Vegetable Crop Update

A newsletter for commercial potato and vegetable growers prepared by the University of Wisconsin-Madison vegetable research and extension specialists

Division of Extension
University of Wisconsin-Madison

No. 10 – June 13, 2021

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Calendar of Events

July 21, 2021 – UW-Hancock Ag Research Station Field Day (1-4:30PM)
July 22, 2021 – UW-Extension Langlade Co. Airport Ag Research Station Field Day
November 30-December 2, 2021 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
February 8-10, 2022 – UW-Madison Div. of Extension & WPVGA Grower Education Conference, Holiday Inn, Stevens Point, WI

Amanda Gevens, Chair, Professor & Extension Vegetable Pathologist, UW-Madison, Dept. of Plant Pathology, 608-575-3029, Email: gevens@wisc.edu.

Current P-Day (Early Blight) and Disease Severity Value (Late Blight) Accumulations. Many thanks to Ben Bradford, UW-Madison Entomology; Stephen Jordan, UW-Madison Plant Pathology; and our grower collaborator weather station hosts for supporting this disease management effort. A Potato Physiological Day or P-Day value of ≥300 indicates the threshold for early blight risk and triggers preventative fungicide application. A Disease Severity Value or DSV of ≥18 indicates the threshold for late blight risk and triggers preventative fungicide application. Red text in table indicates threshold has been met or surpassed. TBD indicates that data are To Be Determined as time progresses. Weather data used in these calculations comes from weather stations that are placed in potato fields in each of the four locations. Data are available in graphical and raw formats for each weather station at: https://vegpath.plantpath.wisc.edu/dsv/

Location	Planting Date		50% Emergence Date	Disease Severity Values (DSVs) 6/12	Potato Physiological Days (P-Days) 6/12
Grand Marsh	**Early**	April 2	May 10	14	200
	Mid	April 10	May 15	14	190
	Late	May 1	May 23	8	128
Hancock	**Early**	April 5	May 12	7	215
	Mid	April 15	May 15	7	207
	Late	May 5	May 23	2	145
Plover	**Early**	April 7	May 12	13	202
	Mid	April 20	May 20	10	157
	Late	May 7	May 30	5	95
Antigo	**Early**	April 26	May 28	0	107
	Mid	May 10	June 5	0	69
	Late	May 20	June 13	TBD	TBD

The persistence of hot and dry weather has kept disease risk low, however, heat in an irrigated crop still produces some risk which is evidenced in the gradually accumulating DSVs for earliest planted potatoes in southern and central Wisconsin. It is likely that by next week we will begin to meet thresholds for onset of early blight and preventative fungicides are necessary. There have been no reports of late blight

in tomato or potato in the US yet this season (usablight.org). Once thresholds are met for risk of early blight and/or late blight, fungicides are recommended for optimum disease control. Fungicide details can be found in the 2021 Commercial Vegetable Production in Wisconsin Guide, Extension Document A3422: https://cdn.shopify.com/s/files/1/0145/8808/4272/files/A3422-2021.pdf

Jed Colquhoun, Professor and Extension Specialist, IPM Program Director, UW-Madison Department of Horticulture, colquhoun@hort.wisc.edu, https://specialtycrops.wisc.edu/

Optimizing herbicide performance during droughty conditions. Many non-irrigated areas of the Upper Midwest are becoming significantly droughty as our weather prematurely enters the dog days of summer. There are several agricultural impacts of these hot and dry conditions, including on weed growth and management. While we can't make it rain, we can use awareness of how drought affects weeds to adjust plans in a way that optimizes management. Here, we offer a very short summary of weed growth and herbicide performance in a drought and a few tips on how to adjust plans in these conditions.

Weed growth in a drought: Annual weeds are biologically conditioned to germinate and emerge when weather conditions favor survival and reproduction. There are many factors that affect seed dormancy, such as soil temperature, seed age, seed coat mechanical breakdown and soil moisture. Weed seed that is close to the soil surface is most affected by drought and we often see fewer weed seeds break dormancy and germinate in these conditions. And, some weeds that do germinate will die before establishment because of inadequate moisture to support growth.

That's the good news. Unfortunately, there are two negative aspects of weed biology during a drought that affect successful management. First, in the absence of annual small-seeded weeds that germinate from near the soil surface, the weed spectrum shifts to those that are often harder to control: perennials regrowing from deep and established root systems such as yellow nutsedge and Canada thistle and large-seeded weed species that can germinate and emerge from deeper in the soil where moisture may be more available. Second, emerged weeds become "hardened off" and more difficult to control during a drought. In particular, they will put on a thicker, waxier cuticle on leaf surfaces to protect from water loss.

Herbicide performance during a drought and what we can do to optimize it:
There are two common misconceptions that we need to first address: soil residual herbicides don't prevent weed seed germination and stressed weeds are actually harder to control than healthy, actively growing weeds. In a very general sense, herbicides act by blocking an active biological process required for normal weed growth, and so that target biological process needs to be happening for the herbicide to work.

For soil residual herbicides that are applied prior to weed germination and emergence (pre-emergent herbicides), the herbicide needs to be near the weed seed in the soil as it germinates and the seed needs to break dormancy. In many cases we rely on soil moisture from moderate rainfall to incorporate pre-emergent herbicides into the target weed germination zone. If this doesn't happen weed seed can germinate and emerge rapidly through herbicide sitting on the soil surface. When rainfall is scarce or sporadic, it's worth watching the forecast even more carefully to try to time crop planting and/or pre-emergent herbicide application to the best chance of adequate soil moisture as outlined on the herbicide label. Editorial note: this is obviously easier said than done. I have a beet trial where I planted just before an 80% chance of showers that never happened and has sat with herbicide on the powder dry soil surface for two weeks now. When it does finally rain, I don't expect much out of the pre-emergent herbicide and have started planning for a more aggressive post-emergent program. This is a time when scouting is more important than ever so that post-emergent control options can be considered and timed relative to unanticipated changes in the weed spectrum.

If the droughty conditions persist during the remainder of the growing season and beyond, we'll need to consider another consequence: the risk for extended soil residual carryover. In short, the vast majority of herbicides rely on soil microbes for breakdown and these microbes aren't very active in dry soils. But, let's cross that bridge if and when we get to it in a follow-up article – just be aware of what might be planted next as you think about your herbicide choices and rotational restrictions.

For post-emergent herbicides, as always be very careful to follow the details of the label to optimize performance. Be sure to use the correct adjuvant to help the herbicide penetrate drought-protected leaf surfaces, follow the weed growth stages carefully, and consider adjusting the rate within the labeled ranges with a more challenging target in mind.

In the meantime, stay cool and hydrated and know that I'll be right alongside you checking the weather forecast day and night...

Ground cracking in a powder dry Wisconsin mint field on June 7, 2021.

Vegetable Insect Update – Russell L. Groves, Professor and Department Chair, UW-Madison, Department of Entomology, 608-262-3229 (office), (608) 698-2434 (cell), e-mail: rgroves@wisc.edu

Vegetable Entomology Webpage: https://vegento.russell.wisc.edu/

Onion thrips – (https://vegento.russell.wisc.edu/pests/onion-thrips/). Onion thrips overwinter as adults and later instar larvae in legume and grain fields and along weedy field edges. They can often overwinter in cull onions (bulbs) left in the fields from the previous year. Females are parthenogenetic (can reproduce without mating) and lay eggs just beneath the leaf's surface. Eggs hatch after 5-10 days (temperature dependent), and immatures develop through 4 instar stadia in 15-25 days (again, temperature dependent. Development of the last two immature stages occurs in the soil, without feeding. After the fourth molt, adult female thrips return to the plant. Again, dependent upon prevailing daytime high and nighttime low temperatures, thrips can produce 5-8 generations per year, and outbreaks are most likely to occur in hot, dry weather. Reference is made to his last point!

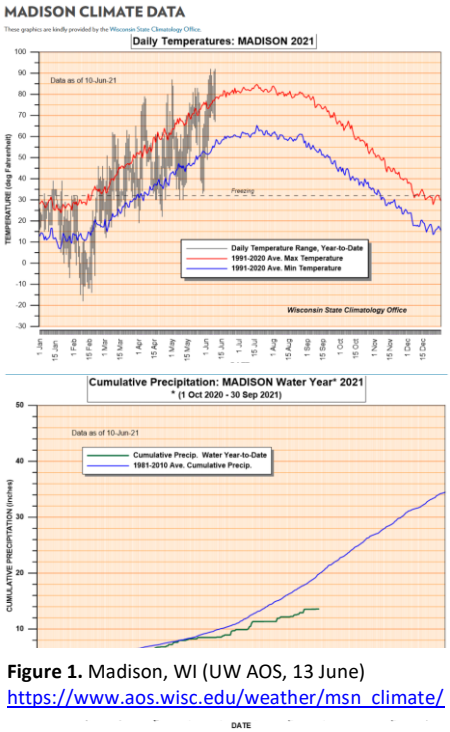


Figure 1. Madison, WI (UW AOS, 13 June) https://www.aos.wisc.edu/weather/msn_climate/

Although we experienced some unseasonably low temperatures in mid-May, the daytime highs (and evening lows) have been back up around avg maximums. Unfortunately, the annual precipitation estimates lag by approximately 7.5" of moisture increasing the risk of onion thrips outbreaks in the region (**Fig. 1**). Thrips management should be considered 'early' before they have a chance to develop large populations under ideal weather conditions. Due to their small size and reclusive habits, onion thrips are difficult to monitor, and it is important to scout for the larvae in the leaf whorls.

Onion thrips are an important annual pest of onion, but they can also attack nearly all garden crops. Serious damage is generally limited to onions, cauliflower, cabbage, cucumber, and greenhouse tomatoes. Monitor plants weekly, and scout plants on field edges initially as thrips are more common at borders in the early part of the season. 1-3 immature thrips per onion leaf is a widely accepted threshold for chemical treatment, and this varies according to the compound considered for use. Feeding damage causes whitish blotches and dry, silvered areas on leaves, decreased pollen set, and, under heavy infestations, brown leaf tips and distorted or undersized bulbs. Both adults and larvae can cause silvery streaking on leaves, which becomes dry and yellow. Immature thrips prefer to feed on the youngest leaves.

Active ingredients that currently have the greatest impact upon immature onion thrips include:

- abamectin (Agri-Mek SC & many registrations), MoA Group 6 (plus pre-mixes), 30-day PHI, ideal with mild penetrating surfactant (NIS), pH < 6.8, avoid high UV
- cyantraniliprole (Exirel, Minecto Pro), MoA Group 28 (plus pre-mixes), 7-day PHI, ideal a methylated seed oil (MSO) adjuvant, pH < 6.5, avoid high UV
- methomyl (Lannate LV), MoA Group 1A, 7-day PHI, pH < 7.0

- spinetoram (Radiant, Delegate), MoA Group 5, 1 day PHI, pH < 7.0
- spirotetramat (Movento HL), MoA Group 23, 3-day PHI, ideal with mild surfactant, pH < 6.8, avoid high UV
- tolfenpyrad (Torac), MoA 21, 7-day PHI, pH < 7.0

Due to insensitivity among populations of onion thrips, synthetic pyrethroids (MoA Group 3) often do not provide adequate control of developing thrips populations. Consider rotating products as a series of two, successive applications of the same mode of action (MoA) class, and then rotating to a new MoA (**Fig. 2**).

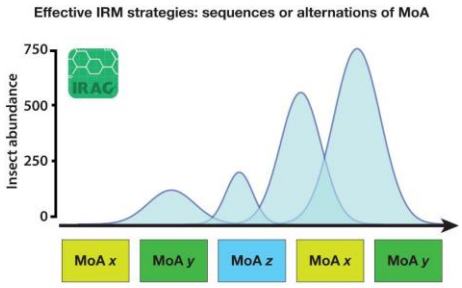
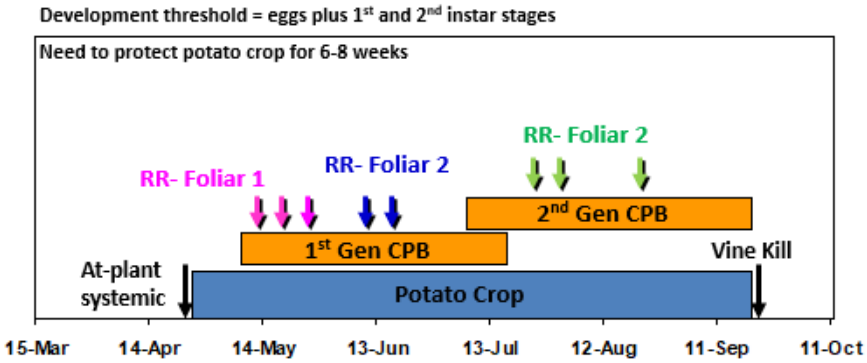


Figure 2. Effective product rotations (https://irac-online.org/).

Colorado potato beetle – (https://vegento.russell.wisc.edu/pests/colorado-potato-beetle/). Adults continue to colonize potato fields along field edges through the past week, but many egg masses are now present and hatching into early larval populations. Forecast temperatures into next week will remain above average, and attention should be paid to the rapidly developing populations or larvae. Recall that our insecticide programs are built around product rotations across generations, and 2-3 successive applications of the same, reduced-risk (RR) mode of action (MoA) within a generation (**Fig. 3**).

Applications of novaluron (Rimon) tolfenpyrad (Torac), spinosad (Blackhawk), spinetoram (Radiant, Delegate), or abamectin (Agri-Mek) should be applied when nearly 50-75% of egg masses have hatched, and a few 2nd instar larvae are present from the earliest hatched egg masses. This event will likely occur through the upcoming week at many locations in central Wisconsin, with additional egg masses being deposited this week as well. Recall, these 1st generation larvicides often require 2-3 subsequent re-applications spaced on a 7-10 day interval to achieve sufficient control of this damaging generation. Our second generation materials often include the anthranilic diamides (several registrations), as they control many lifestages of CPB to include adults, eggs and larvae.



2021 CPB programs - At-Plant and Post-emergence foliar programs

-	No Activity
+	Very little Activity
++	Mod Activity
+++	Excellent

Trade name	Active ingredient	IRAC MoA Code	Spray pH<	Adjuvant	PHI	Rate	Adult	Egg Mass	Early Larvae (1st-2nd instar	Late Larvae (3rd-4th instar)	Notes
At-Plant Systemic											
Belay	clothianadin	4A	pH < 7	none (see notes)	0	12 fl oz	+	-	+++	++	Note: 1). consider soil surfactant to increase uniform movement in soil profile, 2.) season total maximum is only 0.2 lb a.i./ac for both soil-applied and foliar). Do not apply any Group 4A insecticides over the top of an at-plant application of Belay. Considerable resistance with CPB, very effective for potato leafhopper and colonizing aphids
Platinum 75SG	thiamethoxam	4A	pH < 7	none (see notes)	0	2.67 oz	+	-	+++	++	Note: 1). consider soil surfactant to increase uniform movement in soil profile, 2.) season total maximum varies by use pattern (soil-applied vs foliar). Can apply additional foliar applications of a Group 4A on an at-plant application. Considerable resistance with CPB, very effective for potato leafhopper and colonizing aphids
Admire Pro (generics)	imidacloprid	4A	pH < 7	none (see notes)	0	8.7 fl oz	+	-	+++	++	Note: 1). consider soil surfactant to increase uniform movement in soil profile, 2.) season total maximum varies by use pattern (soil-applied vs foliar). Can apply additional foliar applications of a Group 28 on an at-plant application. Considerable resistance with CPB, very effective for potato leafhopper and colonizing aphids
Verimark SC	cyantraniliprole	28	pH < 6.5	none (see notes)	0	13.5 fl oz	+	-	+++	++	Note: 1). consider soil surfactant to increase uniform movement in soil profile, 2.) season total maximum varies by use pattern (soil-applied vs foliar). Can apply additional foliar applications of a Group 28 on an at-plant application (not advisable!). Will provide only 45-60 days of control of CPB. Ineffective for potato leafhopper and mildly effective for aphids.
Regent 4SC	fipronil	2B		none (see notes)	90	3.2 fl oz	-	-	-	-	Note: for use as an at-plant, distributed in-furrow application for the control of Asiatic garden beetle, other white grubs and wireworms.

Trade name	Active ingredient	IRAC MoA Code	Spray pH<	Adjuvant	PHI	Rate	Adult	Egg Mass	Early Larvae (1st-2nd instar	Late Larvae (3rd-4th instar)	Notes
1st generation CPB Materials											
Rimon 0.83EC	novaluron	15	pH < 6.5	NIS (0.25-0.5% V:V)	14	9,8,7 fl oz 10,8,8 fl oz	-	+++	++	++	Initiate applications when egg deposition first appears in outer rows (0-48rows) of the field. Initial foliar application (9.0 fl oz/ac) can be applied as a 'ring' application, treating only the outer-most rows of the field. Subsequently, apply 2nd foliar application (8.0 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application (7.0 fl oz/ac) 7 days after prior application. Continue to scout the field, if an additional application is necessary, apply a final application (8.0 fl oz) to the interior of the field, not initially treated during the ring application. Must be applied with an adjuvant (NIS), and consider application outside of mid-day hours (10:00 - 16:00 h). Slightly acidify tank mix prior to application (pH < 6.5). Caution when tank-mixing this product with fungicides containing proprietary stickers (e.g., WeatherStik). Ground application advised.
Agri-Mek SC	abamectin	6	pH < 6.5	NIS (0.5% V:V)	14	3.0-3.25 fl oz	+	-	+++	++	Initiate applications when 50-75% egg hatch has occurred, and 1st instar larvae are present on outer-most field rows. Initial foliar application (3.25 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (3.0 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7 days after previous application with another larvicide that is effective on later stage larvae (e.g., Radiant @ 8 fl oz/ac). Must be applied with an adjuvant (NIS), and consider application outside of mid-day hours (10:00 - 16:00 h). Slightly acidify tank mix prior to application (pH < 6.5). Caution when tank-mixing this product with fungicides containing proprietary stickers (e.g., WeatherStik). Ground-application advised. Only two successive applications of Agri-Mek SC allowed per crop season.

Torac	tolfenpyrad	21A	pH = 6.5	NIS (0.5% V:V)	14	14-21 fl oz	++	++	+++	++	Initiate applications when 50-75% egg hatch has occurred, and 1st instar larvae are present on outer-most field rows. Initial foliar application (21.0 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (21.0 fl oz/ac) over entire field two weeks later. Continue to scout field and consider a 3rd foliar application with another larvicide that is effective on later stage larvae as needed. Must be applied with an adjuvant (NIS), and consider application outside of mid-day hours (10:00 - 16:00 h). Slightly acidify tank mix prior to application (pH < 6.5). Ground-application advised. Only two successive applications of Torac allowed per crop season.
Trade name	**Active ingredient**	**IRAC MoA Code**	**Spray pH<**	**Adjuvant**	**PHI**	**Rate**	**Adult**	**Egg Mass**	**Early Larvae (1st-2nd instar**	**Late Larvae (3rd-4th instar)**	**Notes**
1st generation CPB Materials (cont.)											
Blackhawk 36WDG	spinosad	5	pH = 7	NIS (0.125 - 0.25% V:V)	7	3.0-3.3 oz	+	-	+++	+++	Initiate applications when 50-75% egg hatch has occurred, and 1st instar larvae are present on outer-most field rows. Initial foliar application (3.3 oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (3.0 oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7 days after previous application with another larvicide that is effective on later stage larvae (e.g., Agri-Mek SC @ 3.25 fl oz/ac). Can be applied with an adjuvant (NIS), and consider application outside of mid-day hours (10:00 - 16:00 h). Neutral tank pH is appropriate for this application (pH = 7.0). Ground-application advised. Only two successive applications of Blackhawk allowed in succession per crop season.
Radiant SC Delegate WG	spinetoram	5	pH = 7	NIS (0.125 - 0.25% V:V)	7	Radiant 6.5-8.0 fl oz/A Delegate 2.5 – 4.0 oz/A	++	-	+++	+++	Initiate applications when 50-75% egg hatch has occurred, and 1st instar larvae are present on outer-most field rows. Initial foliar application (8.0 oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (6.5 oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7 days after previous application with another larvicide that is effective on later stage larvae (e.g., Agri-Mek SC @ 3.25 fl oz/ac). Can be applied with an adjuvant (NIS), and consider application outside of mid-day hours (10:00 - 16:00 h). Neutral tank pH is appropriate for this application (pH = 7.0). Ground-application advised. Only two successive applications of Radiant or Delegate allowed in succession per crop season.

Trade name	Active ingredient	IRAC MoA Code	Spray pH<	Adjuvant	PHI	Rate	Adult	Egg Mass	Early Larvae (1st-2nd instar	Late Larvae (3rd-4th instar)	Notes
2nd generation CPB Materials											
Coragen 1.67SC Vantacor 5SC	chlorantraniliprole	28	pH < 6.5	MSO (0.25-0.5 % V:V)	14	variable and formulation dependent (fl oz/A)	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (7.5 fl oz/ac, Coragen) can be applied to the entire field. Subsequently, apply 2nd foliar application (5.5 fl oz/ac, Coragen) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7-10 days later only if populations continue to defoliate. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Up to 4 successive applications of Coragen allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).
Exirel 0.83SC	cyantraniliprole	28	pH < 6.5	MSO (0.25-0.5 % V:V)	7	5.0-13.5 fl oz	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (13.5 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (10 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7-10 days later only if populations continue to defoliate. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Only two successive applications of Exirel allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).
Minecto Pro	abamectin + cyantraniliprole	6 + 28	pH < 6.5	MSO (0.25-0.5 % V:V)	14	5.5-10 fl oz	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (10 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (7.5 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7-10 days later only if populations continue to defoliate. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Only

											two successive applications of Minecto Pro allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).
Trade name	**Active ingredient**	**IRAC MoA Code**	**Spray pH<**	**Adjuvant**	**PHI**	**Rate**	**Adult**	**Egg Mass**	**Early Larvae (1st-2nd instar**	**Late Larvae (3rd-4th instar)**	**Notes**
2nd generation CPB Materials (cont.)											
Besiege	chlorantraniliprole + lambda-cyhalothrin	28 + 3	pH < 6.5	MSO (0.25-0.5 % V:V)	14	6.0-9.0 fl oz	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (9.0 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (7.0 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7-10 days later only if populations continue to defoliate. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Three successive applications of Besiege are allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).
Elevest	chlorantraniliprole + bifenthrin	28 + 3	pH < 6.5	MSO (0.125 – 0.25% V:V)	21	5.6-9.6 fl oz/A	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (9.6 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (7.5 fl oz/ac) over entire field one week later. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Two successive applications of Elevest are allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).

Voliam Flexi	chlorantranilprole + thiamethoxam	28+4A	pH < 6.5	MSO (0.25-0.5 % V:V)	14	4.0 fl oz	++	++	+++	+++	Initiate applications after the emergence of the 2nd generation of CPB, and when defoliation estimates have reached or exceeded 5-10%. Initial foliar application (4.0 fl oz/ac) can be applied to the entire field. Subsequently, apply 2nd foliar application (3.5 fl oz/ac) over entire field one week later. Continue to scout field and consider a 3rd foliar application 7-10 days later only if populations continue to defoliate. Should be applied with an adjuvant (MSO) and acidify tank pH (pH < 6.5). Ground-application advised. Only two successive applications of Voliam Flexi are allowed in succession per crop season for control of the Colorado potato beetle. Do not apply a Group 28 material if a Group 28 material was applied in 1st generation, or as an at-plant systemic (e.g., Verimark).

Trade name	Active ingredient	IRAC MoA Code	Spray pH<	Adjuvant	PHI	Rate	Adult	Egg Mass	Early Larvae (1st-2nd instar	Late Larvae (3rd-4th instar)	Notes
Other options											
Admire Pro (foliar)	imidacloprid	4A	pH < 7	none (see notes)	7	1.3 fl oz	+	-	++	+	Apply Admire Pro as a foliar insecticide for control of late-season potato leafhopper and aphids where no Group 4A insecticide was used as an at-plant insecticide starter.
Actara 25WG (foliar)	thiamethoxam	4A	pH < 7	none (see notes)	14	1.5-3.0 oz	+	-	++	+	Apply Actara 25WG as a foliar insecticide for control of late-season potato leafhopper and aphids where no Group 4A insecticide was used as an at-plant insecticide starter.
Assail 30SG (foliar)	acetamiprid	4A	pH < 7	NIS (0.25-0.5 % V:V)	7	1.5-4.0 oz	+	-	++	+	Apply Assail 30SG as a foliar insecticide for control of late-season potato leafhopper and aphids where no Group 4A insecticide was used as an at-plant insecticide starter.
Venom	dinotefuran	4A	pH < 7	none (see notes)	7	1.0-1.5 oz	+	-	++	+	Apply Venom as a foliar insecticide for control of late-season potato leafhopper and aphids where no Group 4A insecticide was used as an at-plant insecticide starter.
Avaunt	indoxacarb	22	pH < 7	NIS (0.25% V:V)	7	3.5-6.0 fl oz	+	-	-	-	Apply Avaunt insecticide targeting only adult Colorado potato beetle. Applications can be tank mixed with Rimon 0.83EC during early season applications to kill adults, alternatively a tank mix application can be applied during later 2nd generations to target adults only. The addition of piperonyl butoxide may increase the efficiency of adult control. Apply only two successive applications, spaced 5 days apart.
Brigade 2EC	bifenthrin	3A	N/A	N/A	21	2.1-6.4 fl oz	+	-	-	-	Apply Brigade insecticide targeting only adult Colorado potato beetle. Applications can be applied during later 2nd generations to target adults only. The addition of piperonyl butoxide may increase the efficiency of adult control. Apply only two successive applications, spaced 5-7 days apart.

Imidan 70W	phosmet	1B	pH < 6.5	N/A	7	1.33	+	-	+	-	DO NOT Re-enter fields within 5 days (5-day REI)! Apply Imidan insecticide targeting only adult Colorado potato beetle. Applications can be applied during later 2nd generations to target adults only. Apply successive applications spaced no less than 10 days apart.