 394-0525 ext.2

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CROP INSIGHTS

Figure 1. Newborn baby onions in the "loop" stage in muck soil with barley windbreak standing tall in the background. May they grow up to be big healthy bold New York onions! Beginnings are so hopeful! *Photo: C. Hoepting, CVP*

ONIONS

A long winter made for a late spring and a slow and interrupted start to the planting season. However, it looks like the majority of the crop is going to get planted on time with some growers already finished direct seeding. Earliest transplants are greening up nicely with 2-3 leaves and earliest direct seeded onions are in the loop stage (Fig. 1). High winds with gusts around 50 mph last week may have caused some blowouts or buried seedlings deeper and ravaged some barely nurse crops. Thankfully, the direct seeded onions were still underground. See article on highlights from 2017 pre-emergent herbicide trials, page 6. Some growers have made adjustments to their pre-herbicide programs based on the trial results. **Muck Donut Hour is set to start on Tuesday, June 4th in Elba.** The **Annual Elba Muck Onion Twilight Meeting has been set for Thursday, June 21**, which will feature tours of several onion herbicide trials.

Table Beets: Early Season Management of Seedling Diseases and Root Rots

Julie Kikkert, CCE Cornell Vegetable Program, and Sarah Pethybridge, Cornell

It is important to get table beet seedlings off to a good start to ensure uniform root spacing which ultimately affects final root size, and to minimize the occurrence of root rots in harvest and storage. The two primary early-season pathogens of table beets are *Pythium ultimum* and *Rhizoctonia solani*. However, *Phoma betae* and *Aphanomyces cochlioides* can also infect beets. These pathogens can cause poor emergence, uneven growth, dead seedlings and wire-stem symptoms. Even if the plants don't die initially, they often develop abnormal roots as well as root-rot symptoms. Pocket-rot disease is caused by *R. solani*. It affects the crown area, followed by dry, rotted portions of the roots. It is often seen as patches or "pockets" of wilted, dying plants within a field. Below is a listing of cultural practices and fungicides available to manage these pathogens. It is important to implement as many strategies as possible to minimize the risk of infection. Environmental conditions will also play a role in the incidence and severity of disease.

Inspecting seedlings for signs of root rot. *Photo: J. Kikkert, CVP*

Cultural Practices

- Avoid fields with a history of problems and/or beet production.
- Minimum 2-year rotation out of vegetables. Grains are the best rotational crop.
- Well-drained, healthy soil without soil compaction and crusting.
- Plant vigorous, disease-free seed.
- Use fungicide treated seed (see section below).
- Avoid throwing soil on the crowns during cultivation.

Seed and Soil Treatments

The table below provides a listing of the conventional and Organic Materials Institute (OMRI) approved options available, including the fungicide resistance grouping, pathogens controlled or suppressed, and the methods of application. We do not have first-hand experience with all of these products.

Products labeled in New York for the management of various pathogens that commonly cause seedling and/or root rots in table beets. Additional details can be found in the Cornell Vegetable Guidelines. Please read and follow the New York State approved label before using a particular product.

Product	Active Ingredient	Fungicide Resistance Group	Pathogens Controlled	Application Methods	OMRI listed
Apron or Allegiance	Metalaxyl-M	4	Pythium	Seed Treatment	No
Maxim 4FS	Fludioxonil	12	Fusarium, Rhizoctonia, Phoma	Seed Treatment	No
Thiram	Tetramethylthiuram disulfide	M03	Phoma, as well as a broad spectrum	Seed Treatment	No
Quadris or OLP	Azoxystrobin	11	Rhizoctonia	In-furrow; banded over the row; through irrigation	No
Ridomil Gold	Mefenoxam	4	Pythium	Pre-plant incorporated; Soil spray	No
Uniform	Azoxystrobin + Mefenoxam	11 + 4	Rhizoctonia, Pythium	In-furrow	No
Reason 500 SC	Fenamidone	11	Pythium	Soil spray; through irrigation	No
Presidio	Fluopicolide	43	Pythium	At planting; through irrigation	No
Actinovate	*Streptomyces lydicus* strain WYEC 108	NC	Suppression of Pythium, Rhizoctonia, Fusarium	Seed treatment; at planting; through irrigation	Yes
Double Nickel LC	*Bacillus amyloliquefaciens* strain D747	44	Rhizoctonia, Pythium, Fusarium	In-furrow; drench; through irrigation	Yes
Serenade Soil	*Bacillus subtilis*	44	Rhizoctonia solani	In-furrow; soil drench	Yes

Weather Charts

John Gibbons, CCE Cornell Vegetable Program

Weekly Weather Summary: 5/01 - 5/07/18

Location**	Rainfall (inch)		Temp (°F)	
	Week	Month August	Max	Min
Albion	0.48	0.48	80	43
Baldwinsville	0.46	0.46	85	40
Bergen	0.70	0.70	81	36
Buffalo*	0.43	0.43	79	39
Burt	0.60	0.60	82	38
Ceres	0.34	0.34	82	26
Fairville	0.63	0.63	84	40
Farmington	0.86	0.86	83	38
Gainesville	0.61	0.61	77	39
Geneva	1.02	1.02	84	40
Lodi	0.17	0.17	83	40
Niagara Falls*	0.34	0.34	81	43
Ovid	0.40	0.40	85	36
Penn Yan*	0.28	0.28	85	39
Phelps	NA	NA	84	36
Portland	0.66	0.66	79	47
Rochester*	0.44	0.44	84	39
Silver Creek	0.48	0.48	81	44
Sodus	0.44	0.44	84	33
Versailles	0.69	0.69	80	36
Volney	0.46	0.46	84	39
Williamson	0.10	0.10	84	33

Accumulated Growing Degree Days (AGDD)
Base 50°F: April 1 - May 17, 2018

Location**	2018	2017	2016
Albion	99	106	47
Baldwinsville	111	148	62
Bergen	96	105	41
Buffalo	94	108	69
Burt	85	88	NA
Ceres	90	141	42
Fairville	102	123	38
Farmington	101	131	45
Gainesville	73	93	22
Geneva	108	150	51
Lodi	125	188	66
Niagara Falls	108	122	66
Ovid	109	172	63
Penn Yan	113	163	59
Phelps	99	135	46
Portland	105	150	49
Rochester	113	137	60
Silver Creek	88	131	36
Sodus	102	121	35
Versailles	100	155	58
Volney	100	122	NA
Williamson	93	118	28

* Airport stations

** Data from other station/airport sites is at: http://newa.cornell.edu/ Weather Data, Daily Summary and Degree Days.

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 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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Cornell Cooperative Extension
Cornell Vegetable Program

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