Vegetable Crop Update

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

Extension
UNIVERSITY OF WISCONSIN-MADISON

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In This Issue:

Calendar of Events:

July 7, 2022 – UW-Hancock Ag Research Station Field Day
July 8, 2022 – UW-Extension Langlade Co. Airport Ag Research Station Field Day
July 28, 2022 – UW-Rhinelander Field Day
November 29-December 1, 2022 – Midwest Food Producers Assoc. Processing Crops Conference, Kalahari Convention Center
February 7-9, 2023 – UW-Madison Div. of Extension & WPVGA Grower Education Conference & Industry Show, Stevens Point, WI

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This week, the early emerging potatoes reached tuber initiation and we have seen hooking (Figure 1) on Colomba in our research plots. Overall for commercial growers in the Central Sands, most people have finished their N fertilization at tuber initiation. Canopy closure is about 30 - 40% on average (Figure 2). Looking at the weather forecast for the next 10 days, it will be wet until early next week, followed by warm days for the rest of the week, so we should expect to see rapid tuber bulking and growth.

Figure 1. Bulking tip of Colomba.

Figure 2. About 40% canopy closure observed on a commercial field with Lakeview Russet.

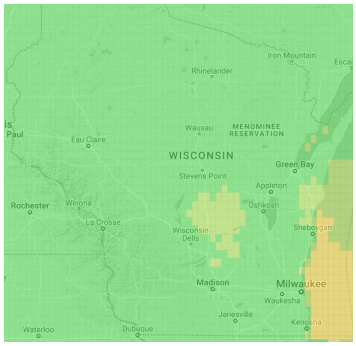
This year we had some emergence issues at Hancock. Varieties like Colomba, Dakota Russet, Dakota Trailblazer, and Reveille Russet showed decayed / un-sprouted seed tubers (Figures below) with symptoms from dry rot and soft rot. One thing to notice was that we cut seeds for those varieties. Although we suberized them under 55°F for about 16 days, we still had issues. Similar problems have been reported by commercial growers. Possible causes include unfavorable weather conditions right after planting (too cold or too hot) or diseases on the seed.

Some updates on our remote sensing research. This past week we flew two commercial potato fields for the first time. We have noted that we could fly at 400' with a resolution of 1.4'', and it took us about 45 minutes with 2 batteries to fly an 80-acre field, and we used 3.2 gb of memory. The big factor that determines the turnaround time is still the image processing. It took us about 24 hours to precisely stitch the raw pictures together, and we are working hard on making the following steps including data extraction, vegetation index (like NDVI) calculation, and field map generation with predicted yield (or other traits) as short as possible.

Some growers who are using UAV-based remote sensing pay less attention to precision stitching of the images, and instead they just use the images to identify possible problematic spots within the field so they can go and check on those plants before any further damage occurs. Other growers who are using sensors mounted on center pivots like the idea of getting high-resolution pictures of their field when the pivot was moving around, and typically they can receive info on AI-identified problems of bugs/diseases/weeds/nutrient deficiency from those pictures with GPS coordinates within a week. In general, remote sensing is really helping growers to make their production more efficient, and hopefully it will help reduce the production inputs like field scouting someday.

Amanda Gevens, Chair, Professor & Extension Vegetable Pathologist, UW-Madison, Dept. of Plant Pathology, 608-575-3029, Email: gevens@wisc.edu, Lab website: https://vegpath.plantpath.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 again in 2022. 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 will come from weather stations that are placed in potato fields in each of the four locations, once available. Data from an alternative modeling source: https://agweather.cals.wisc.edu/vdifn will be used to supplement as needed for missing data points. Data are available in graphical and raw formats for each weather station at: https://vegpath.plantpath.wisc.edu/dsv/.



In sum, none of our in-field weather stations in WI have accumulated enough Disease Severity Values (DSVs) to indicate need for preventative fungicide application for late blight control in potato/tomato, risk values are at around 12 DSVs (threshold of 18) for south central WI for crops that have emerged in mid-May (Figure on left). P-days, used to estimate timing of treatment for potato early blight control, are accumulating progressively. In roughly 10 days, we may reach threshold of 300 for southern WI locations.

Location	Planting Date		50% Emergence Date	Disease Severity Values (DSVs) 6/10/2022	Potato Physiological Days (P-Days) 6/10/2022
Grand Marsh	**Early**	Apr 5	May 10	7	222
	Mid	Apr 20	May 15	7	181
	Late	May 12	May 25	7	122
Hancock	**Early**	Apr 7	May 12	1	200
	Mid	Apr 22	May 17	1	166
	Late	May 14	May 26	0	121
Plover	**Early**	Apr 7	May 15	3	178
	Mid	Apr 24	May 20	3	144
	Late	May 18	May 27	2	107
Antigo	**Early**	May 1	Jun 3	1	46
	Mid	May 15	June 10	0	5
	Late	TBD	TBD	TBD	TBD

In addition to the potato field weather stations, we have the UW Vegetable Disease and Insect Forecasting Network tool to explore P-Days and DSVs across the state (https://agweather.cals.wisc.edu/vdifn). This tool utilizes NOAA weather data (stations are not situated within potato fields). In using this tool, be sure to enter your model selections and parameters, then hit the blue submit button at the bottom of the parameter boxes. 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 2022 Commercial Vegetable Production in Wisconsin Guide, Extension Document A3422, linked here: https://learningstore.extension.wisc.edu/products/commercial-vegetable-production-in-wisconsin

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

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

Colorado potato beetle (CPB) – (https://vegento.russell.wisc.edu/pests/colorado-potato-beetle/). Overwintered adults continue to be active in nearly all fields within Wisconsin. In southern Wisconsin, we are very likely near 50% egg hatch and 50% early larvae (**Fig. 1**). In central Wisconsin, we are around 10-20% egg hatch and adults will continue to mate and lay eggs over the next 10-14 days. In northern Wisconsin, adults continue to emerge and colonize fields with only a few egg masses being laid toward the end of this last week. Forecast high temperatures in the coming week will change this trajectory, and will hasten the development of populations very rapidly.

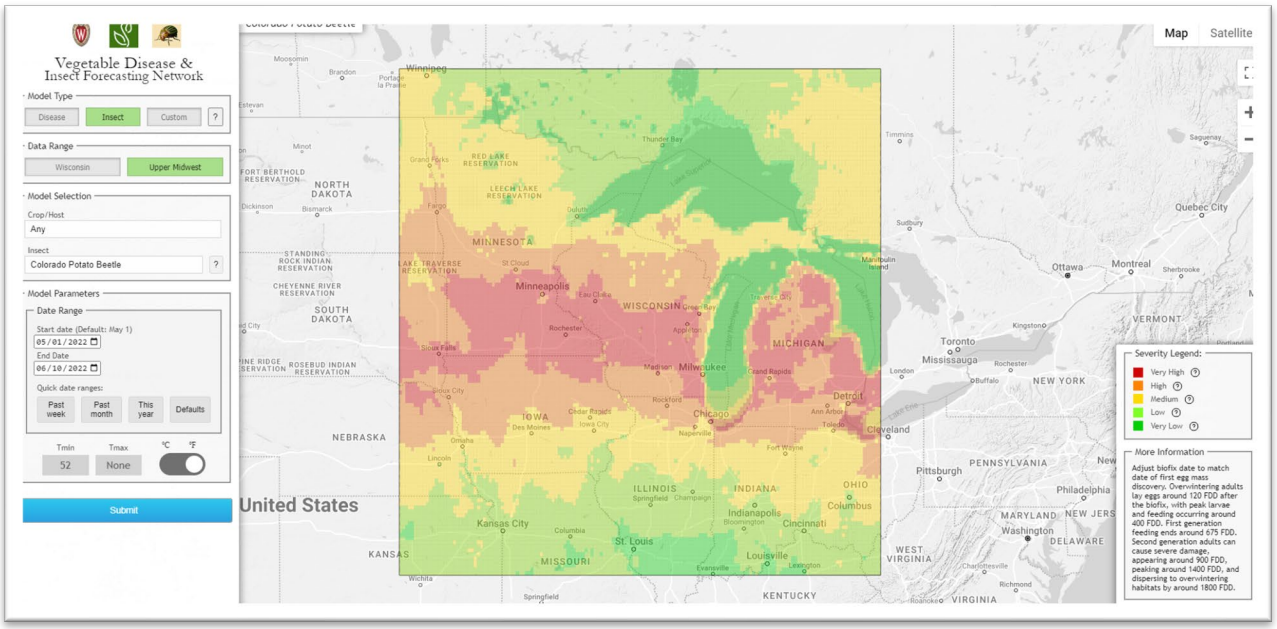


Figure 1. Vegetable Disease and Insect Forecasting Network (VDIFN) map of Colorado potato beetle population development, https://agweather.cals.wisc.edu/vdifn (sourced 06/11/2022). Notice we are at the peak of early larvae risk with accumulated Fahrenheit Degree Days, using a base temperature of 52°F (FDD_{52}). Users are able to select any cell in the VDIFN map(s) and obtain locally relevant DD for their farms. Areas within the 'red shaded' and high risk zone are either at, or very near to the 400 FDD_{52} which signifies the predicted temperatures required for early larval presence and associated egg hatch.

Now is the time to begin looking for small larvae (1st and 2nd instars) on the crop, and now is the time to implement control using reduced-risk (RR) insecticides (**Table Supplement**). Do not utilize older, defoliation-based thresholds (5-10% defoliation) for the purposes of making control decisions. By the time potatoes reach 5-7% defoliation (in about 7-10 days), populations will have progressed through early larval stages and will be nearing the 3rd and 4th instar stages. This will be too late to effectively manage the populations with RR options including novaluron (Rimon), abamectin (Agri-Mek) and spinosad (Blackhawk) or spinetoram (Delegate). This timing is especially true for organic producers who need to focus the use of materials like Entrust SC

(spinosad), Trident (*Bacillus thuringiensis* subsp. *tenebrionis*) or Venerate (heat-killer Burholderia spp.) on these early larval populations. Don't wait! Remember also that the first application should be followed up in 5-7 days with a second application of the same compound depending on the formulation and label restrictions. With warmer day and nighttime high temperatures forecast for the coming week, it will be critical to initiate first larval sprays soon in central and southern Wisconsin. Careful scouting will reveal the exact timing!

Seedcorn maggot 'Round #2' across Wisconsin and upper Midwest – (https://vegento.russell.wisc.edu/pests/seedcorn-maggot/). The second generation of the seedcorn maggot has entered southern Wisconsin and is progressing northward. Recall that seedcorn maggots (SCM) have a large host range including numerous common vegetable crops. In high numbers and when peak SCM are predicted (again in southern Wisconsin, **Fig 2.**), egg laying and larval development can decimate entire crop stands if left untreated. Larvae will feed in the cotyledons and below-ground hypocotyl (stem) tissue of seedling plants, resulting in a variety of damage symptoms. Feeding damage in germinating seeds will often kill seedlings before they emerge. Poor germination or poor stands of susceptible crops may indicate a SCM problem. Since adult SCM is attracted to decaying organic matter, do not plant susceptible crops in fields where animal or green manure has recently been incorporated. The faster planted seeds germinate and grow, the less opportunity the maggots have to damage the crop.

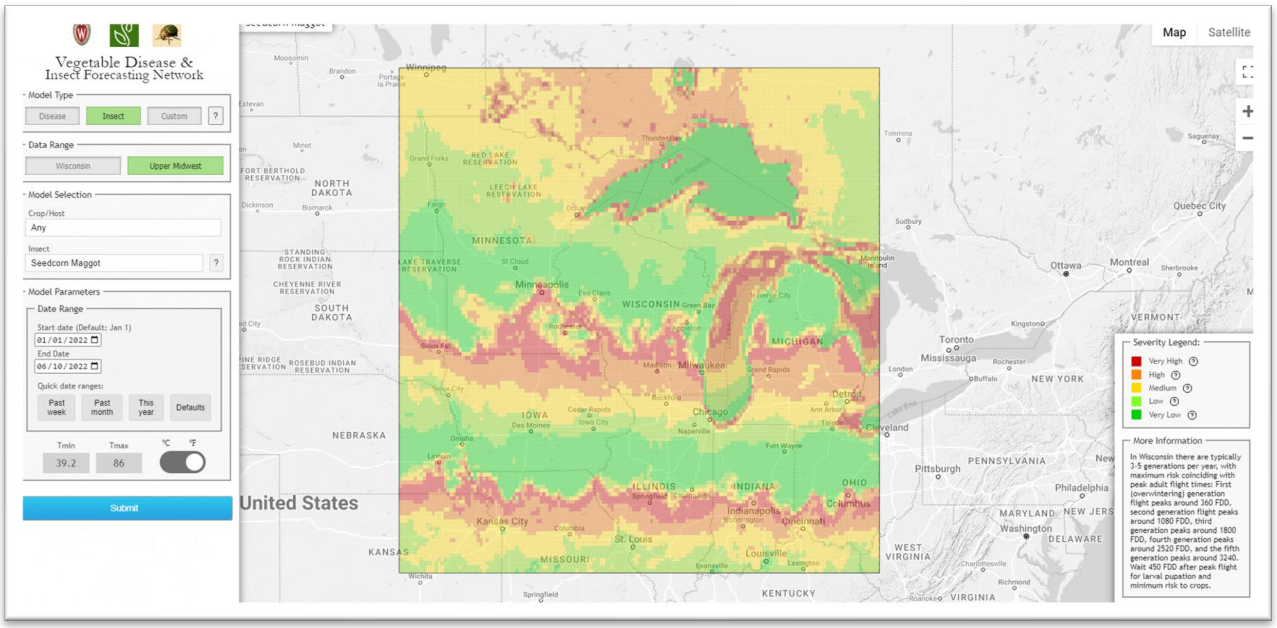


Figure 2. Peak flight activity for 2nd generation of seedcorn maggot in the upper Midwest and across southern Wisconsin. First generation peak is illustrated across southern Canada and has already passed. The risk of infestation from the developing 2nd generation is illustrated by the warm colors (reds, oranges, yellows) on the map. The 3rd generation is currently across southern Illinois and this risk interval will be moving northward in the 10-14 days to come. This population is typically not an issue as most planted crops have developed through susceptible stages (Source: https://agweather.cals.wisc.edu/vdifn).

Brown Marmorated Stinkbug (BMSB) Wisconsin and upper Midwest – In addition to being a conspicuous household nuisance pest in the winter and spring, BMSB is a serious agricultural pest of numerous crops during the summer months. After emerging from shelters in late spring,

BMSB adults begin mating and laying eggs on various trees and host plants in late May and June, and early nymph populations become conspicuous (**Fig. 3**). Overwintering adult BMSBs emerge when day length reaches 13.5 hours in the spring (approx. mid-April). Adults will begin laying eggs at around 148 FDDs after spring emergence. Egg hatch occurs at around 686 FDDs. All life stages can damage plants and fruit.

In most of its range in North America, BMSB completes only one effective generations per year, progressing through an egg stage and 5 nymphal instars before molting into a fully-winged adult. This development can take 4-5 weeks and adults typically emerge in mid-July. Nymphs and adults of the BMSB will attack most vegetables to include okra, bell pepper, green bean, tomato, eggplant, sweet corn, asparagus and Swiss chard. Only infrequent damage has been observe on cucurbits such as squash and cucumber and brassica vegetables such as broccoli, and collards.

Nymphs and adults injure vegetables by inserting their piercing-sucking feeding stylets into fruit, pods, buds, leaves, and stems. Feeding can also open the path for secondary pathogens, further reducing the marketable yield. In Wisconsin, the highest pest pressure to vegetablescoccurs in July and August, with special reference to crops directly bordering woodlots. These sections of the field are at the highest risk of attack as a large portion of the BMSB population disperses from wild tree hosts in the summer.

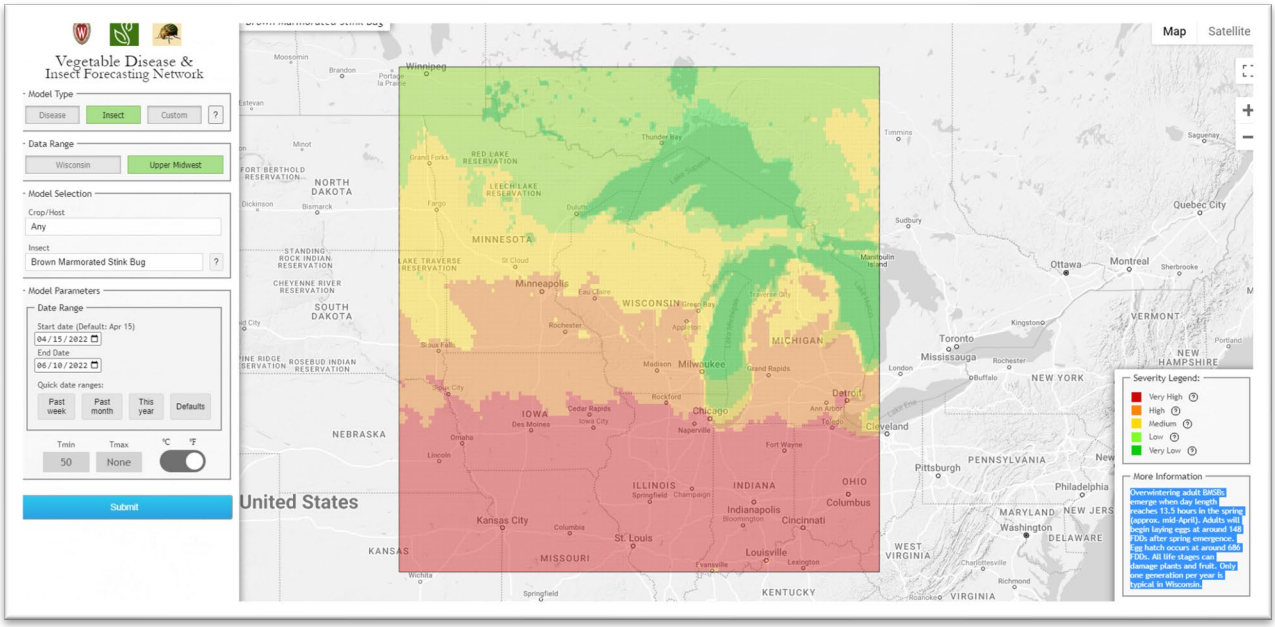


Figure 3. Peak egg hatch activity for the 1st generation of Brown Marmorated Stinkbug is predicted soon in Wisconsin and the upper Midwest. The appearance of early season nymphs is illustrated by the warm colors (reds, oranges, yellows) on the map. Border sprays to control early nymphs may be a practical option, especially in areas where the pest is known to occur and become problematic later in the season. For most vegetables, control measures should be initiated if bugs (nymphs or adults) are present in fields and the crop has initiated fruit development. (Source: https://agweather.cals.wisc.edu/vdifn).

At-Plant Systemic Options

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)
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.										

1st generation CPB Materials

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)
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	+	-	+++	++

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)
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.										
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.										

2nd generation CPB Materials

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)
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 <										

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)
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).										
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).										

Other options

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)
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.										

Definitions:

- PHI: Post-harvest interval (time that must elapse after last application and before any harvesting of the crop, given in hours)
- Activity icons: (-) no activity, (+) very little activity, (++) moderate activity, (+++) excellent activity