Field conditions before, during, and after herbicide application can influence coverage, absorption, and translocation in a plant.

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VEGEdge

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

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Cornell University
Cooperative Extension
Cornell Vegetable Program

Photo: Judson Reid

Environmental Factors Can Influence Herbicide Activity

Darcy Telenko, CCE Cornell Vegetable Program

Herbicide activity is influenced by light, temperature, humidity, soil moisture, wind and precipitation. Field conditions before, during and after herbicide application can influence coverage, absorption, and translocation in a plant. Temperature extremes can slow plant metabolism and reduce herbicide effectiveness. The optimum temperature for herbicide activity generally range from 65 to 85°F corresponding to ideal temperatures for crop and weed growth. High temperatures, low humidity and wind can lead to vaporization, crystallization or degradation of the herbicide. In general, moisture is required to activate many herbicides used in vegetable production. It is important to understand the specific requirements for each herbicide: Is there a rainfast (rain-free) period? Does it need rain or irrigation to be activated? Does it need to be mechanically incorporated? What's the best timing of application?

Herbicide injury to zucchini due to drift.
Photo: Darcy Telenko, Cornell Vegetable Program

As many pre-plant-incorporated (PPI) and PRE emergence herbicides are being put out this spring, keep in mind that soil chemistry (pH), structure and moisture can all influence the activity of soil-applied herbicides. Unevenness of plant residue in a field can influence soil moisture and herbicide activity on the target weeds and could place uneven residues into the root zone leading to crop injury. Also keep in mind that if herbicides are being applied after plas-

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VegEdge newsletter is exclusively for enrollees in the Cornell Vegetable Program, a Cornell Cooperative Extension regional agriculture team, serving 12 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.

Cornell University
Cooperative Extension
Cornell Vegetable Program

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The next issue of VegEdge will be produced on May 18, 2016.

Become a Taste NY Farm Market Vendor at Thruway Service Areas

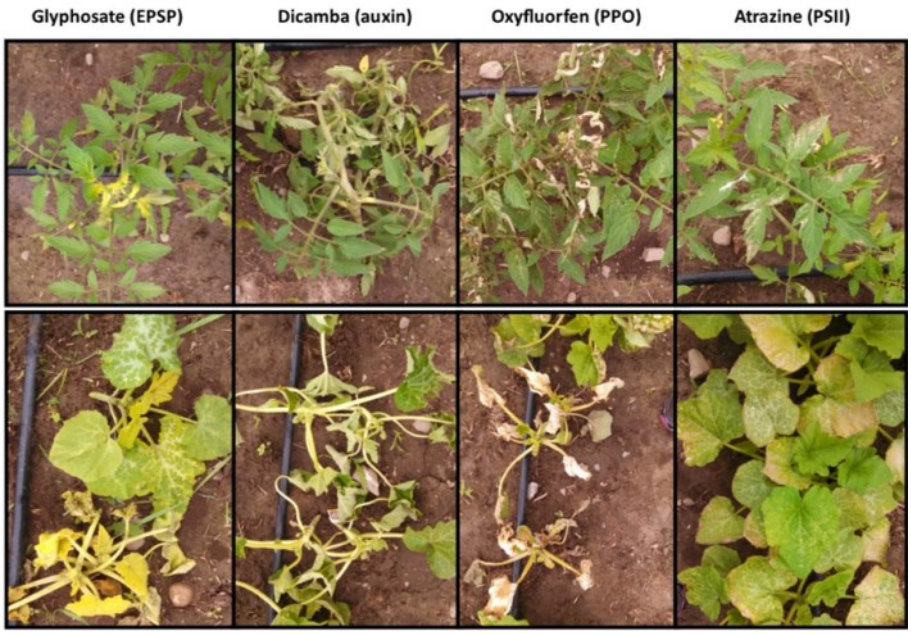
The Thruway Authority invites farmers across New York State to sign up to sell their products at service areas along the Thruway this spring season. For over two decades, New York State has been committed to showcasing some of its finest vendors and their products. From locally grown fruits and vegetables to some of the finest cheese, edible herbs, and horticultural products in the northeast, promoting these products continues to be a priority. Only produce grown or produced in New York State may be sold.

New York vendors interested in selling food products at Taste NY Farm Markets should email the Thruway Authority for more information on how to participate this season at TravelersServices@thruway.ny.gov

continued from cover – Environmental Factors Can Influence Herbicide Activity

tic mulch has been put down that many labels have "for row-middle applications only" or state that "if sprayed over plastic mulch significant crop injury can occur when spray residue is concentrated in the plant hole by irrigation or rainfall."

When detecting herbicide injury other stress factors need to be ruled out including diseases, insects, nutrient deficiencies and adverse weather conditions. Many these conditions may predispose the crop to an increased sensitivity to a herbicide leading to a multifaceted issue. A plant that is weakened and poorly growing it may not be able to grow past the herbicide treated zone in the soil or detoxify the herbicide as it would under normal conditions.



Off-site movement of herbicide can cause injury to non-target areas by spray-particle drift, vapor drift and herbicide-contaminated soil. See examples of herbicide injury symptoms on tomato and summer squash.
Photos: Darcy Telenko, CCE Cornell Vegetable Program

Factors that may contribute to herbicide injury in a crop

- Faulty application - usually distinct patterns within a field cause by miss application of herbicide or faulty equipment.
  - Streaks of injury due to improper incorporation.
  - Overlapping spray pattern.
  - Improper nozzle size and spacing/or boom height.
  - Worn nozzles.
  - Failure to shut off sprayer when making turns or decreased sprayer speed
- Environmental conditions – conditions that favor optimum crop growth and minimize risk of crop injury are desired.
  - Planting seed too deep causes seedling to have extended contact with the herbicide risking injury.
  - Planting too shallow may result in the seed germinating in the herbicide treated zone of the soil risking injury.
  - Cool, wet conditions reduce plant metabolism and growth slowing detoxification of herbicide.
  - Warm, humid condition may increase herbicide uptake leading to injury.
  - Hot, dry conditions may magnify herbicide effects on plant since plant is under stress.
- Selectivity of Herbicides – most herbicides have a 4x margin of selectivity on labeled crops.
  - Under conditions that stress the crop (environmental, soil compaction or other pests) injury might occur.
- Genetic susceptibility – genetic background can play a role in selectivity of herbicide on the plant.
- Herbicide Persistence –the length of time a herbicide remains active in soil.
  - Herbicide families with compounds that have longer persistence in soil include the triazines, uracils, phenylureas, sulfonylureas, dinitroanilines, isoxazolidiones, imidazolinones, and plant growth regulators.
  - Follow rotation restrictions on label to avoid herbicide carryover injury.
- Herbicide drift – off-site movement of herbicide can cause injury to non-target areas by spray-particle drift, vapor drift and herbicide-contaminated soil (see photos).
  - Glyphosate (Roundup) – EPSP synthase inhibitor depletion of key amino acids needed for protein synthesis - plants gradually turn yellow, leaf chlorosis.
  - Dicamba (Vision) – growth regulator –leaves become cupped and strapped and plant stems twist (epinasty), emerging leaves may appear chlorotic, growth slows and plants appear stunted.
  - Oxyfluorfen (Goal 2XL) – protoporhyrinogen oxidase (PPO) inhibitor starts a reaction that causes cell membrane to leak– spots can be observed where herbicide contacted the leaves, expanding leaves become crinkled due to contact burn on the edges.
  - Atrazine (AAtrex) – photosystem inhibitor (PSII) – stops photosynthesis –interveinal chlorosis with necrotic margins, leaf burn symptom.

Highlights of 2015 Pre-Emergent Herbicide Trial for Direct Seeded Onions on Muck

Christy Hoepting, CCE Cornell Vegetable Program

Main players for pre-emergent (PRE) weed control in direct seeded muck grown onions:

Prowl EC (a.i. pendamethalin; WSSA Group 3). For control of annual grasses and select broadleaves. Of Prowl, Outlook and Buctril, only product that provides adequate control of lamb's quarters. May be applied to onions PRE to onions to the loop stage at 2.4 to 4.8 pts, often used in combination with herbicides to kill barley windbreaks. Use lower rates in shallow muck and where wind has exposed seed. Prowl may not be used again until the 2 leaf stage. Apply every 4-6 weeks at the 2-6 leaf and 6-9 leaf stage. Maximum 14.4 pts/acre per season. PHI; 45 days. **Prowl H_2O** is a water-based formulation that has improved crop safety; 4 pts may be applied in the same manner as Prowl EC up to 12.5 pts per season.

Outlook (a.i. dimethenamide-P; WSSA Group 15). For control of annual grasses, yellow nutsedge and select broadleaves. Of Prowl, Outlook and Buctril, only product that provides adequate control of common groundsil. May be applied as a single application of 21 fl oz or as a split application of 10.5 - 14 fl oz first and 10.5 - 7 oz 14 days later. Maximum 21 fl oz per season. PHI: 30 days. Unfortunately, the 2-leaf restriction remains on the Outlook label, despite research (Ellerbrock, Cornell) that finds Outlook + Buctril PRE to be a good and safe combination.

Buctril 4EC (a.i bromoxynil; WSSA Group 6). For control of select broadleaf weeds. Apply 8 to 12 fl oz at least 3-4 days prior to onion emergence. Rainfall or irrigation within 2 days following PRE applications or 3 days prior to crop emergence may result in unacceptable crop injury. Same rate may also be applied POST-emergent to onions for PRE- and POST-emergent weed control between 2-5 leaf stage. Maximum 12 fl oz per season. Note that some generic products with active ingredient, bromoxynil, such as Broclean are labeled at 1 to 1.5 pts on onion, because the concentration of active ingredient is only half as much as Buctril 4EC.

Trial conducted in hot and dry spring, no annual grass or yellow nutsedge pressure. Results for weed control and crop safety are presented in Table 1 and 2, respectively. It is important to note that the first application (PRE onion emergence = spray A) was made 14 days after the onions were seeded during which time, it never rained and daily high temperatures were in the 70s and 80s. Eight-tenths inches of rain fell 3 days after spray A. It did not rain again until 6 days after spray B (late flag/early 1-leaf; 1 inch). There were no annual grasses or yellow nutsedge in the untreated checks. The this trial focused on control of broadleaf weeds, particularly pigweed, smartweed, ragweed and lamb's quarters. Emulsifiable concentrate (EC) formulation of Prowl was used in this study.

What do Prowl, Outlook and Buctril bring to the table? When used alone at maximum allowable rates in split applications, Prowl EC (4.8 pt applied PRE, flag/1-leaf and 3-leaf) provided significantly twice as much broadleaf weed control (70%) as the high rate of Outlook 21 fl oz when applied PRE (39% control) at the 2-leaf stage (Table 1). The split rate of Outlook (11 fl oz PRE, 10 fl oz flag/1-leaf) numerically provided only half as much control as Outlook 12 fl oz PRE (17.5%). Notably, both the Prowl and Outlook split app failed to control ragweed, while Outlook 21 fl oz PRE gave fair/mediocre control. Although Buctril was not trialed by itself, when used in a program with Outlook and Prowl, control of ragweed was very good to excellent, indicating that **Buctril is very important for controlling ragweed in onion pre-emergent program**. Similarly, Prowl is very important for controlling lamb's quarters. Pigweed control was variable in this trial; in general terms, control increased as total use of Prowl increased (e.g. in trts 2,5 & 6) and was improved when high rate of Outlook was used instead of split application. Best weed control was achieved with combination treatments that included the high rate of Prowl (trt 6: 86%) and/or Outlook (trt 7: 88%). Unfortunately, these treatments also resulted in the highest crop injury.

Crop Injury (Table 2)
Except for the split application of Outlook, at the 2-leaf stage, all treatments resulted in plants that were significantly stunted by approximately 1 inch compared to the untreated. All treatments were still significantly stunted by 1-2 inches (=7-20%) at the 3-4 leaf stage on Jun-19. We did not harvest the trial, so do not know if this early stunting would result in a yield reduction. **Greatest visual injury at the 2-leaf stage was observed in the treatments where high rates of Prowl or Outlook were used at the PRE timing:** Prowl EC 4.8 pt PRE in program (trt 6: 20%), Outlook 21 fl oz PRE in program (trt 7: 14.2%) and by itself (trt 4: 17.5%). Prowl EC 4.8 pt at PRE and flag/1-leaf by itself (trt 2) did not result in increased visual injury, stunting or stand reduction. Plant stand was numerically lower than in the untreated, but the difference was not significant.

77% weed control with less than 10% crop injury was achieved with Prowl 2 pt + Outlook 11 fl oz + Buctril 12 fl oz PRE followed by Outlook 10 fl oz + Prowl 4.8 pt at flag/1-leaf and then another Prowl 4.8 pt at 3-leaf (trt 5; Fig. 1). This treatment did still stunt the onions by 1 inch, however. Perhaps using Prowl H_2O instead of the EC formulation, or reducing the rate of the second application would further improve crop safety of this treatment. Reducing the rate would likely also reduce weed control slightly.

What does Chateau bring to the table?
Chateau is used in onions between the 2- and 6-leaf stage for post-emergent broadleaf weed control. But because it also has pre-emergent activity, we wanted to see how it compares to the other PRE herbicides for weed spectrum, efficacy and residual, as well as evaluate its crop tolerance PRE to onions. When onions were at 2-leaf stage, compared to the

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Figure 1. Prowl EC 2 pt + Outlook 11 fl oz + Buctril 12 fl oz PRE to onions, followed by Outlook 10 fl oz + Prowl EC 4.8 pt at flag/1-leaf with barley kill provided 77% weed control with less than 10% visual crop injury at 2-leaf stage.
Photo: C. Hoepting Jun-19.

Table 1. Evaluation of pre-emergent herbicides and programs for crop tolerance and weed control in yellow direct seeded onion (c.v. Montclair), Elba, 2015: **Weed Control.**

Treatment		Jun-4 (2-leaf); 14 DAT B					Jun-19 (3-4 leaf) 7 DAT E
		% weed control (visual estimate)	Weed control rating[4]				% weed control (visual estimate)
			pigweed	smartweed	Lamb's quarters	ragweed	
1	Untreated	0 % c[2]					0 % d
2	Prowl 4.8 pt **ABE**[1]	70 % a	G-E	G	E	Fail	49 % ab
3	Outlook 12 fl oz **A** Outlook 11 fl oz **B**	17.5 % bc	Fail-VG	Fail	Fail-F	Fail	8.7 % cd
4	Outlook 21 lf oz **A**	39 % b	Fail-E	Fail-G/E	Fail-G	P	48.5 % abc
5	**Prowl 2 pt A** + Buctril 12 fl oz **A** + Outlook 12 fl oz **A** Prowl 4.8 pt **BE** + Outlook 10 fl oz **B**	77 % a	G-E	E (some F-P)	E-VG	E-G	52.5 % ab
6	**Prowl 4.8 pt A** + Buctril 12 fl oz **A** + Outlook 12 fl oz **A** Prowl 4.8 pt **BE** + Outlook 10 fl oz **B**	86 % a	VG	F	E	G	83 % a
7	Buctril 12 fl oz **A** + **Outlook 21 fl oz A** Prowl 4.8 pt **BE**	88 % a	E,G,F	E	E,G,F	VG-E	73 % a
8	Chateau 6.0 oz **A**	81% a	G-E	F-G	--	P-E	75 % a
9	Chateau 2.0 oz **A**	70 % a	Fail-G	Fail/E	E-F	F	31 % bcd
p value (α=0.05)		***0.0000****	--	--	--	--	***0.0009***

[1]**Spray date and crop stage: A** = May-8, pre-emergence to onions 14 days post planting; **B** = May-22, flag-leaf with first leaf half way, herbicides for barley kill applied at the same time; **E** = Jun-11 (3-leaf).
[2]Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, p<0.05.
[3]**Weed control rating: E** = excellent; **VG** = very good; **G** = good; **F** = fair; **P** = poor; **Fail** = no control.

untreated, Chateau 6 oz (trt 8) resulted in an unacceptable 67.5% onion injury, 0.2 fewer leaves per plant, 0.9 inch stunted plants and a 69% reduction in stand. Obviously, this rate is not safe. However, the 2 oz rate (trt 9) resulted in only minor and insignificant visual injury (6%), stunting (0.4 inch) and 11% reduction in stand. Weed control of the 6 oz rate (81%) was comparable to best Prowl/Outlook/Buctril treatments (86%, 88%) and was still statistically as good as these treatments when onions were in 3-4 leaf stage (Jun-19). The 2 oz rate provided 70% weed control, which was statistically as good as the best treatments and much better than the Outlook treatments (17.5%, 39%); very impressive for only a single little application.

With Chateau having such impressive broadleaf weed control and long residual, next steps are to determine whether use and rates of Prowl, Outlook and Buctril may be reduced and crop safety be improved as Chateau is integrated into the onion weed control

Table 2. Evaluation of pre-emergent herbicides and programs for crop tolerance and weed control in yellow direct seeded onion (c.v. Montclair), Elba, 2015: **Crop Tolerance.**

Treatment Product & Rate		Jun-4 (2-leaf); 14 DAT B				Jun-19 (3-4 leaf); 7 DAT E	
		% Onion Injury (visual estimate)	Mean No. leaves per plant	Mean plant height (inch)	Stand (No. plants/ 3 feet)	% Onion Injury (visual estimate)	Mean plant height (inch)
1	Untreated	0 % d[2]	1.9 a	4.9 a	14.7 a	0 % c	12.8 a
2	Prowl 4.8 pt **ABE**[1]	7.5% bc	1.8 ab	4.0 bc	14.7 a	1.2 % c	11.8 b
3	Outlook 12 fl oz **A** Outlook 11 fl oz **B**	3.7 % cd	1.7 abc	4.6 a	12.7 a	0 % c	11.2 bcd
4	Outlook 21 lf oz **A**	17.5 % bc	1.8 abc	4.0 bc	13.1 a	1.9 % bc	11.6 bc
5	**Prowl 2 pt A** + Buctril 12 fl oz **A** + Outlook 12 fl oz **A**	9.5 % bc	1.7 bc	3.8 c **= 20%**	13.6 a	3.0 % bc	10.8 cd **= 16.4%**
6	**Prowl 4.8 pt A** + Buctril 12 fl oz **A** + Outlook 12 fl oz **A** Prowl 4.8 pt **BE** + Outlook 10 fl oz B	20 % b	1.6 c **= 16%**[3]	3.8 c **= 20%**	11.4 a	5.7 % b	10.4 cd **= 20%**
7	Buctril 12 fl oz **A** + **Outlook 21 fl oz A** Prowl 4.8 pt **BE**	14.2 % bc	1.7 abc	3.7 c **=24%**	11.6 a	5.7 % b	10.4 cd **= 19%**
8	Chateau 6.0 oz **A**	67.5 % a	1.6 bc **= 16%**	3.9 c	4.4 b **= 69%**	60 % a	11.2 bcd
9	Chateau 2.0 oz **A**	6 % bcd	1.8 ab	4.5 ab	12.6 a	0 % c	11 bcd
p value (α=0.05)		***0.0000****	***0.0006***	***0.0000***	***0.0000***	***0.0000****	***0.0000***

[1]**Spray date and crop stage: A** = May-8, pre-emergence to onions 14 days post planting; **B** = May-22, flag-leaf with first leaf half way, herbicides for barley kill applied at the same time; **E** = Jun-11 (3-leaf).
[2]Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, p<0.05.
[3]**(= 16%);** percent reduction compared to the untreated.
*arcsin(x/100)^0.5 transformed data; untransformed data shown.

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program. Also would expect that Chateau could be used at high rates (e.g. 4 oz) on bare root transplants within 48 hours of transplanting with very impressive results.

Next steps:
Our goal is to improve weed control while reducing crop injury. Another pre-emergent herbicide trial is already underway. We are tweaking programs with Prowl, Outlook and Buctril, integrating Chateau into the program, as well as trialing pipeline products including pyroxasulfone and bicyclopyrone for improved control of ragweed, pigweed and mustards.

2015 Black Bean Variety Trial Results

Carol MacNeil and John Gibbons, CCE Cornell Vegetable Program

Dry bean variety breeding and evaluation for yield, quality and disease resistance are high priorities for the NYS dry bean industry, and work has been supported each year. The on-farm variety trial is the focus of the Dry Bean Field Meeting each year. With the retirement of the Cornell Dry Bean Specialist Don Halseth a year ago, an on-farm, grower planted strip trial of two new promising black beans compared side-by-side to standards, was proposed for 2015. The trial was planted 6/18 by Paul Stein and Sons, Caledonia, on a Palmyra gravelly loam. The new varieties Eclipse and Zenith were compared to the standards: T-39, Midnight, Black Velvet, and Zorro. Two rows of each variety were planted. Data was collected from each of three tiers of adjacent two row variety plots.

For each variety 3 plots 15 ft. long x 2 rows wide were hand-pulled and harvested into burlap bags when pods were mostly dry. Beans were completely dried at Hemdale Farms Greenhouses, and threshed at the NYS Ag Experiment Station, Cornell - Geneva. Cleaned picked seed from each of the plots was shipped to Furmano Foods, Northumberland, PA, for canning. Canned beans were evaluated by the industry at Raw Products, NYS Ag Experiment Station, on March 10.

Results - Stand counts varied between the varieties, ranging from 5.0 to 6.5 plants/ft. All stand counts were within or above the ideal for maximum dry bean yield, however, 4 – 6 plants/ft. No disease was seen. The growing conditions were favorable, but the lack of rain in July and August hastened bean maturity. The earliest 4 varieties (Eclipse, T-39, Zenith and Zorro) were harvested 9/15. Some yellow leaves remained on Zorro. The latest two varieties (Black Velvet and Midnight) were harvested 9/22 because the grower was ready to harvest, but many leaves needed to be removed, though pods were mostly dry. Early September rain had caused some regrowth. There was substantial variability within the trial *making fair yield comparison between the varieties impossible*. For example, the average yield of T-39 on the east edge of the trial was over 20% greater than the yield of T-39 on the west edge of the trial. This is the weakness of strip trials without random replication.* In the canning evaluation Eclipse and Zenith had good, uniform color, much better than the other varieties. All the varieties had good to premium color when canned with ferrous gluconate, a black iron additive.

2015 Dry Bean Strip Trial Results

Variety (field order)	Aver Yield (lbs/acre)	Maturity (days)	Pod height (in.)	Seed size (seeds/lb)	Other
T-39 east	2,970	82	on ground	2,167	long vines
Eclipse	2,919	80	most above	2,124	upright, compact
Zenith	2,981	86	1" above	2,028	upright
Black Velvet	2,503	94	on ground	1,876	medium vines
Midnight	2,718	94	on ground	2,134	medium vines
Zorro	1,934	89	1" above	2,006	upright
T-39 west	2,408				

Variety - From east (top) to west (bottom)
Yield - Marketable yield corrected to 18% moisture
Maturity - Days to 90% dry pods
Height of pods - Distance from ground to lowest pod
Seed size – corrected to 12% moisture

In 2016, Jim Ballerstein, who conducts the processing sweet corn, snap bean and pea trials at the NYS Ag Experiment Station, will conduct a small plot, replicated dry bean variety trial, with industry support.

***Average results for randomized, replicated trials through 2014, E. Sandsted and D. Halseth, Cornell.**
T-39 –Sprawling, medium - long vines; yield: 2668 lb/A; maturity: 98 days.
Eclipse –Short runners; yield: 2735 lb/A; maturity: 94 days.
Zenith –Upright; yield: 2781 lb/A; maturity: 99 days.
Black Velvet –Erect plant, medium vines; yield: 2707 lb/A; maturity: 99 days
Midnight –Erect, with short vines; yield: 2780 lb/A; maturity: 101 days
Zorro –Upright; yield: 2854 lb/A; maturity: 97 days

Thanks to the NYS Dry Bean Industry for their support, and to Eric Sandsted and Don Halseth, Cornell, for their advice and assistance.

Worker Protection Standard (WPS) Reminders, Update

Alice Wise and Sandy Menasha, CCE Suffolk County, Long Island Fruit & Vegetable Update, #1, 4/7/16

DEC has the right to conduct inspections to certify that growers are in compliance with regulations for agricultural pesticides including organics. Inspections may include WPS, record keeping, and pesticide storage. Go through the checklist to make sure everything is in order for the season. *Note: The EPA has announced stronger revisions to the 1992 Worker Protection Standard which will take effect on January 2, 2017. For this growing season, the below WPS requirements still apply.* For more information on the changes, visit the EPA website at https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps. Alternatively, contact the NYS Dept. of Environmental Conservation office in your Region.

1. Check decontamination kits and upgrade as necessary:
   - coverall, soap and a stack of single use towels.
   - fresh water, enough for routine washing (at least 1 gal. per worker using the site) and emergency eye flushing. If the decontamination kit might be used by a pesticide handler, there must be at least 3 gal/handler using the site.
   - check expiration date on eye flushing.
   - decontamination kits must be within ¼ mile of all workers.
   - all handlers and workers need to know where the decontamination sites are and what they contain.
2. Where eye protection is required on a pesticide label, the WPS guidelines say the eyewash must be "immediately accessible" to a pesticide handler. The need for eye protection will be listed on the pesticide label in the box entitled "Agricultural Use Requirements", in the section listing PPE (personal protective equipment). The emergency eyewash water (1 pint) must be carried on the tractor. However, if the applicator gets off the tractor, the eyewash must be carried on their person.
3. Check your Central Posting Area and make sure it is easily seen, accessible and the information posted is legible. This has been a source of violations in years past. Make sure emergency contact information is accurate. If the WPS safety poster is in poor condition, get a new one. Have your pesticide application forms* together – they need to have:
   - location and description of area to be treated,
   - product name, EPA registration no., active ingredient(s),
   - date and time pesticide is scheduled to be applied, and the restricted-entry interval (REI). You are required to post this information before each application begins.
4. A farm map is suggested for the Central Posting Area so workers can easily ID the location of all farm fields. Some growers use names (Main Road Chardonnay Block), some use numbers or letters (Block 2 Chardonnay). If a DEC inspection occurs, your workers must understand and be able to communicate the location of the applications and a farm map makes this easier.
5. Train new workers within 5 days of working. Handlers and early-entry workers who will come in contact with anything treated during the REI must be trained before they work. Handlers and workers must be trained at least once every 5 years – check your records on long-term employees. **All training must be done by a licensed pesticide applicator.**
6. Look at the "Agricultural Use Requirements" box on the pesticide label for a list of required PPE. Make sure PPE is adequately stocked – chemical resistant suits, gloves, aprons, protective eyewear, boots, and respirators. Store respirator cartridges in an airtight container. Store respirators away from the pesticide storage area. Check unopened respirator cartridges for an expiration date.
7. Have copies of pesticide labels available. All applicators must have a copy of the label immediately accessible. Some growers deal with individual labels, some put together a notebook to be carried on the tractor.
8. When making an application, the applicator must have the following items immediately accessible:
   - Applicator's license.
   - Labels for all materials being applied.
   - Appropriate PPE (see the label).
9. Organize and clean up your pesticide storage area. Pesticide storage guidelines can be found at http://www.dec.ny.gov/regulations/8871.html.

* Record keeping forms for private applicators: DEC has forms that satisfy the NYS requirements: 30-day WPS notification and USDA requirements. Forms can be found at: http://www.dec.ny.gov/docs/materials_minerals_pdf/privatercdfr.pdf

EPA's WPS **How to Comply Manual** can be found at: https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps

Personal protection equipment. *Photo: Carol MacNeil, CVP*

2016 Vegetable Pesticide Updates – Many New Herbicides

Christy Hoepting, CCE Cornell Vegetable Program

Changes in pesticide registrations occur constantly and human errors are possible. Read the label before applying any pesticide. No endorsement of products or companies is made or implied. Other pesticide updates that we missed are welcome. Information was last updated on April 27, 2016. Updates after this date will 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.)

- **ACURON Herbicide:** (EPA No. 100-1568; a.i. bicyclopyrone, mesotrione, S-metolachlor, atrazine; Syngenta). For pre- and post-emergent control of annual grasses and broadleaf weeds in sweet corn. ***This is the first product in NYS containing the active ingredient bicyclopyrone.***
- **ACURON FLEXI Herbicide:** (EPA No. 100-1568; a.i. bicyclopyrone, mesotrione, S-metolachlor; Syngenta). For pre- and post-emergent control of annual grasses and broadleaf weeds in sweet corn.
- **ARMEZON PRO Herbicide:** (EPA No. 7969-372; a.i. topramezone and dimethenamid-P; BASF). For post-emergent control of broadleaf and grass weeds in sweet corn. Essentially, this is a premix of Armezon and Outlook.
- **BIOCERES Biological Contact Insecticide:** (EPA No. 89600-2; a.i. *Beauvaria bassiana* strain ANT-03; Anatis Bioprotection, Inc.). For control of many foliar feeding insect pests including aphids, white flies, plant bugs, beetles, and weevils. It is registered on all vegetable crops including greenhouse vegetables. ***This is the first product in NYS containing this active ingredient.***
- **FASTAC CS Insecticide:** (EPA No. 7969-364; a.i. alpha-cypermethrin; BASF). For broad-spectrum insect control in leafy, head and stem Brassicas; sweet corn, cucurbits, fruiting veggies (tomatoes, etc.), leafy veggies (e.g celery, spinach), dry and succulent lugumes (beans and peas), root and tuber veggies (beets, carrots, etc.).
- **MAJESTENE Bionematicide.** (EPA No. 84059-14; a.i. heat-killed *Burkholderia* spp. strain A396 cells and spent fermentation media; Marrone Bio Innovation). For suppression of plant parasitic nematodes in field and greenhouse grown sweet corn, cucurbits and fruiting veggies (e.g. tomatoes). ***This is the first product in NYS containing this active ingredient.*** Note, the 2(ee) labels for use on potatoes and onions are not available in New York.
- **MANTOCOR LRF IN-FURROW FUNGICIDE/INSECTICIDE:** (EPA No. 279-3478-7969; a.i. bifenthrin and pyraclostrobin, BASF). For soil insect pests and soilborne/seedling disease control and plant health in sweet corn by mixing directly with liquid fertilizer using at-planting applications.
- **MERIVON® XEMIUM® BRAND fungicide:** (EPA No. 7969-310, a.i. fluxapyroxad + pyraclostrobin, BASF). For control of Alternaria, Botrytis, Cercospora, Powdery mildew, etc. leaf diseases of bulb veggies (e.g. onion), cucurbits, leafy veggies (e.g. lettuce) and root veggies (e.g. beets & carrots).
- **PRIAXOR Xemium Brand Fungicide.** (EPA No. 7969-311; a.i fluapyroxad and pyraclostrobin; BASF). For foliar disease control (Alternaria, Anthracnose, Downy mildew, powdery mildew, Botrytis, rust, etc.) in Brassica leaf veggies, sweet corn, dried and succulent peas and beans, fruiting veggies (like tomato) and potatoes.
- **TUSCANY SC Herbicide:** (EPA No. 71368-113; a.i. flumioxazin; Nufarm Americas). For pre- and post-emergent control of broadleaf weeds in asparagus, artichoke, celery, dry beans (harvest aid only), garlic, dry bulb onion, potato and sweet potato. Essentially, this is a liquid formulation of Chateau/Valor.
- **VARISTO Herbicide:** (EPA No. 241-447; a.i. imazamox and bentazon; BASF). For post-emergent control of broadleaf and grass weeds in dry beans and peas, English peas, and snap and succulent lima beans. This is a pre-mix of Raptor plus Basagran.

Label Expansions (new pests added to updated version of label)

- **DUAL MAGNUM Special Local Needs (SLN) herbicide:** EPA No. 100-816/SLN No. NY-110004; a.i. metolachlor; Syngenta). Added Brussels sprouts (transplanted), cauliflower (transplanted), lettuce (head and leaf) and summer squash.

  Note that previous Dual Magnum SLN labels NY-090004 (pre-harvest intervals for tomatoes) and NY-050001 (use on asparagus, transplanted bell pepper, cabbage, carrots, garden beets, dry bulb and green onions, spinach, Swiss chard, pumpkins and winter squash) are rolled into this new label along with broccoli (direct seeded and transplanted), melon crop subgroup 9a (cantaloupe, muskmelon and watermelon), cucumber, garlic and leafy brassica greens crop subgroup 5b.

  Note: All of these uses require signing a waiver/indemnification – for instructions, visit the CVP website: http://rvpadmin.cce.cornell.edu/uploads/doc_450.pdf

FIFRA 2(ee) Recommendations (unlisted pest for crop already on label)

- **QUINTEC fungicide:** (EPA No. 62719-375; a.i. quinoxyfen; Dow AgroSciences). For suppression of the unlabeled pest bacterial spot in tomatoes.

Supplemental Labels

No new labels for 2016

FIFRA Section 24(c) Special Local Need Labels (SLN)

- **NORTRON SC Herbicide:** (EPA no. 264-613, SLN NY-120014; a.i. ethofumesate; Bayer CropSciences). For selective control of weeds in garden beets. **Expires: 12/31/18.**

continued on next page

Note: Users must have a copy of <u>both</u> 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.

<u>Discontinued Products</u>

- **MONITOR 4 Insecticide**: (EPA Nos. 3125-280; 239-2404; 59639-56) a.i. methamidophos; Bayer, Valent).
- **PENNCAP-M and other methyl parathion products:** (It is <u>illegal to use this product in New York.</u>

<u>In short supply:</u>

- **OPTION Herbicide:** EPA No. 264-685; a.i. foramsulfuron; Bayer CropSciences). For annual and perennial grass, and broadleaf weed control in sweet corn. **Not available.**
- **RELY 280 Potato vine dessicant.** (EPA No. 264-829; a.i. glufosinate-ammonium; Bayer CropSciences).
- **VYDATE L and C-LV Insecticide/Nematicide:** EPA No. 352-532 & 352-372, a.i. oxamyl, DuPont). Product is not currently being produced due to a deadly incident that occurred in the Texas plant where Vydate is produced.

How to LOOK UP LABELS for Pesticides Labeled in New York

Go to the NYS Pesticide Product, Ingredient, and Manufacturer System (PIMS) website: http://pims.psur.cornell.edu/.

To look up **primary and supplemental labels for products that are currently registered**, you may search by product name, active ingredient or EPA number. From the product search results, click the "NYS" label under the "Labels" column of the pesticide that you are interested in. On the next page click "View" for the most recent (by date) and currently approved NYS primary or supplemental label. Any current **2(ee)s or Section 18 Emergency Exemptions** approved for a pesticide will also be available via this search.

If the pesticide you're searching for doesn't come up when searching in the currently registered product listings, you can check to see if the **pesticide's NY registration has ended**. Select search by product name or EPA number in the main menu and under "Search Options", select "Archive", then click "Submit". If the pesticide you're searching for is listed in the results, then it's no longer registered in NYS. If the product you're searching for is not listed here, then it either never was registered in NYS or it has a **Special Local Needs (SLN)** registration.

To look up **SLN** labels, from the main menu, click on "Special Registrations". On this screen, go under the "Special Local Need Products" option, set the "Display" setting to 100 records and click "Submit". A list of all current SLN registrations will come up where you can search for the specific product. Click on the "NYS" link under the "Labels" column to view the approved label(s).

Revised 2016, C. Hoepting, CVP, and M. Helms, PMEP

How Cool is Too Cool?

Judson Reid, CCE Cornell Vegetable Program

With the increased use of high tunnels, we see more crops going into the ground earlier each spring. Growers often focus on air temperature to avoid frosting foliage. Row covers and forced hot air are common solutions to low nighttime temperatures. However, is the soil warm enough for transplanting these crops? Black plastic mulch can be used to increase soil temperature but requires the following:

- Tight contact with soil
- Moderately moist soil
- Sunlight
- Time

If the contact with the soil is not tight, there is a lack of sunshine or transplants go onto the plastic immediately after being laid, soil temperatures may still be too low. 55F is the minimum for tomatoes and 60F for beans. Pepper and eggplant should go into the ground closer to 70F. Although 55F is a minimum for tomatoes, the plants will not thrive at this temperature and will become susceptible to infection from cool temperature pathogens such as Pythium and Rhizoctonia. Leggy transplants that are pot bound need to establish roots quickly to avoid transplant shock. Cool soils slow root growth and these plants may not recover. Cloudy weather over the last several weeks has slowed the process of soil warming. If in doubt, be sure to check soil temperature before transplanting and avoid burying transplants too deep where temperatures are lower.

Pot-bound transplants unable to revive in cold tunnel soil. *Photo: Judson Reid, CVP*

FRESH MARKET

Despite the seemingly cool weather, flea beetles have been kicking around for some time now. So every slightly warm and sunny day, they are active and feeding on brassicas. Corn flea beetles have also been active on sweet corn seedlings under plastic. Keep an eye out for these pests and keep them from heavily damaging leaves.

Check for black aphids on greens grown under row cover. Cool weather is favorable for these periodic insects. Infestation may be spotty but they can make a mess out of some greens and fava beans.

ONIONS

Direct seeding of onions is nearing completion as transplanting continues. Rain events of past couple of weeks has been perfect for wind erosion control and to activate pre-emergent herbicides. Many fields will be getting first pre-emergent herbicide application this week – see article regarding highlights of last year's pre-emergent program. Keep in mind that this year's conditions have been muck cooler and wetter than they were during the 2015 trial; both crop injury and weed control could be increased comparatively.

CVP Specialists Receive 2016 NYFVI Grant Awards

Crops and Wildlife, It's More than a Nuisance

New York sweet corn and cucurbit production have a combined value of over $104 million. Wildlife, particularly birds and deer, can create significant damage. In 2014 a survey of vegetable growers found that 84% of them had an estimated 16% loss from birds alone. The damage is more than just economic; wildlife contamination of fresh market vegetables is a food safety issue and potential liability for growers. Dr. Darcy Telenko with the Cornell Cooperative Extension, Cornell Vegetable Program (CVP), along with Robert Hadad (CVP) and Marion Zuefle (NYS Integrated Pest Management Program), has received a grant to implement her research plan to test physical and chemical deterrents and provide specific recommendations about timing, placement and use of the tools. Award value: $74,534.

Best Management Practices for Long Term Profitable High Tunnel Soil Fertility and Health

The growth in winter market opportunities, paired with the challenges of increasingly volatile weather patterns has led to an exponential increase in the use of high tunnels by New York growers. However, the best management practices (BMPs) to ensure soil health and fertility are not widely known and some of the early adopters of high tunnels are encountering challenges. This project, led by Andy Fellenz of NOFA-NY, in partnership with Judson Reid of Cornell University, is focused on supplementing knowledge of BMPs gained from a prior NYFVI project and ensuring the widespread adoption of these sustainable practices to help NY growers maximize their profits with these structures. Award value: $116,126

What You Need to Know About Using Sanitizer Monitoring Strips

Robert Hadad, CCE Cornell Vegetable Program

For post-harvest washing or rinsing of produce, the use of sanitizer in the water is highly recommended for food safety. Sanitizer added to water will help to reduce the microbial risk that might occur from introduction of contamination into the water. Sanitizers don't really clean produce. Instead, sanitizers keep the wash water from being microbes and contaminating the clean produce that is being washed.

To make sure the sanitizers are at the correct concentration at the beginning of the wash cycle or for checking the levels during the wash process, monitor strips specific for types of sanitizers are available. There are test strips for free available chlorine, peracetic acid (PAA) , and hydrogen peroxide. Similar in method of use like pool water strips and pH, the sanitizer strips are dipped into the wash water, they turn color, and then you match the color to a chart on the label of the test strip container.

We wanted to check on the ease of use, accuracy, and consistency of various brands and ages of test strips readily found in the marketplace. The trial was done using clean tubs filled with municipal water(10 gallons). The pH was checked and it was 7.0. Three tubs were used to give us three replications. Five test strips from each brand and age were used for each tub giving a total of 15 readings. The calculation for the concentration used in produce washing for the PAA from the label was 60ppm and this was added to the water for each tub. The sanitizer was mixed thoroughly into the water and left for 10 minutes. The strips were then dipped into the water per label instructions and the color chart matches provided the ppm of sanitizer that each strip was supposed to be representing.

The results were rather disappointing.

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Two brands of PAA strips gave variable results. One had results that were more than half of what the ppm should have been representing. Another brand consistently gave higher readings than it should have. Two samples had strips that were expired (even though one was purchased late last fall). One of these expired samples gave mixed lower results, the other gave consistent spot-on results of 60ppm. Two other brands had results that had the majority of strips at 60ppm or just slightly higher.

The problem with color chart matching is a big issue. For most of the brands, the differences in color representing different ppm aren't very distinct. Depending on the light, the observations seemed variable. Bright sunlight vs inside a darker shed can give different views of the color chart or the color of the strip.

Another issue that became quickly apparent is that the directions for using the strips on the label may be different and in some cases very different for each. There is a quick time limit for matching the dipped strips against the color chart before the colors change. Some as little as 10 seconds. Dip times in the water ranged from1 second to 2 to no mention of duration. Some wanted the strips to be moved in the water while others wanted them held still.

The chlorine strip test failed miserably. The trial was held with fresh water and rinsed out tubs. Germicidal chlorine bleach (8.25%) was added at 50ppm. The strips did not read accurately at all, with all the strips showing concentrations way low or not all.

Conclusions: How the directions are followed have a direct bearing on the results. Be sure the directions are followed to the letter and the time for dipping and the time to read the strip against the chart are adhered to. The age of the strips may have an effect. Check expiration dates on the packages. Store packages properly according to the label. Prior to harvest, do a run-through of setting up the wash water and adding the correct concentration of sanitizer. Check your math. Know how much volume of water you are using and mark it with marker on the side of the tub or basin exactly. In this way, you can fill the correct amount each time. Be precise when adding the correct concentration of sanitizer. Use the test strips and get a feel for how to take the readings quickly. If you don't get the readings you think you should have, go over all the steps again to make sure everything is correct. If the readings are still off, purchase a new set of strips and maybe a different brand.

The monitoring strips are a guide for growers to be able to check if the sanitizer concentration starts at the right levels and if lowers after washing produce, then more can be added or a new batch of clean water in the tubs can be set up. Keep in mind that the monitoring strips can be variable so if you know you have set up the wash water correctly with sanitizer the strips should be giving you a pretty close reading. Once set, then continued monitoring periodically during the wash cycle will provide guidance of when the sanitizer levels start to decline and need replenishing or replacement.

For a list and information on sanitizers go to https://ag.purdue.edu/hla/foodsafety/Pages/WashWaterSanitizers.aspx

https://store.extension.iastate.edu/Product/Guide-to-Liquid-Sanitizer-Washes-with-Fruit-and-Vegetables

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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 in Western New York. 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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