

# Potato

## Planting

Choose fertile, well-drained sands, sandy loams, or silt loams for best production. Prepare a deep, loose seedbed using minimum tillage. Deep tillage may be beneficial in soils with compacted layers resistant to rooting. Deep tillage should be done at an angle to planting operations to ensure straight rows. Potatoes should be planted from early April through early May on sandy soils, and from mid-April through late May in northern Wisconsin. Potatoes can be planted from late April through early July on muck soils depending on soil moisture conditions and intended market.

Potatoes should be planted when soil temperatures are similar to the pulp temperature of the seed piece (50–55°F). Temperature differences of more than 10°F between soil and seed pieces can lead to condensation on seed piece surfaces, leading to decay. In addition, soils should be near field capacity for moisture at planting. When seed pieces are planted in dry soils and then irrigated or rained upon, they're more vulnerable to decay. Sandy soils dry relatively quickly, especially when tilled and in windy conditions.

**Rows:** 30–36 inches.

**Seed piece spacing in row:** 8–16 inches apart, depending on variety and market goals. Seed pieces should be blocky and weigh 1.5–2.0 oz; use 12–24 cwt/a, depending on variety and spacing. Plant 2–6 inches deep.

## Seed-piece treatment

Condition seed potatoes prior to planting. Seed potatoes should be warmed slowly to 50–55°F for several days before handling and cutting to minimize bruising. After cutting, store seed at 50–55°F for 3–4 days with good air circulation and high relative humidity to promote wound healing. Treatment of cut and whole seed pieces with a fungicide may help to reduce seed piece decay as well as tuber-borne and soil-borne problems caused by fungi. Fungicides include formulations

of captan (5.0–7.5D) and mancozeb (6.0–6.4D), and combination products containing mancozeb + fludioxonil, mancozeb + flutolanil, mancozeb + thiophanate-methyl, and mancozeb + thiophanate-methyl + cymoxanil. For seedlots where a risk of late blight infection exists, the use of the combination product containing mancozeb and cymoxanil should be considered. Treatment of cut seed pieces with fungicide will not, by itself, control seed piece decay caused by bacteria.

## Hilling

Potatoes are generally grown in hills that are 15–20 inches across and 6–8 inches tall. Hilling prevents tubers from being exposed to sunlight and greening of tuber ends. Hilling is done at planting and sometimes again shortly after plants emerge. Delaying hilling too long after emergence can prune roots, which stresses plants and could lead to disease infection.

## Irrigation

Potatoes require a constant supply of water, especially during tuber formation and growth. With some varieties, such as Russet Burbank, moisture stress not only reduces yields but can significantly lower tuber quality. To ensure good yields and tuber quality most potatoes are irrigated. If the WISP scheduling program is used, the AD for irrigated sands is 0.7 inch. The AD for silt loams is 1.5 inches. These low AD values reflect the shallow rooting system of potatoes. Research and grower experience has shown that frequent irrigation of small amounts is best. See "Irrigation Management for Vegetables" on page 3.

## Lime and fertilizer

**Lime:** Maintain a pH of 5.2 for scab-susceptible potatoes on organic and mineral soils, 5.6 for scab-resistant varieties on organic soils, and 6.0 for scab-resistant varieties on mineral soils.

**Fertilizer rates:** Recommended rates are shown in the following tables. Apply amounts recommended by soil test by banding starter fertilizer with the planter (not exceeding 800 lb/a on sands) and broadcasting the remainder before seeding. Recent research on medium-textured, acid soils in northeastern Wisconsin shows response to 120–150 lb/a P<sub>2</sub>O<sub>5</sub> even on soils testing more than 100 ppm soil test phosphorous (P). Sandy soils showed few responses when soil test P was higher than 75 ppm. Potassium should be broadcast in spring on highly leachable sandy and organic soils. Some row-placed starter fertilizer (30-30-30) is recommended even when soils test in the EH range.

**Nitrogen:** On sandy soils, apply 25–50% of the supplemental nitrogen (N) at emergence and the remainder at tuberization, or apply it in multiple split applications. During years with high precipitation, multiple split applications improve yield and quality, but during years with normal to low precipitation, splitting N applications at emergence and at tuberization consistently produces high-yielding, high-quality potatoes. Excessive N splitting may increase the percentage of cull potatoes. Late N can be applied up to 60 days after emergence. Applications after this do not improve yield or quality and may delay crop maturity. On medium to heavily textured soils, there is no advantage to splitting applications. When potatoes follow a legume crop, reduce the N recommendation by 40–190 lb/a (see table below). Take appropriate credits if manure has been used. For help determining credits, see Extension publication *Credit What You Spread—and Reap the Profits* (A3580). Broadcasting or applying N with the irrigation water, especially early in the season, results in less efficient N use because most water moves downward in the furrows, therefore the N bypasses the plant roots. Petiole nitrate (NO<sub>3</sub>) levels can help determine the need for late N application. The table below provides optimum petiole NO<sub>3</sub>-N levels for several varieties and stages of growth. If levels

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

Pea

are below optimum and the crop has at least 45 days to vine kill, apply 30–50 lb N/a. If you will be monitoring N levels through petiole NO<sub>3</sub>-N testing, early season supplemental N rates can be reduced by 25–30%. Additional N may be applied when needed through fertigation.

**Secondary nutrients and micronutrients:** Calcium, magnesium, sulfur, and micronutrients should only be added when the need is clearly indicated by soil test, plant analysis, or confirmed

deficiency symptoms. Row magnesium (10 lb Mg/a) is recommended where soil test potassium (K) exceeds 140 lb/a.

Pepper

### Optimum petiole nitrate-nitrogen levels for several varieties at different growth stages

Stage of growth (days after emergence)	Dry weight basis (% NO <sub>3</sub> -N)			Sap basis (ppm NO <sub>3</sub> -N)		
	Norkotah Norland Atlantic Kennebec	Shepody R. Burbank Snowden	Onaway Superior	Norkotah Norland Atlantic Kennebec	Shepody R. Burbank Snowden	Onaway Superior
30	2.5–2.8	2.0–2.3	2.3–2.5	1900–2100	1600–1800	1800–1900
40	2.3–2.5	1.7–2.2	2.0–2.3	1800–2000	1600–1700	1600–1800
50	1.8–2.3	1.2–1.6	1.5–1.9	1400–1800	1000–1300	1200–1500
60	1.3–1.9	0.8–1.1	0.9–1.2	1100–1500	700–900	500–1000
70	0.8–1.1	0.5–0.8	0.4–0.6	700–900	500–700	400–600

Potato

### Annual nitrogen, phosphate, and potash recommendations for potato<sup>a</sup>

Yield goal (cwt/a)	Amount nitrogen to apply (lb/a)				Phosphate and potash <sup>b</sup>	
	Organic matter %				Amount P <sub>2</sub> O <sub>5</sub> to apply (lb/a)	Amount K <sub>2</sub> O to apply (lb/a)
<2	2.0–9.9	10–20	>20			
250–350	145	120	100	60	10	50
351–450	180	155	130	75		
451–550	220	180	150	85		
551–650	250	210	175	95		

<sup>a</sup>The nutrient application rates include starter fertilizer and are the total amount of nutrient to apply.

<sup>b</sup>Amounts shown are for optimum (O) soil test levels. Apply half the listed rate plus 30 lb/a for soils testing high (H). If soils test excessively high (EH), apply only 30 lb/a. If soil test is low (L) or very low (VL), increase rates according to soil test recommendations.

Sweet corn

### Nitrogen replacement credits for previous legume crops

Legume	Credit—sandy soils	Credit—non-sandy soils
<b>Forages<sup>a</sup></b>		
Alfalfa		
poor stands (<1.5 plants/sq ft)	80 lb/a	130 lb/a
fair stands (1.5–4.0 plants/sq ft)	110 lb/a	160 lb/a
good stands (>4.0 plants/sq ft)	140 lb/a	190 lb/a
Red clover or trefoil	Use 80% of alfalfa credit	Use 80% of alfalfa credit
<b>Soybeans</b>	No credit	40 lb/a
<b>Vegetable legumes</b>	No credit	20 lb/a where residue remains on field
<b>Green manure crops</b>		
Sweet clover	30–60 lb/a	80–120 lb/a
Alfalfa	10–50 lb/a	60–100 lb/a
Red clover	0–30 lb/a	50–80 lb/a

<sup>a</sup> If harvesting forage crops after September 10, reduce credit by 40 lb/a.

Table beet

Tomato

## Color enhancement for red potatoes

Properly timed applications of 2,4-D enhance color in red potatoes, aid in storage retention of color, improve skin appearance, increase tuber set, and improve tuber size uniformity. Crop response may vary depending on variety, stress factor, and local conditions. For example, Dark Red Norland has minimal response to 2,4-D while Red Norland turns darker and holds its color. Make first application when potatoes are in the pre-bud stage (about 7–10 inches high) and make a second application about 10–14 days later. Allow 45 days to harvest. **Only certain 2,4-D products are labeled for this use in Wisconsin.**

## Tuber shape

The shape of potato tubers can be improved with the application of maleic hydrazide (Royal MH-30). While maleic hydrazide may reduce total yield, it should increase the marketable yield. Apply at least 2 weeks before vine desiccation. However, typical applications are made around the first week of August, when tubers are 1.5–2.0 inches in diameter. Optimal timing will vary depending on variety. Avoid making applications during hot, dry weather to minimize the potential for phytotoxicity.

## Potato vine killing

Apply 3.2 qt/a of Defol 750 (sodium chlorate) mixed with a non-ionic surfactant or COC in 10–20 gal water/a for ground application or 5–10 gal water/a via air 10 days before harvest. Do not mix with insecticides or other organic materials because of a potential fire and explosion hazard. Do not spray if rain is anticipated within 24 hours. Crops under stress, incomplete coverage, and cool temperatures can yield slow or erratic results.

Diquat (multiple trade names) with a suggested surfactant kills potato vines adequately. Apply at least 7 days before

harvest. Three weeks between vine killing and harvest is recommended. Where vine growth is dense, make a second application at the same rate. Allow a minimum of 5 days between applications. Do not apply Diquat to drought-stressed potatoes. Do not feed vines treated with Diquat to livestock.

Vida (pyraflufen ethyl) is labeled for vine desiccation in Wisconsin. When applied to potatoes in the early stages of senescence, it will hasten desiccation of potato vines and foliage as well as burn down late-season broadleaf weeds. Make one or two applications of 2.0–5.5 oz/a in 20–50 gal/a. Do not apply within 7 days of harvest. Vines are typically dried within 14 days after the first treatment. Two applications are allowed, but do not exceed 11.0 oz/a per crop season. Use an approved agricultural buffering agent buffering to pH 5.0 or less if using Vida in a water source of pH 5.0 or greater. Always buffer the water source before adding Vida to the spray tank.

Rely 280 (glufosinate-ammonium) is a nonselective, broad-spectrum herbicide labeled as a potato desiccant. Make a single application of 21.0 fl oz/a in 20–100 gallons of water with ground equipment. Where the crop canopy is dense, use higher spray volumes for best results. Wait at least 9 days following application before harvesting. Do not use on potatoes grown for seed stock. See label for rotation restrictions.

Aim EW can be used alone or in combination with other herbicides (if allowed by the tank-mix partner label) to desiccate potatoes. Apply Aim EW as a broadcast spray at a rate of 3.2–5.8 oz/a product (0.05–0.09 lb ai/a) with an appropriate spray adjuvant in a spray volume sufficient for complete potato foliage coverage. Thorough coverage is essential. Aim can be applied to potato foliage in the later stages of senescence. If plants are still actively growing, two applications may be required to adequately kill leaves and stems. Wait 7–14 days after the first application before making a second

treatment. Allow at least 7 days before harvest. See the Aim EW label for specific application and adjuvant instructions and restrictions.

## Harvest

To reduce the chances of tuber infection by early and late blight fungi, do not begin digging until vines are dead either from a vine burner, a chemical vine killer, or frost. Vines should be killed 14–21 days before harvest. (Do not use TPTH fungicides within 21 days of harvest.) This interval allows proper maturity and skin set. Allowing tubers to remain in the soil for several weeks after vines are dead increases the risk of silver scurf, a disease that affects the visual appearance and storability of infected tubers.

Avoid bruising or injuring tubers during harvesting, grading, packaging, and storing. Tuber breakdown organisms generally start where there is a bruise or other mechanical injury.

Proper operation of windrowing and harvesting equipment will minimize tuber damage, especially bruising. Harvester chain and boom drops should be 6 inches or less. Harvester blade angle should cause potatoes to flow onto primary chain. Adjust ground and chain speeds to keep chains as full of potatoes as possible without rollback. All loads of potatoes should be covered during transport from field to grading–storing locations.

Early-maturing potatoes should not be harvested in hot, windy conditions because of increased potential for breakdown. For late-maturing varieties, harvest when soil temperatures are 45–65°F. At colder temperatures, tubers are more susceptible to black spot bruising; higher temperatures increase tuber water loss and may promote development of pressure bruising.

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Storage

### Storage management

Do not store injured, diseased, or immature potatoes. Do not wash potatoes before storage unless they are sound and disease-free. All washed potatoes must be completely dried before storage. When loading bins, allow several feet between the top of the pile and ceiling for adequate air circulation.

### Before storage

Remove old refuse and potatoes from storage. Spray inside surfaces of storage with a quaternary ammonium compound or another disinfectant. Except for seed storage, rinse surfaces with clean water after ammonium treatment.

Make sure ventilation system is in proper operation and that insulation and vapor barriers are properly maintained. One week before storage, open doors at night and close them during the day to cool the storage space. Operate air systems and humidifiers in preparation for harvest. The floors can be watered to build up humidity.

### Storage operation

Storage operation is divided into three stages: curing, holding, and removal.

**1) Curing.** Curing promotes suberization (healing of bruises, cuts, and skinned surfaces). Curing takes place over 2–4 weeks immediately after harvest. Cure potatoes at 50–55°F and a relative humidity of 90–95°F. Tubers that are stressed from disease or are excessively wet can be cured at 85% relative humidity, but the lower humidity levels will increase the potential for pressure bruising.

**2) Holding.** Long-term storage temperatures are based on intended use: 38–40°F for seed and table stocks, 42–47°F for frozen and dehydration stocks and for cultivars used for both table and processing, 50°F for chipping stock and potatoes stored 3 months or less.

Slowly lower storage temperature 1° per 5–7 days, to prevent reducing sugar accumulation. Relative humidity should be 90–95% unless potatoes are damaged by rot, frost, or late blight. Ventilating airflow rates of 0.5–0.8 cfm/cwt should prevent excessive moisture loss and pressure bruising.

Monitor temperatures. Temperatures at the top of the pile should be 1.0–1.5°F higher than the temperature at the bottom of the pile. If temperatures are the same, too much air is moving through the pile.

Monitor relative humidity. At high relative humidities, a drop in outside temperature can cause condensation at the ceiling. This can wet the potatoes and increase the potential for tuber breakdown by soft rot bacteria.

Long-term storage of potatoes will require use of a sprout inhibitor. Sprout inhibitors can be applied either in the field (MH-30 during the growing season) or in storage (such as CPIC) after curing has been completed.

**3) Removal.** Before removing potatoes, storage should be warmed to 55–65°F for 2–3 weeks. This is essential for reconditioning potatoes for quality chips and french fries. Warming also reduces the possibility of tuber injury. Cold tubers are easily bruised.

## Disease control—late blight

Late blight appears periodically in Wisconsin when cool, wet conditions prevail and the disease inoculum is present. From 1996 to 2002, the US-8 genotype was the only pathogen genotype observed in Wisconsin. In recent years, newer genotypes US-22, US-23, and US-24 have emerged. US-22 and US-23 can be controlled with mefenoxam-containing fungicides at this time. Mefenoxam does not control the US-8 or US-24 genotypes. Protective fungicides (including chlorothalonil, mancozeb, metiram, fixed coppers, and triphenyltin hydroxide) used before infection give much better control of late blight and also control early blight. Because several genotypes of the late blight pathogen currently exist in the United States, we urge growers observing late blight on seed potatoes or in production fields to submit samples for genotype analysis to the Vegetable Pathology Laboratory, Department of Plant Pathology, 693 Russell Laboratories, UW–Madison, Madison, WI 53706, phone 608-575-3029. Knowing the genotype of the late blight pathogen helps with long-term management.

Research has shown that temperature, relative humidity, and rainfall or irrigation play an important role in determining when or if late blight appears, and the timing of influxes in airborne spores of the early blight fungus. A computer program, Blitecast, is available from the UW-Extension to warn growers of the potential development of late blight. The program recommends a schedule of fungicide applications to prevent or control disease. For further details, contact the Department of Plant Pathology, UW–Madison, Madison, WI 53706.

## Disease control in potato

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Black dot</b>	azoxystrobin	6.0–15.5 fl oz Aframe, Equation, Quadris Flowable, Satori, Willowood Azoxy 2SC	14	Quadris and Headline belong to the Group 11 (strobilurin) fungicide category. Quadris Opti contains a combination of Group 11 and Group M fungicides. Do not exceed 1 application of a Group 11 fungicide before alternating with a fungicide having a different mode of action.  Make an in-furrow application at planting. Apply the spray in a narrow band over the seed piece. Do not apply more than 9.5 oz/a as a banded application.  Apply at 7- to 14-day intervals. Use shorter interval when plants are rapidly growing and disease conditions are severe.  Begin fungicide applications preventively. Do not apply more than 43.6 fl oz/a per season. Do not make more than 2 sequential applications of any Group 7 or 9 fungicide before rotating with a fungicide from a different group.  Direct spray uniformly around and over seed piece in a 4- to 8-inch band prior to covering with soil.  Make no more than 3 applications/a per season. Apply no more than 24.0 fl oz/a per season.  Do not make more than 4 applications per season. Do not make more than 2 sequential applications. Do not apply more than 16.0 oz/a per season.  Do not exceed 72.0 fl oz/a per year. Make no more than 2 sequential applications of Vertisan before switching to a fungicide with a different mode of action.  Do not make more than 2 sequential applications before alternating to a non-Group 11 or M3 fungicide.  Do not make more than 2 sequential applications before alternating to another mode of action.
	azoxystrobin + chlorothalonil	1.6 pt Quadris Opti	14	
	azoxystrobin + difenoconazole	8.0–14.0 fl oz Quadris Top	14	
	pyraclostrobin	6.0–9.0 fl oz Headline SC, EC	3	
	azoxystrobin + benzovindiflupyr	0.34–0.5 oz Elatus/1,000 ft row	14	
	chlorothalonil + cymoxanil	2.0 pt Ariston	14	
	fluopyram + pyrimethanil	11.2 fl oz Luna Tranquility (for suppression)	7	
	flutolanil	0.71–1.1 lb Moncut 70-DF	in-furrow, at-plant treatment	
	fluxapyroxad + pyraclostrobin	4.0–8.0 fl oz Priaxor	7	
	metconazole	2.5–4.0 oz Quash	1	
<b>Black leg</b>	0.5% calcium or sodium hypochlorite	Hilex Clorox 1 gal Lysol 50%/10 gal water		Disinfect machinery, warehouse, planters, and seed cutters.
	formaldehyde	4 cups 40% solution/10 gal water		
	phenol	1–3% solution		
<b>Common scab</b> ( <i>Streptomyces scabies</i> )	<i>Cultural practices aid in overall common scab management. Maintain adequate field moisture during tuberization and adjust pH to less than 5.2. Select varieties with resistance. Early-season stress can promote scab.</i>			
	chloropicrin	varies by product	see label	Soil fumigation processes require special certification and management plans with the WI Department of Agriculture, Trade, and Consumer Protection.

\*Restricted-use pesticide.

(continued)

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Disease control in potato *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions	
<b>Common scab</b> <i>(cont.)</i>	PCNB (pentachloro-nitrobenzene)	5.2–10.4 fl oz Blocker 4F		Do not exceed 5.0 lb of active ingredient per acre in any one season.	
<b>Early blight</b> <i>(Alternaria solani)</i> and <b>brown spot</b> <i>(Alternaria alternata)</i>	azoxystrobin	6.0–15.5 fl oz Aframe, Equation, Quadris Flowable, Satori, Willowood Azoxy 2SC	14	Quadris and Headline belong to the Group 11 (strobilurin) fungicide category. Quadris Opti contains a combination of Group 11 and Group M fungicides. Do not exceed 1 application of a Group 11 fungicide before alternating with a fungicide having a different mode of action.	
	difenoconazole	5.5–7.0 fl oz Top MP	14	Do not apply more than 28.0 fl oz/a per season. Special label with Omega for broad spectrum disease control.	
	fluopyram + pyrimethanil	<i>early blight:</i> 11.2 fl oz Luna Tranquility	7	Begin fungicide applications preventively. Do not apply more than 43.6 fl oz/a per season. Do not make more than 2 sequential applications of any Group 7 or 9 fungicide before rotating with a fungicide from a different group.	
Potato	fluxapyroxad + pyraclostrobin	4.0–8.0 fl oz Priaxor	7	Make no more than 3 applications/a per season. Apply no more than 24.0 fl oz/a per season.	
	metconazole	2.5–4.0 oz Quash	1	Do not make more than 4 applications per season. Do not make more than 2 sequential applications. Do not apply more than 16.0 oz/a per season.	
	penthiopyrad	10.0–24.0 fl oz Vertisan	7	Do not exceed 72.0 fl oz/a per year. Make no more than 2 sequential applications of Vertisan before switching to a fungicide with a different mode of action.	
	<b>Early blight and late blight</b>	azoxystrobin	6.0–15.5 fl oz Aframe, Equation, Quadris Flowable, Satori	14	Evito, Gem, Headline, Quadris, Reason, and Tanos belong to the Group 11 (strobilurin) fungicide category. Quadris Opti contains a combination of Groups 11 and M5 fungicides. Do not exceed 1 application of any of these products before alternating with a fungicide having a different mode of action.  Tanos must be tank mixed with a contact fungicide having a different mode of action.  Following the final application of Reason 500 SC, wait 30 days before rotating to wheat; wait 1 year before rotating to all other crops.  Use higher rates and shorter intervals when disease pressure is severe.
		azoxystrobin + chlorothalonil	1.6 pt Quadris Opti	14	
azoxystrobin + difenoconazole		8.0–14.0 fl oz Quadris Top	14		
cymoxanil + famoxadone		<i>early blight:</i> 6.0 oz Tanos 50DF	14		
		<i>late blight:</i> 6.0–8.0 oz Tanos 50DF	14		
fenamidone		5.5–8.2 fl oz Reason 500 SC	14		
fluoxastrobin		2.0–3.8 fl oz Aftershock, Evito 480 SC	7		
Table beet	pyraclostrobin	<i>early blight:</i> 6.0–9.0 fl oz Headline SC, EC	3		
		<i>late blight:</i> 6.0–12.0 fl oz Headline SC, EC	3		
	pyraclostrobin + metiram	2.9 lb Cabrio Plus	3		
Tomato	boscalid	2.5–4.5 oz Endura WDG	10	For control of early blight only. Endura belongs to the Group 7 fungicide category. Do not exceed 2 sequential applications of Endura before alternating to a labeled fungicide with a different mode of action. Do not exceed 4 applications per season. Do not exceed 20.5 oz/a Endura per season.	

\*Restricted-use pesticide.

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**Disease control in potato** (continued)

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions	
<b>Early blight and late blight</b> (cont.)	chlorothalonil	1.0–1.5 pt Bravo Weather Stik, Echo 720, Equus 720	7	Note seasonal use limitations on label. Current labeling for annual use of chlorothalonil products in Wisconsin allows 11.2 lb ai/a Equus products and 16.0 lb ai/a Bravo products (Ultrex, WeatherStik, Zn)—special WI registration expires 12/31/17; and 16.0 lb ai/a Echo products (Zn, 720, 90DF)—special WI registration expires 12/31/17.	
		1.5–2.25 pt Bravo Zn, Equus 500 Zn	7		
		0.875–1.25 lb Echo 90DF, Echo Zn	7		
		0.9–1.36 lb Bravo Ultrex 82.5WDG, Equus DF	7		
	chlorothalonil + cymoxanil	2.0 pt Ariston	14		Apply preventively when triggered by disease forecasting tools such as Blitecast and P-Days.
	copper hydroxide	0.66–2.66 pt Champ Formula 2	0		Gives fair control of early blight and good control of late blight. Can be tank mixed with maneb, mancozeb, or chlorothalonil for broad-spectrum disease control. Tank mixing with insecticides such as Monitor may reduce effectiveness of the insecticide.
		0.67–2.67 pt Kocide 4.5 LF	0		
		1.3–5.3 pt Kocide LF	0		
		0.5–1.75 lb Kocide 3000	0		
		0.75–3.0 lb Kocide 2000 DF	0		
1.0–4.0 lb Champion 77WP; Kocide 101, DF	0				
cymoxanil	3.2 oz Curzate 60DF	14	Do not use Curzate 60DF alone; always mix with another registered protectant fungicide such as mancozeb, chlorothalonil, triphenyltin hydroxide, or metiram. Do not apply more than 7 sprays per season. After three to 4 applications of Curzate 60DF, switch to another fungicide program for one to two sprays before applying additional sprays of Curzate 60DF. Very warm day and night temperatures hastens curative activity to 1 day rather than normal 2–3 days.		
mancozeb	0.4–1.6 qt Dithane F45 4F	3	Do not exceed a total of 11.2 lb ai/a EBDC per growing season. EBDC materials include maneb, mancozeb, and metiram.		
	0.5–2.0 lb Dithane M45, Penncozeb 80WP, Penncozeb 75DF	3			
	1.0–2.0 lb Dithane 75DF Rainshield NT, Koverall, Manzate 200 75DF	3			
mancozeb + chlorothalonil	1.2–1.8 lb Elixir	7	Also controls black dot. Do not apply more than 18.0 lb product/a per crop.		
mandipropamid/difenoconazole	5.5–7.0 fl oz Revus Top	14	Make no more than 2 consecutive applications before switching to a non-Group 40/3 fungicide. Do not exceed 28.0 fl oz/a Revus Top per season. The addition of a spreading/penetrating type adjuvant, such as non-ionic surfactant, is recommended.		
metiram	1.5–2.0 lb Polyram 80 DF	14	Do not exceed 14.0 lb/a Polyram 80 DF per season.		
pyrimethanil	7.0 fl oz Scala SC in combination with broad spectrum fungicide	7	Scala belongs to the Group 9 fungicide category and controls only early blight. If used alone, Scala does not control late blight. Use the 7.0 fl oz/a rate of Scala only in a tank mix with a broad-spectrum fungicide. Alternating the tank-mix combination with a broad-spectrum fungicide is a resistance management strategy.		
trifloxystrobin	early blight: 2.9–3.8 fl oz Gem 500 SC	7			
	late blight: 3.8 fl oz Gem 500 SC tank mixed with a registered protectant fungicide	7			

\*Restricted-use pesticide.

(continued)

Pea

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Pumpkin & squash

Sweet corn

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Tomato

## Disease control in potato *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Early blight and late blight</b> <i>(cont.)</i>	triphenyltin hydroxide (TPTH)	4.0–6.0 fl oz *Super Tin 4L 2.5–3.75 oz *Agri Tin 80WP, *Super Tin 80WP	7 7	Do not exceed 18.0 fl oz/a Super Tin 4L, 11.25 oz/a Super Tin 80WP, or 11.5 oz/a Agri Tin 80WP per season. Combination of TPTH fungicides with MH-30 and some emulsifiable concentrate insecticides can cause serious crop injury. High rates may injure foliage of sensitive varieties such as Superior and Norland. Observe 24-hour field re-entry period as specified on label. Note label information regarding mixing, loading, and application.
	triphenyltin hydroxide (TPTH) plus mancozeb or metiram	3.0 fl oz *Super Tin 4L <i>or</i> 1.87 oz *Super Tin 80WP <i>or</i> 1.87 oz *Agri Tin 80WP <i>plus one of the following:</i> 1.5 lb Dithane M45 80WP, 75DF, WSP <i>or</i> 1.2 qt Manex F4 <i>or</i> 1.5 lb Manzate 200 75DF <i>or</i> 1.5 lb Penncozeb 80WP, 75DF <i>or</i> 1.5 lb Polyram 80DF	7 7 7	Combining TPTH with maneb, mancozeb, or metiram reduces foliage injury while providing improved control of early blight.  See comments on TPTH above.  Do not exceed a total of 11.2 lb ai/a EBDC per growing season. EBDC materials include maneb, mancozeb, and metiram.
	zoxamide + chlorothalonil	32.0–34.0 fl oz Zing	7	Do not make more than 2 sequential applications before alternating to another mode of action.
	zoxamide + mancozeb	1.5–2.0 lb Gavel 75DFp	3	Begin treatment before the onset of late blight. This product contains mancozeb, an active ingredient of EBDC. If using other EBDC-containing fungicides, do not exceed 11.2 lb ai/a EBDC per growing season. Do not make more than 6 applications per season or exceed 12.0 lb/a of Gavel 75DF.
<b>Early dying complex</b>	<i>A soil test to determine the presence of Verticillium and/or nematodes is recommended prior to treatment since other agents that are not controlled by soil fumigation may cause early senescence of a potato crop. If Verticillium propagules, root lesion nematodes, or root knot nematodes are present in significant numbers, treatment with a soil fumigant may provide acceptable disease control.</i>			
	metam-sodium	50 gal Vapam HL, Metam, Sektagon 42		Knife into plow layer of soil at a rate of 50.0 gal/a or on sandy soils only apply through the irrigation system in 0.6–1.0 inch water in the fall. An approved backflow prevention valve must be used when applying fumigant through irrigation system. Do not apply if significant rainfall is forecast in the next 24 hours. Fields must be monitored during and after application.  Soil temperature must be below 75°F. Treatment should not be applied immediately following a potato crop. Potato vine debris should be decomposed at the time of fumigant application for best results. A 2- to 3-year rotation between potato crops is recommended.  Fumigant cannot be applied through an irrigation system within 1/4 mile of an institution such as a hospital, school, or prison.
<b>Fusarium</b>	azoxystrobin + fludioxonil + difenoconazole	1.0 fl oz Stadium/2,000 lb tubers	—	Postharvest treatment only. Do not use on seed potatoes or seed pieces. Do not make more than one postharvest application to the tubers.
	cymoxanil + mancozeb + thiophanate-methyl	0.75 lb Evolve/100 lb seed pieces	seed treatment	Thoroughly cover seed pieces with treatment mixture.

\*Restricted-use pesticide.

*(continued)*

**Disease control in potato** *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Fusarium</b> <i>(cont.)</i>	fludioxonil	0.08–0.16 fl oz Maxim 4FS or Spirato 480 FS/100 lb seed potatoes	seed treatment	If applied to potatoes being grown for seed, either a labeled rate of mancozeb or an in-furrow application of Quadris (azoxystrobin) at 0.40 fl oz/1,000 ft row must be applied after Maxim 4FS or Spirato 480 FS.
	fludioxonil + mancozeb	0.5 lb Maxim MZ/100 lb seed pieces	seed treatment	Apply using equipment that ensures uniform and thorough coverage of each seed piece.
	flutolanil + mancozeb	0.75–1.0 lb MonCoat MZ/100 lb cut seed pieces	seed treatment	Apply immediately after seed cutting for thorough coverage of dust to the cut seed piece surfaces.
	mancozeb	1.0 lb Potato Seed Treater PS or Macozeb 6% Firbark/100 lb whole or cut seed pieces	seed treatment	Plant as soon as possible after treatment. Provides some control of late blight on cut seed.
	penflufen + prothioconazole	0.31 fl oz Emesto Silver/100 lb seed pieces	seed dressing applied at-plant	Do not apply more than 2.5 fl oz of slurry treatment/100 lb seed pieces. Application of an inert absorbent ingredient is recommended to improve suberization.
	thiabendazole	0.42 fl oz Mertect 340-F/2000 lb of tuber		Mist unwashed tubers entering storage with 0.42 fl oz Mertect 340-F per 2000 lb of tubers in sufficient water for complete coverage. Additional treatment may be made before shipping by misting the tubers at the same rate or dipping the tubers for 20 seconds in a solution containing 0.42 fl oz of Mertect per gallon of water. Do not treat seed potatoes after cutting.
	thiophanate-methyl + mancozeb	0.75–1.0 lb Tops MZ/100 lb cut seed pieces	seed treatment	Thoroughly cover seed pieces with fungicide dust. Can also limit late blight spread on cut seed.
<b>Late blight</b>	ametoctradin + dimethomorph	11.0–14.0 fl oz Zampro	4	Begin treatment prior to disease development. Do not make more than 3 applications of Zampro per season.
	cyazofamid	1.4–2.75 fl oz Ranman 400SC	7	Do not apply more than 10 sprays or 27.5 fl oz/a per year. Alternate Ranman (Group 21) sprays with a fungicide having a different mode of action. Crops not listed on the label should not be planted within 30 days after the last application.
	cymoxanil + mancozeb + thiophanate-methyl	0.75 lb Evolve/100 lb seed pieces	seed treatment	Thoroughly cover seed pieces with treatment mixture.
	dimethomorph	6.0 oz Forum	4	Begin treatment before the onset of late blight. Forum should be used as a tank mix with other protectant fungicides, but do not mix with mefenoxam or metalaxyl. Adjust rates and timing according to late blight conditions. Do not exceed 30.0 oz/a of product per season. Consult the label for rotational crop restrictions. May be used after vine kill for control of late blight tuber infection.
	fluazinam	5.5 fl oz Omega 500F	14	Application should begin prior to onset of disease. Do not apply more than 3.5 pt/a per season. Tank mix with other fungicides such as chlorothalonil, maneb, or mancozeb. REI = 4 days for high-exposure activities.
	fludioxonil + mancozeb	0.5 lb Maxim MZ/100 lb seed pieces	seed treatment	Apply using equipment that ensures uniform and thorough coverage of each seed piece.

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Disease control in potato (continued)

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Late blight</b> (cont.)	flutolanil + mancozeb	0.75–1.0 lb MonCoat MZ/100 lb cut seed pieces	seed treatment	Apply immediately after seed cutting for thorough coverage of dust to the cut seed piece surfaces.
	mancozeb			
	oxathiapiprolin	1.6–4.8 fl oz Orondis Opti A, Orondis Ultra A	5	Begin foliar applications prior to disease development and continue on a 5- to 14-day interval. Do not exceed 27.2 fl oz/a per year.
	propamocarb hydrochloride	0.7–1.2 pt Previcur Flex	14	Begin treatment before the onset of late blight. Tank mix with other fungicides such as chlorothalonil, maneb, or mancozeb. Adjust rates and timing according to late blight conditions. Do not exceed 6 pt/a of Previcur Flex per season.
<b>Rhizoctonia</b>	azoxystrobin	0.4–0.8 fl oz Quadris Flowable/1,000 ft row	—	Apply in-furrow at planting.
	azoxystrobin + benzovindiflupyr	0.34–0.5 oz Elatus/1,000 ft row	14	Do not apply more than 9.5 oz per year of Elatus. Band over the seed piece.
	fludioxonil	0.08–0.16 fl oz Maxim 4FS/100 lb seed potatoes	seed treatment	If applied to potatoes being grown for seed, either a labeled rate of mancozeb or an in-furrow application of Quadris (azoxystrobin) at 0.40 fl oz/1,000 ft row must be applied after Maxim 4FS.
	fludioxonil + mancozeb	0.5 lb Maxim MZ/100 lb seed pieces	seed treatment	Apply using equipment that ensures uniform and thorough coverage of each seed piece.
	flutolanil	0.71–1.1 lb Moncut 70-DF	in-furrow, at-plant treatment	Direct spray uniformly around and over seed piece in a 4- to 8-inch band prior to covering with soil.
	flutolanil + mancozeb	0.75–1.0 lb MonCoat MZ/100 lb cut seed pieces	seed treatment	Apply immediately after seed cutting for thorough coverage of dust to the cut seed piece surfaces.
	PCNB (pentachloro-nitrobenzene)	1.65 lb Blocker 10 G/1,000 ft row	45	Direct 8.5-inch band into the furrow over the seed and cover as part of the hilling operation at planting. Received label for common scab control in 2014.
	penthiopyrad	10.0–24.0 fl oz Vertisan	7	Do not exceed 72.0 fl oz/a per year. Make no more than 2 sequential applications of Vertisan before switching to a fungicide with a different mode of action.
	pyraclostrobin	0.4–0.8 fl oz Headline SC/1,000 ft row	—	Apply in-furrow at planting.
	<i>Reynoutria sachalinensis</i> extract	1.0–4.0 qt or 2.2–8.8 fl oz/1,000 ft row Regalia Rx Biofungicide	0	Improves plant health and induces the defense system of treated plants.
	thiophanate-methyl + mancozeb	0.75–1.0 lb Tops MZ/100 lb cut seed pieces	seed treatment	Thoroughly cover seed with fungicide dust. Can also limit late blight spread on cut seed.
<b>Root lesion and root knot nematodes</b>	metam-sodium	Vapam HL, Metam, Sectagon 42		Generally double mineral soil rates for muck soils. More effective when soils are warmer than 55°F. A minimum of 3 weeks is necessary between fumigation and planting to prevent phytotoxicity.
<b>Silver scurf</b> ( <i>Helminthosporium solani</i> ) and <b>black scurf</b> ( <i>Rhizoctonia solani</i> )	azoxystrobin	0.4–0.8 fl oz Quadris Flowable/1,000 ft row	0	Apply at planting just before covering seed pieces with soil. Application of Quadris at planting does not appear to control early blight or late blight on the foliage later in the season. Do not exceed 2.88 qt/a Quadris per season.

\*Restricted-use pesticide.

(continued)

## Disease control in potato *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Silver scurf and black scurf</b> <i>(cont.)</i>	azoxystrobin + benzovindiflupyr	0.34–0.5 oz Elatus/1,000 ft row	14	Do not apply more than 9.5 oz per year of Elatus. Band over the seed piece.
	azoxystrobin + fludioxonil + difenoconazole	<i>silver scurf:</i> <i>postharvest only:</i> 1.0 fl oz/2,000 lb tubers	—	Do not use on seed potatoes or seed pieces. Do not make more than one postharvest application to the tubers.
	cymoxanil + mancozeb + thiophanate-methyl	0.75 lb Evolve/100 lb seed pieces	seed treatment	Thoroughly cover seed pieces with treatment mixture.
	fludioxonil	0.08–0.16 fl oz Maxim 4FS/100 lb seed potatoes	seed treatment	If applied to potatoes being grown for seed, either a labeled rate of mancozeb or an in-furrow application of Quadris (azoxystrobin) at 0.40 fl oz/1,000 ft row must be applied after Maxim 4FS.
	fludioxonil + mancozeb	0.5 lb Maxim MZ/100 lb seed pieces	seed treatment	Apply using equipment that ensures uniform and thorough coverage of each seed piece.
	flutolanil + mancozeb	0.75–1.0 lb MonCoat MZ/100 lb cut seed pieces	seed treatment	Apply immediately after seed cutting for thorough coverage of dust to the cut seed piece surfaces.
	penflufen + prothioconazole	0.31 fl oz Ernesto Silver/100 lb seed pieces	seed dressing applied at-plant	Do not apply more than 2.5 fl oz of slurry treatment/100 lb seed pieces. Application of an inert absorbent ingredient is recommended to improve suberization.
<b>Tuber rot, pythium leak, and pink rot</b>	cyazofamid	<i>at planting:</i> 0.42 fl oz Ranman/1,000 ft row (6.1 fl oz/a on 36-inch row spacing) <i>lay-by hilling:</i> 2.75 fl oz Ranman		Do not use reduced rates as incomplete control can promote resistance.
	fluopicolide	4.0 fl oz Presidio	7	For pink rot control. Can be applied in-furrow in 5–10 gal/a spray mixture OR can be applied as a sidedress in 20–40 gal/a spray mixture.
	mefenoxam	0.42 oz Ridomil Gold SL/1,000 ft row at planting 0.84 fl oz Ultra Flourish/1,000 ft row at planting	—	Mix Ridomil Gold SL or Ultra Flourish in a minimum of 3 gal/a of water and apply in a 6- to 8-inch band over the potato seed piece at planting.
	mefenoxam + chlorothalonil	2.5 pt Ridomil Gold Bravo	14	A total of up to 3 applications at 14-day intervals may be made beginning at flowering. May also provide control of late blight if caused by a sensitive genotype.
	mefenoxam + copper hydroxide	2.0 lb Ridomil Gold Copper	14	
	mefenoxam + mancozeb	2.5 lb Ridomil Gold MZ	3	
	phosphorous acid	<i>foliar:</i> 2.5–10.0 pt Phostrol <i>in-furrow:</i> 3.75–10.0 pt Phostrol <i>postharvest:</i> 0.1 gal Phostrol in 0.5 gal water/2,000 lb tubers <i>russet varieties only:</i> 12.0–16.0 fl oz Confine Extra in 0.5 gal water/2,000 lb tubers	0	For control of pink rot, late blight, and Pythium leak. First foliar treatment should begin at tuber initiation at the 10 pt/a rate, followed by a second and third application timed 2 weeks apart. Use adequate spray mixture volumes when applying to avoid phytotoxicity. In-furrow application aids in control of pink rot, late blight, and Pythium leak. Postharvest application can limit advancement and spread of pink rot, late blight, and Pythium leak. Use adequate spray mixture volumes when applying to avoid tuber damage.

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Disease control in potato *(continued)*

Disease	Active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>White mold</b> ( <i>Sclerotinia sclerotiorum</i> )	boscalid	5.5–10.0 oz Endura WDG	30	Endura belongs to the Group 7 fungicide category. Do not exceed 2 sequential applications of Endura before alternating to a labeled fungicide with a different mode of action. Do not exceed 2 applications per season for white mold control. Do not exceed 20.5 oz/a Endura per season.
	<i>Coniothyrium minitans</i>	0.75–1.5 oz/1,000 sq ft Contans		Preplant or postharvest soil incorporation to reduce viability of pathogen sclerotia in soil. Can make up to 8 applications/a per season. This is a biological fungicide with specific activity only against white mold.
	fluazinam	5.5–8.0 fl oz Omega 500F	14	Application should begin prior to onset of disease. Do not apply more than 3.5 pt/a per season. Tank mix with other fungicides such as chlorothalonil, maneb, or mancozeb.
	iprodione	2.0 lb Rovral 50WP 2.0 pt Rovral 4F, Iprodione 4L, Nevado 4F	14 14	Treat when warm, wet weather conditions favor disease development. Up to 4 applications at 7- to 10-day intervals may be made. Note crop rotation information on label. All crops on the Rovral label may be grown after treated potatoes. Root crops, cereal grains, soybeans, and tomatoes may be grown the year following treated potatoes.
	metconazole	4.0 oz Quash	1	Make first application prior to infection at row closure and 14 days later if conditions promote disease. Do not make more than 4 applications per season. Do not make more than 2 sequential applications. Do not apply more than 16.0 oz/a per season.
	thiophanate-methyl	1.0–1.5 lb Topsin M WSB, 70 WP 20.0–30.0 fl oz Topsin 4.5FL	21 21	Make first application just before row closure. Subsequent applications may be made at 7- to 14-day intervals if conditions warrant. Application at peak bloom provides best control. Do not apply more than 4.0 lb/a Topsin M WSB or 80.0 fl oz/a Topsin 4.5FL per season.

\*Restricted-use pesticide.

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

### Scouting calendar for insect pests of potato

April			May			June			July			August			September		
early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late	early	mid	late
Aster leafhopper																	
Colorado potato beetle, 1st gen. only						both generations			2nd generation only								
						Potato leafhopper											
						Potato aphid											
									Tarnished plant bug								
												Green peach aphid					

### Insect control in potato

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>General insect control with soil-applied systemic</b>	<i>Aphid, leafhopper, flea beetle, Colorado potato beetle:</i>			
	0.1–0.2 lb clothianidin	7.2–12.0 fl oz Belay	—	Apply specified rate in sufficient carrier volume to ensure uniform coverage and incorporate into soil using either (1) narrow-band application centered over the plant row, (2) direct, in-furrow spray on the seed pieces, or (3) sidedress to both sides of the row or as directed spray at ground-cracking over the row. Cover immediately with soil.
	0.088–0.176 lb cyantraniliprole ( <i>soil</i> )	6.75–13.5 fl oz Verimark	—	Do not apply more than 13.5 fl oz/a Verimark per crop per season. Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. The pH of the application solution should be adjusted to between pH 4 and 6.
	0.2–0.3 lb imidacloprid	5.7–8.7 fl oz Admire Pro8	21	Apply as band below seed furrow within 7 days before planting or spray in furrow at planting. Use higher rate on muck soils or for seed production. Do not exceed 8.7 fl oz/a per season.
	<i>Aphid, leafhopper, flea beetle, and suppression of Colorado potato beetle:</i>			
	<i>broadcast rate:</i> 2.0–3.0 lb phorate <i>banded rate:</i> heavy soil—0.22 lb/1,000 ft row light soil—0.14 lb/1,000 ft row	<i>banded rate:</i> heavy soil—17.3 oz *Thimet 20G, *Phorate 20G light soil—11.3 oz *Thimet 20G, *Phorate 20G	90	Apply as band in furrow at planting or apply sidedress postemergence at hilling; do not use both. Use the lower rate only on sandy soils and for all emergence applications.
	thiamethoxam	5.0–8.0 fl oz Platinum 2SC 1.66–2.67 oz Platinum 75SG	30 30	Do not apply more than 8.0 fl oz of Platinum 2SC and no more than 2.67 oz Platinum 75SG per acre per crop season and apply sufficient water volume after in-ground application to ensure incorporation into the seed zone.
<b>Seed piece treatment</b>	<i>Use a seed dusting metering applicator to assure thorough coverage. Plant seed pieces as soon as possible after treatment.</i>			
	clothianidin	0.4–0.6 fl oz Belay/100 lb cut seed pieces	—	Apply as a diluted spray to ensure uniform coverage over whole or cut seed pieces. Liquid fungicides can be applied with Belay. If using a dust formulation of fungicide, apply Belay first, then the dust application. Plant seed as soon as possible after treatment. Do not use treated seed pieces as food, feed, or fodder. Do not apply a neonicotinoid (MoA Class 4) compound following Belay seed treatment.

\*Restricted-use pesticide.

(continued)

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato (continued)

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Seed piece treatment</b> (cont.)	imidacloprid + thiophanate-methyl + zinc + manganese	0.75–1.0 lb Tops-MZ-Gaucho/100 lb cut seed pieces		Regardless of the type of application, do not exceed 0.31 lb ai/a imidacloprid (Admire or Provado) per year. There is a 12-month rotational plantback interval for all crops except those registered.
	thiamethoxam	0.11–0.16 fl oz Cruiser 5FS/100 lb seed	30	Do not apply more than 4.0 fl oz of Cruiser 5FS per 100 lb of seed potato per year.
<b>Colorado potato beetle</b>	<p><i>Historically, the need for control was based upon percent defoliation observed in the canopy of potato at different growth stages. If you are using an active ingredient that is effective across all developmental stages of the insect (eggs, larvae, pupa, adults), then defoliation thresholds may still be useful. Few foliar-applied, broad-spectrum products remain effective for the control of Colorado potato beetle in this way, however. A high proportion of populations are resistant to the synthetic pyrethroids, carbamates, organophosphates, chlorinated hydrocarbons, and the neonicotinoids.</i></p> <ul style="list-style-type: none"> <li>• <i>Pre-flowering plants (e.g., 6–8 inches tall) can withstand 20–30% defoliation with no economic loss.</i></li> <li>• <i>Flowering plants can withstand only 5–10% defoliation with no economic loss.</i></li> <li>• <i>Post-flowering plants (e.g., tuberization) can withstand &lt;10% defoliation with no economic loss.</i></li> </ul> <p><i>Current, reduced-risk insecticides have only limited effectiveness against very specific stages of the Colorado potato beetle and should be applied when the majority of individuals in a population have reached this stage. The specific stages of Colorado potato beetle development can be predicted based upon an accumulation of degree days using a base temperature of 52°F. Following are the specific DD<sub>52</sub> accumulations necessary for specific stages of development:</i></p> <ul style="list-style-type: none"> <li>• <i>Eggs</i> 120</li> <li>• <i>1st instar larvae</i> 185</li> <li>• <i>2nd instar larvae</i> 240</li> <li>• <i>3rd instar larvae</i> 300</li> <li>• <i>4th instar larvae</i> 400</li> <li>• <i>Pupae</i> 675</li> </ul> <p><i>When the appropriate life stages are prevalent in fields, apply 2–3 successive applications of reduced-risk compounds, spaced 7–10 days apart, to target vulnerable stages of Colorado potato beetles, primarily 1st and 2nd instar stages. Active ingredients that fit in this category include abamectin, acetamiprid, chlorantraniliprole, cyantraniliprole, novaluron, spinetoram, and spinosad. For the second generation of Colorado potato beetle, which occurs primarily in July and August, use compounds including chlorantraniliprole and cyantraniliprole that possess a broader spectrum of activity against several of the life stages of the insect.</i></p> <p><i>Also use perimeter, or spot treatments, on early season colonizing adult insects that invade fields along outside edges.</i></p>			
	abamectin	8.0–16.0 fl oz Agrimek	14	Target first-generation larvae.
	acetamiprid	1.5–4.0 fl oz Assail 30 SG	7	For heavy pest pressure, use higher label rates. Do not make more than 4 applications or exceed 0.3 lb ai/a per season. Do not apply more than once every 7 days.
		0.6–1.7 fl oz Assail 70WP	7	
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	<i>Bacillus thuringiensis</i> subsp. <i>tenebrionis</i>	Raven	0	Make initial spray when you first observe eggs and small larvae. Rates vary with formulation.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year. Do not exceed 0.125 lb ai/a cyfluthrin including Baythroid and Leverage 360.
	0.075–0.096 lb bifenthrin + imidacloprid	4.8–6.14 fl oz *Brigadier	21	Do not apply more than 25.6 fl oz/a (0.4 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.2 lb ai/a imidacloprid are allowed per season.

\*Restricted-use pesticide.

(continued)

**Insect control in potato** (continued)

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Colorado potato beetle</b> (cont.)	chlorantraniliprole	3.5–7.5 fl oz Coragen	14	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.03–0.05 lb clothianidin	1.9–2.8 fl oz Belay	14	Do not exceed 3 applications of Belay. Allow at least 7 days between applications. Do not make a foliar application of Belay following an at-plant application of a neonicotinoid (MoA Class 4) compound.
	0.033–0.088 lb cyantraniliprole (overhead irrigation only)	5.0–13.5 fl oz Verimark	—	Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. Minimum reapplication interval is 5 days.
	0.12–0.24 lb cyromazine	2.66–5.32 oz Trigard 75WP	7	Do not apply more than 1.0 lb/a Trigard per crop. Repeat applications 7 days apart.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.05–0.33 lb dinotefuran	foliar: 1.0–1.5 oz Venom 70SG soil: 6.5–7.5 oz Venom 70SG	7 —	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not apply more than 4.5 oz/a per year using foliar applications, or 7.5 oz/a per season using soil applications. See product label for application directions.
	0.05–0.07 lb dinotefuran (foliar)	2.0–2.75 oz Scorpion 35SL	7	Can repeat at 14-day intervals. Do not apply more than 7.75 oz per year. Use only one application method.
	0.28–0.33 lb dinotefuran (soil)	11.0–13.0 oz Scorpion 35SL	7	Do not apply more than 13.0 oz per year. Apply either as a preplant, preemergence, or at ground crack. Do not follow soil applications with foliar applications; use only one application method.
	0.025–0.05 lb esfenvalerate	5.8–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season. CPB has developed resistance in some areas.
	flupyradifurone	10.5–14.0 fl oz Sivanto	7	Foliar application. Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
	0.047 lb imidacloprid	3.75 fl oz Provado 1.6	7	Foliar application: Use ground equipment only. Allow at least 7 days between applications. Regardless of the type of application, do not exceed 0.31 lb ai/a imidacloprid (Admire, Leverage 360, or Provado) per year. <b>There is a 12-month rotational plantback interval for all crops except those registered.</b>
	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
	0.11 lb indoxacarb	6.0 oz Avaunt 30 DG	7	Wait at least 5 days between applications. Do not apply more than 24.0 oz/a Avaunt (0.44 lb ai/a) per crop. In areas where Colorado potato beetles are resistant to other insecticides, addition of piperonyl butoxide (PBO) as a tank mix with Avaunt may be required. Adult beetles will cease to feed following exposure to Avaunt but may not die for several days.

\*Restricted-use pesticide.

(continued)

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Colorado potato beetle</b> <i>(cont.)</i>	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
	0.017–0.03 lb lambda-cyhalothrin + thiamethoxam	3.5–4.5 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
	0.058–0.078 lb novaluron	9.0–12.0 fl oz Rimon 0.83EC	14	Apply when population is between egg hatch and second instar. Use higher rates for larger larvae. Do not apply more than twice to a single generation of Colorado potato beetles and do not apply to successive generations. Do not apply more than 24.0 oz/a per season.
	0.5–1.0 lb oxamyl	2.0–4.0 pt *Vydate L	7	Treat first-generation larvae. Use low rates for light infestation; higher rates for severe infestation.
	0.05–0.2 lb permethrin	*Ambush, *Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
	1.0 lb phosmet	1.33 lb Imidan WP	7	Use only on potatoes to be machine harvested.
	9.6–11.5 lb sodium aluminofluoride	10.0–12.0 lb Prokil Cryolite 96, Kryocide	0	Treat beginning at 20% egg hatch at a minimum of 7-day intervals. Do not exceed 96.0 lb per season. Mortality does not occur for 2–4 days. Does not affect beneficial insects. Cryolite can be abrasive to equipment; check the label.
	0.047–0.094 lb spinetoram	6.0–8.0 oz Radiant SC	7	Do not apply more than 32.0 oz/a Radiant (0.25 lb ai/a) per crop and do not make more than 4 applications per crop.
	spinosad	1.7–3.3 oz Blackhawk	3	Apply when pests reach or exceed established thresholds. Do not make more than two successive applications of a Group 5 material and do not apply more than 14.4 oz/a Blackhawk per crop season in potato. Do not exceed 4 applications in a year.
		3.0–10.0 fl oz Entrust SC	7	Target application for eggs at hatching and small larvae. Use higher rates for heavier infestations and for older larvae. Do not apply more than 21.0 fl oz/a per crop.
	thiamethoxam	1.5–3.0 oz Actara 25WDG	14	Apply before pests reach damaging levels. Allow at least 7 days between applications. Do not exceed 3.0 oz/a per season.
		0.11–0.16 fl oz Cruiser 5FS/100 lb seed pieces	0–30	Use rate chart on label to select proper application rate. Do not exceed 0.125 lb ai/a.
	0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.
	0.02–0.025 lb zeta-cypermethrin	3.2–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season. May provide inadequate control in areas where CPB are resistant to other synthetic pyrethroids.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.

\*Restricted-use pesticide.

*(continued)*

**Insect control in potato** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Cutworms, loopers</b>	<i>Before July 25 treat when counts exceed four per row foot; after July 25 treat when counts exceed eight per row foot. Use spot treatments if infestations are patchy.</i>			
	alpha-cypermethrin	1.3–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	<i>Bacillus thuringiensis subsp. kurstaki</i>	Agree, Biobit, DiPel	0	Rates vary with formulations for loopers.
	1.0–2.0 lb <i>Bacillus thuringiensis subsp. kurstaki</i>	1.0–2.0 lb Lepinox WDG	0	Treat early instar larvae before noticeable feeding damage occurs. Repeat as needed.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year.
	0.5–2.0 lb carbaryl	Sevin	0	Several formulations; see label for rate.
	chlorantraniliprole	3.5–7.5 fl oz Coragen	14	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.012–0.028 lb deltamethrin	1.0–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.025–0.05 lb esfenvalerate	2.8–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season.
	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
	0.015–0.025 lb lambda-cyhalothrin	0.96–1.6 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	5.0–8.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
	0.017–0.03 lb lambda-cyhalothrin + thiamethoxam	2.5–4.5 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
	0.058–0.078 lb novaluron	9.0–12.0 fl oz Rimon 0.83EC	14	Apply when population is between egg hatch and second instar. Use higher rates for larger larvae. Do not make more than 2 applications or exceed 24.0 oz/a per season.
	0.1–0.2 lb permethrin	*Ambush, *Pounce	14	Do not exceed 1.6 lb ai/a per season.
	0.047–0.094 lb spinetoram	6.0–8.0 oz Radiant SC	7	Do not apply more than 32.0 oz/a Radiant (0.25 lb ai/a) per crop and do not exceed 4 applications per crop.
spinosad	1.7–3.5 oz Blackhawk	3	Apply when pests reach or exceed established thresholds. Do not make more than two successive applications of a Group 5 material and do not apply more than 14.4 oz/a Blackhawk per crop season in potato. Do not exceed 4 applications in a year.	
	4.5–10.0 fl oz Entrust SC	7	Target application for eggs at hatching and small larvae. Use higher rates for heavier infestations and for older larvae. Do not apply more than 21.0 fl oz/a per crop.	
0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.	

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Cutworms, loopers</b> <i>(cont.)</i>	0.01–0.025 lb zeta-cypermethrin	1.76–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.
<b>European corn borer</b>	acetamiprid	1.5–2.5 fl oz Assail 30 SG	7	For heavy pest pressure, use higher label rates. Do not make more than 4 applications or exceed 0.3 lb ai/a per season. Do not apply more than once every 7 days.
		1.1 fl oz Assail 70WP	7	
	alpha-cypermethrin	1.8–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	1.0–2.0 lb <i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i>	1.0–2.0 lb Lepinox WDG	0	Treat early instar larvae before noticeable feeding damage occurs. Repeat as needed.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year.
	0.5–2.0 lb carbaryl	Sevin	0	Several formulations; see label for rate.
	chlorantraniliprole	3.5–7.5 fl oz Coragen	14	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.044–0.088 lb cyantraniliprole <i>(overhead irrigation only)</i>	7.0–13.5 fl oz Verimark	—	Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. Minimum reapplication interval is 5 days.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.015–0.05 lb esfenvalerate	2.9–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season.
<b>Sweet corn</b>	imidacloprid + beta-cyfluthrin	2.8 fl oz *Leverage 360	7	Minimum interval between applications is 7 days and maximum allowable crop use per season is 12.8 fl oz/a.
	0.065–0.11 lb indoxacarb	3.5–6.0 oz Avaunt	7	Do not exceed 0.26 lb ai/a per season.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
<b>Table beet</b>	0.02–0.027 lb lambda-cyhalothrin + thiamethoxam	3.0–4.0 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
	0.1–0.2 lb permethrin	*Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
	0.047–0.094 lb spinetoram	6.0–8.0 oz Radiant SC	7	Do not apply more than 32.0 oz/a Radiant (0.25 lb ai/a) per crop and do not exceed 4 applications per crop.

\*Restricted-use pesticide.

*(continued)*

**Insect control in potato** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>European corn borer</b> <i>(cont.)</i>	spinosad	1.7–3.3 oz Blackhawk	3	Apply when pests reach or exceed established thresholds. Do not make more than two successive applications of a Group 5 material and do not apply more than 14.4 oz/a Blackhawk per crop season in potato. Do not exceed 4 applications in a year.
		3.0–10.0 fl oz Entrust SC	7	Target application for eggs at hatching and small larvae. Use higher rates for heavier infestations and for older larvae. Do not make more than 2 applications per generation. Do not apply more than 21.0 fl oz/a per crop.
	0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.
	0.01–0.025 lb zeta-cypermethrin	1.76–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.
<b>Grass-hoppers</b>	<i>Treat when defoliation exceeds 10%.</i>			
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	2.0 lb carbaryl	Sevin Bait	0	Broadcast. See label for rate.
	chlorantraniliprole	2.0–5.0 fl oz Coragen	14	Do not make more than 4 applications per crop season and allow at least 3 days between applications. Do not apply more than 15.4 fl oz/a Coragen per season.
	0.25–0.5 lb dimethoate	0.5–1.0 pt Dimethoate EC	0	
	0.015–0.05 lb esfenvalerate	2.9–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season.
	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Allow at least 7 days between applications. Do not apply more than 27.0 fl oz/a Besiege per season.
<b>Green peach aphid, potato aphid</b>	<i>Control when green peach aphids exceed one per 10 leaves for seed production or three aphids per 10 leaves for table stock.</i>			
	acetamiprid	1.5–4.0 fl oz Assail 30 SG	7	For heavy pest pressure, use higher label rates. Do not make more than 4 applications or exceed 0.3 lb ai/a per season. Do not apply more than once every 7 days.
		1.0–1.7 fl oz Assail 70WP	7	
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.022 lb beta-cyfluthrin	2.8 fl oz *Baythroid XL	0	Maximum Baythroid XL allowed per 7-day interval is 2.8 fl oz/a and season total allowed per crop season is 16.8 fl oz/a.
	0.075–0.096 lb bifenthrin + imidacloprid	4.8–6.14 fl oz *Brigadier	21	Do not apply more than 25.6 fl oz/a (0.4 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.2 lb ai/a imidacloprid are allowed per season.

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
Pea <b>Green peach aphid, potato aphid</b> <i>(cont.)</i>	0.03–0.05 lb clothianidin	1.9–2.8 fl oz Belay	14	Do not exceed 3 applications of Belay. Allow at least 7 days between applications. Do not make a foliar application of Belay following an at-plant application of a neonicotinoid (MoA Class 4) compound.
	0.088–0.134 lb cyantraniliprole <i>(overhead irrigation only)</i>	13.5–20.5 fl oz Verimark	—	Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. Minimum reapplication interval is 5 days.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
Pepper	0.25–0.5 lb diazinon	several formulations	35	Repeat applications as necessary. Allow at least 7 days between applications. Do not use on potatoes that will be hand harvested. Limit of 5 applications per season.
	0.25–0.5 lb dimethoate	0.5–1.0 pt Dimethoate EC	0	
	0.025–0.05 lb esfenvalerate	5.8–9.6 fl oz *Asana XL	7	For potato aphid only. Do not exceed 0.35 lb ai/a per season.
	0.062–0.089 lb flonicamid	2.0–2.8 oz Beleaf 50SG	7	Thorough coverage is required for optimal control. Do not apply more than 2.8 oz/a Beleaf 50SG (0.089 lb ai/a) per treatment and do not exceed 8.4 oz/a (0.267 lbai/a) per season. Allow at least 7 days between applications; rapidly growing plants often require re-treatment. Limit of 3 applications per year.
	flupyradifurone	7.0–10.5 fl oz Sivanto	7	Foliar application. Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
	0.047 lb imidacloprid	3.75 fl oz Provado 1.6F	7	Foliar application: Use ground equipment only. Allow at least 7 days between applications. Regardless of the type of application, do not exceed 0.31 lb ai/a imidacloprid (Admire or Provado) per year. There is a 12-month rotational plantback interval for all crops except those registered.
	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
Potato	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
	0.027–0.03 lb lambda-cyhalothrin + thiamethoxam	4.0–4.5 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
Pumpkin & squash	0.6–0.9 lb malathion	several formulations	0	Short residual.
	0.45–0.9 lb methomyl	1.5–3.0 pt *Lannate LV 0.5–1.0 lb *Lannate SP	6	Do not exceed 10 applications per season.
	0.5–1.0 lb oxamyl	2.0–4.0 pt *Vydate L	7	Foliar application. Do not exceed 6 applications per season.
Sweet corn	0.1–0.2 lb permethrin	*Ambush, *Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
Table beet				
Tomato				

\*Restricted-use pesticide.

*(continued)*

**Insect control in potato** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Green peach aphid, potato aphid</b> <i>(cont.)</i>	pymetrozine	2.75 oz Fulfill 50WDG	14	Apply according to label directions when aphids first appear. May repeat treatment in 7 days. Do not exceed 2 applications per crop or 5.5 oz ai/a per season. May be applied through chemigation.
	thiamethoxam	3.0 oz Actara 25WDG	14	Apply every 7–10 days as needed. Do not exceed 6.0 oz/a per season.
		0.11–0.16 fl oz Cruiser 5FS/100 lb seed pieces	0–30	Use rate chart on label to select proper application rate. Do not exceed 0.125 lb ai/a.
	0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.
	0.02–0.025 lb zeta-cypermethrin	3.2–4.0 oz *Mustang Maxx	1	Apply Mustang Maxx only after populations have exceeded thresholds and do not exceed 24.0 oz/a per season.
0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.	
<b>Potato flea beetle</b>	acetamiprid	1.5–2.5 fl oz Assail 30 SG	7	For heavy pest pressure, use higher label rates. Do not make more than 4 applications or exceed 0.3 lb ai/a per season. Do not apply more than once every 7 days.
		0.6–1.1 fl oz Assail 70WP	7	
	alpha-cypermethrin	1.8–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year.
	0.075–0.096 lb bifenthrin + imidacloprid	4.8–6.14 fl oz *Brigadier	21	Do not apply more than 25.6 fl oz/a (0.4 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.2 lb ai/a imidacloprid are allowed per season.
	0.5–2.0 lb carbaryl	Sevin (several formulations)	0	See label for limitations on crops that follow.
	0.03–0.05 lb clothianidin	1.9–2.8 fl oz Belay	14	Do not exceed 3 applications of Belay. Allow at least 7 days between treatments. Do not make a foliar application of Belay following an at-plant application of a neonicotinoid (MoA Class 4) compound.
	0.088–0.134 lb cyantraniliprole <i>(overhead irrigation only)</i>	13.5–20.5 fl oz Verimark	—	Do not apply more than 0.4 lb ai/a cyantraniliprole-containing products per crop whether applied as soil or foliar applications. Minimum reapplication interval is 5 days.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.25–0.5 lb diazinon	several formulations	35	Repeat applications as necessary. Allow at least 7 days between applications. Do not use on potatoes that will be hand harvested.
0.05–0.33 lb dinotefuran	foliar: 1.0–1.5 oz Venom 70SG	7	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not apply more than 4.5 oz/a per year using foliar applications, or 7.5 oz/a per season using soil applications. See product label for directions.	
	soil: 6.5–7.5 oz Venom 70SG	—		

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Potato flea beetle</b> ( <i>cont.</i> )	0.05–0.07 lb dinotefuran ( <i>foliar</i> )	2.0–2.75 oz Scorpion 35SL	7	Can repeat at 14-day intervals. Do not apply more than 7.75 oz per year. Use only one application method.
	0.28–0.33 lb dinotefuran ( <i>soil</i> )	11.0–13.0 oz Scorpion 35SL		Do not apply more than 13.0 oz per year. Apply either as a preplant, preemergence, or at ground crack. Do not follow soil applications with foliar applications; use only one application method.
Pepper	0.025–0.05 lb esfenvalerate	5.8–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season.
	0.047 lb imidacloprid	3.75 fl oz Provado 1.6F	7	Use ground equipment only. Allow at least 7 days between applications. Regardless of the type of application, do not exceed 0.31 lb ai/a imidacloprid (Admire, Leverage 360, or Provado) per year. <b>There is a 12-month rotational plantback interval for all crops except those registered.</b>
Potato	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
Pumpkin & squash	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
	0.017–0.03 lb lambda-cyhalothrin + thiamethoxam	2.5–4.5 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
	0.05–0.2 lb permethrin	*Ambush, *Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
	spinosad	1.7–3.3 oz Blackhawk	3	Apply when pests reach or exceed established thresholds. Do not make more than two successive applications of a Group 5 material and do not apply more than 14.4 oz/a Blackhawk per crop season in potato. Do not exceed 4 applications in a year.
Sweet corn	thiamethoxam	0.11–0.16 fl oz Cruiser 5FS/100 lb seed pieces	0–30	Use rate chart on label to select proper application rate. Do not exceed 0.125 lb ai/a.
		1.5–3.0 oz Actara 25WDG	14	Apply when pests reach or exceed established thresholds. Do not apply more than 6.0 oz of Actara 25WDG per acre per crop season. Actara is applied as a foliar spray.
Table beet	0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.
	0.01–0.025 lb zeta-cypermethrin	1.76–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.

\*Restricted-use pesticide.

*(continued)*

**Insect control in potato** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Potato leafhopper</b>	<i>Sample nymphs and adults. Do not treat if fewer than 0.5 adults per sweep unless there are more than 2.5 nymphs per 25 leaves. If 0.5–1.0 adults per sweep, treat if they remain at the same level for 10–14 days or if nymphs are present. If 1.0–1.5 adults per sweep, treat within 5–7 days or immediately if nymphs are present. If more than 1.5 adults per sweep, treat immediately.</i>			
	acetamiprid	1.5–4.0 fl oz Assail 30 SG	7	For heavy pest pressure, use higher label rates. Do not make more than 4 applications or exceed 0.3 lb ai/a per season. Do not apply more than once every 7 days.
		0.6–1.7 fl oz Assail 70WP	7	
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year.
	0.075–0.096 lb bifenthrin + imidacloprid	4.8–6.14 fl oz *Brigadier	21	Do not apply more than 25.6 fl oz/a (0.4 lb ai/a) per season. No more than 0.5 lb ai/a bifenthrin and 0.2 lb ai/a imidacloprid are allowed per season.
	0.5–2.0 lb carbaryl	Sevin (several formulations)	0	See label for limitations on crops that follow.
	0.03–0.05 lb clothianidin	1.9–2.8 fl oz Belay	14	Do not exceed 3 applications of Belay. Allow at least 7 days between treatments. Do not make a foliar application of Belay following an at-plant application of a neonicotinoid (MoA Class 4) compound.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.25–0.5 lb dimethoate	0.5–1.0 pt Dimethoate EC	0	
	0.05–0.33 lb dinotefuran	<i>foliar:</i> 1.0–1.5 oz Venom 70SG <i>soil:</i> 6.5–7.5 oz Venom 70SG	7 —	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Use only one application method. Do not apply more than 4.5 oz/a per year using foliar applications, or 7.5 oz/a per season using soil applications. See product label for directions.
	0.05–0.07 lb dinotefuran ( <i>foliar</i> )	2.0–2.75 oz Scorpion 35SL	7	Can repeat at 14-day intervals. Do not apply more than 7.75 oz per year. Use only one application method.
	0.28–0.33 lb dinotefuran ( <i>soil</i> )	11.0–13.0 oz Scorpion 35SL		Do not apply more than 13.0 oz per year. Apply either as a preplant, preemergence, or at ground crack. Do not follow soil applications with foliar applications; use only one application method.
	0.015–0.05 lb esfenvalerate	2.9–9.6 fl oz *Asana XL	7	Do not exceed 0.35 lb ai/a per season.
	flupyradifurone	7.0–10.5 fl oz Sivanto	7	Foliar application. Apply when pests reach or exceed established thresholds. Do not apply more than 28.0 fl oz of Sivanto per acre per crop season.
0.047 lb imidacloprid	3.75 fl oz Provado 1.6F	7	Foliar application: Use ground equipment only. Allow at least 7 days between applications. Regardless of the type of application, do not exceed 0.31 lb ai/a imidacloprid (Admire or Provado) per year. <b>There is a 12-month rotational plantback interval for all crops except those registered.</b>	
imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.	

\*Restricted-use pesticide.

*(continued)*

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Insect control in potato *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Pea</b> <b>Potato leafhopper</b> <i>(cont.)</i>	0.015–0.025 lb lambda-cyhalothrin	0.96–1.6 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	5.0–8.0 fl oz *Besiege	14	Allow at least 7 days between applications. Do not apply more than 27.0 fl oz/a Besiege per season.
<b>Pepper</b>	0.017–0.03 lb lambda-cyhalothrin + thiamethoxam	2.5–4.5 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
	0.6–0.9 lb malathion	several formulations	0	Short residual will protect beneficial insects.
	0.45–0.9 lb methomyl	1.5–3.0 pt *Lannate LV 0.5–1.0 lb *Lannate SP	6	
	0.05–0.2 lb permethrin	*Ambush, *Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
	1.0 lb phosmet	1.33 lb Imidan WP	7	Use only on potatoes to be machine harvested.
	thiamethoxam	1.5–3.0 oz Actara 25WDG	14	Apply every 7–10 days as needed. Do not exceed 6.0 oz/a per season.
		0.11–0.16 fl oz Cruiser 5FS/100 lb seed pieces	0–30	Use rate chart on label to select proper application rate. Do not exceed 0.125 lb ai/a.
<b>Potato</b>	0.047 lb thiamethoxam + chlorantraniliprole	4.0 oz Voliam Flexi	14	Do not exceed a total of 8.0 fl oz/a Voliam Flexi or 0.094 lb ai/a of thiamethoxam-containing products or 0.2 lb ai/a of chlorantraniliprole-containing products per growing season.
	0.01–0.025 lb zeta-cypermethrin	1.76–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.
	0.04–0.1 lb zeta-cypermethrin + bifenthrin	4.0–10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.
<b>Pumpkin &amp; squash</b>	<b>Tarnished plant bug</b>	<i>Treat when insect sweep net counts exceed an average of 1 bug/sweep.</i>		
	alpha-cypermethrin	3.2–3.8 fl oz *Fastac	1	Apply when pests reach or exceed established thresholds. Do not apply more than 11.4 fl oz of Fastac per acre per crop season.
	0.0125–0.022 lb beta-cyfluthrin	1.6–2.8 fl oz *Baythroid XL	0	Apply every 5 days as needed. Do not exceed 6 applications per year.
	0.5–2.0 lb carbaryl	Sevin (several formulations)	0	See label for limitations on crops that follow.
	0.018–0.028 lb deltamethrin	1.5–2.4 oz *Delta Gold	3	Apply every 3 days as needed.
	0.025–0.05 lb esfenvalerate	5.8–9.6 fl oz *Asana XL	7	Do not exceed 12 applications per season.
	imidacloprid + beta-cyfluthrin	3.8–4.1 fl oz *Leverage 360	0	Do not apply more than 15.4 fl oz/a per season and allow at least 7 days between applications.
	0.02–0.03 lb lambda-cyhalothrin	1.28–1.92 fl oz *Warrior II	7	Do not apply more than 0.12 lb ai/a per season. Do not feed treated foliage to animals.
	lambda-cyhalothrin + chlorantraniliprole	6.0–9.0 fl oz *Besiege	14	Do not apply more than 27.0 fl oz/a Besiege per season and allow at least 7 days between applications.
	0.02–0.027 lb lambda-cyhalothrin + thiamethoxam	3.0–4.0 fl oz *Endigo ZC	14	Do not follow soil applications with foliar application of any other neonicotinoid insecticide. Do not exceed 10.0 fl oz/a Endigo ZC, or 0.12 lb ai/a of products containing lambda-cyhalothrin or 0.094 lb ai/a of products containing thiamethoxam.
<b>Sweet corn</b>				
<b>Table beet</b>				
<b>Tomato</b>				

\*Restricted-use pesticide.

*(continued)*

**Insect control in potato** *(continued)*

Insect	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Tarnished plant bug</b> <i>(cont.)</i>	0.1–0.2 lb permethrin	*Ambush, *Pounce	14	Several formulations; see label for rate. Do not exceed 1.6 lb ai/a per season.
	0.01–0.025 lb zeta-cypermethrin	1.76–4.0 oz *Mustang Maxx	1	Apply at thresholds and do not exceed 24.0 oz/a Mustang Maxx per season.
	0.1 lb zeta-cypermethrin + bifenthrin	10.3 fl oz *Hero	21	Do not exceed 0.2 lb ai/a per season or make more than 2 applications per season.
<b>Two-spotted spider mite</b>	0.125–0.25 lb bifenazate	16.0–24.0 oz Acramite 4SC	14	Apply in at least 50 gallons of water to ensure uniform coverage and canopy penetration. Do not apply more than once per year.
<b>Wireworms</b> (soil treatments)	bifenthrin	<i>at-plant:</i> 19.2 oz *Brigade 2EC		Apply as an in-furrow spray or T-band spray at planting. May be applied as a lay-by treatment as a banded spray over the drilled area.
		<i>lay-by:</i> 3.2–9.6 oz *Brigade 2EC		
		12.75–25.5 oz *Capture LFR	34 (at-plant) 35 (lay-by)	Do not exceed 0.3 lb ai/a per season as an at-plant application. Do not apply more than 0.5 lb ai/a per season including other bifenthrin products.
	4–6 lb ethoprop	2.1 lb/1,000 ft row *Mocap EC		Band in row at planting.
		40.0–60.0 lb *Mocap G		Preplant broadcast if severe infestation is likely.
0.09–0.1 lb fipronil	2.9–3.2 oz Regent 4SC	90	Make only one in-furrow treatment. Apply as a 5- to 7-inch-wide band and cover thoroughly. See label for plantback restrictions.	
	banded rate: <i>heavy soil:</i> 0.22 lb/1,000 ft row phorate <i>light soil:</i> 0.14 lb/1,000 ft row phorate	<i>heavy soil:</i> 17.3 oz *Thimet 20G, *Phorate 20G <i>light soil:</i> 11.3 oz *Thimet 20G, *Phorate 20G	90	Apply as fertilizer band treatment at planting.

\*Restricted-use pesticide.

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Weed control

Control potato weeds with timely cultivation and use of herbicides. Many herbicide application options exist, including preplant, drag-off, preemergence, and postemergence applications. If you hill early, spray-hill and hill-spray options

are also available. Hill-spray refers to applying the herbicide immediately after hilling when potatoes are beginning to emerge. Any preemergence herbicide can be used. Spray-hill refers to application made at cracking but before emergence.

Application is made at cracking and followed immediately by hilling. Herbicides requiring incorporation can be used in this option.

### Relative effectiveness of potato herbicides

Target species	Dual pre	Eptam pre	Lorox pre	Matrix pre, post	Metribuzin pre, post	Poast post	Prowl pre	Treflan pre
<b>Annual broadleaf weeds</b>								
Black nightshade	<b>E*</b>	F*	<b>G</b>	P	P	N	P	P
Carpetweed	—	—*	—*	—	<b>E<sup>a</sup></b>	N	—	—*
Lady's thumb	P	F	<b>E</b>	F	<b>E</b>	N	—	P
Lambsquarters	F	<b>G*</b>	<b>E*</b>	F*	<b>E*</b>	N	<b>G*</b>	<b>G*</b>
Pigweed, redroot	<b>G*</b>	<b>G*</b>	<b>E*</b>	<b>E*</b>	<b>E*</b>	N	<b>G*</b>	<b>G*</b>
Pigweed, prostrate	—	<b>G*</b>	—	<b>E*</b>	— <sup>a</sup>	N	<b>G*</b>	<b>G*</b>
Purslane, common	<b>G</b>	—*	<b>E*</b>	F*	<b>G<sup>b</sup></b>	N	—*	<b>E*</b>
Ragweed, common	F	F	<b>E*</b>	F*	<b>E*</b>	N	P	P
Shepherd's purse	—	—*	—	<b>E*</b>	— <sup>a</sup>	N	—	—
Smartweed, Pennsylvania	F	F	<b>E*</b>	F*	<b>E*</b>	N	P	P
Velvetleaf	P	<b>G</b>	<b>G</b>	F*	<b>E*</b>	N	P	P
Wild buckwheat	P	F	F	F	—	N	—	P
<b>Annual grasses</b>								
Barnyard grass	<b>E*</b>	F*	<b>G*</b>	<b>E*</b>	P	<b>E</b>	<b>G*</b>	<b>E*</b>
Crabgrass, large	<b>E*</b>	<b>E*</b>	<b>G*</b>	F*	<b>G</b>	<b>E</b>	<b>E*</b>	<b>E*</b>
Foxtail, green	<b>E*</b>	<b>E*</b>	<b>G*</b>	<b>E*</b>	<b>G*</b>	<b>E</b>	<b>E*</b>	<b>E*</b>
Sandbur	F	—*	—	—	P	<b>E</b>	<b>G*</b>	—*
Witchgrass	—*	<b>E*</b>	F	—	P	<b>E</b>	<b>E*</b>	<b>E</b>
<b>Perennial grass</b>								
Quackgrass	P	F	P	<b>G*</b>	P	<b>G*</b>	P	P

\*Weeds listed as controlled on the herbicide's label.

**Abbreviations:** E = excellent; G = good; F = fair; P = poor; N = none; — = data not available; pre = preemergence treatment, post = postemergence treatment. Good and excellent ratings are set boldface.

**Note:** Because the performance of herbicides is affected by many variables, these ratings can only indicate the relative effectiveness. The actual performance may be better or worse than indicated in the chart.

<sup>a</sup> Metribuzin label lists carpetweed, jimsonweed, wild mustard, prostrate pigweed, and shepherd's purse as controlled by preemergence sprays only.

<sup>b</sup> Metribuzin label states preemergence treatment will suppress purslane.

**Weed control in potato** (See preceding table of relative effectiveness of potato herbicides.)

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Annual weeds</b>	0.56–0.98 lb dimethenamid-P	<i>coarse soils:</i> 12.0–18.0 fl oz Outlook <i>medium- and fine-textured soils:</i> 14.0–21.0 fl oz Outlook	40	Make preemergence applications after drag-off or after hilling, but before weeds emerge. In cold and wet conditions, Outlook may delay emergence or stunt potatoes.
	fomesafen	Reflex	70	Reflex is prohibited from use in many areas of Wisconsin and is rate-restricted by location. Check label to determine if it can be used in your area and for use instructions.
<b>Annual grasses and some broadleaves</b>	EPTC	Eptam 7E or registered equivalent	30	Rate varies by application timing—see label for details. May be applied and incorporated with various methods before or at planting, or postemergence. Superior may suffer early season stunting if the crop is stressed.
	0.71–1.43 lb pendimethalin	1.5–3.0 pt Prowl H <sub>2</sub> O		Make one preemergence application after potatoes are planted but before weeds or crop emerge. Use rate is based on soil texture. Pendimethalin is most effective if adequate rainfall or irrigation occurs within 1 week of treatment. Incorporate if moisture is inadequate. May also be applied postemergence from crop emergence to 6-inch stage and through chemigation. Do not make applications to potatoes under stress from cold/wet or hot/dry weather.
	0.74–1.49 lb pendimethalin	1.8–3.6 pt Prowl 3.3EC		
	s-metolachlor	1.0–2.0 pt Dual Magnum or Dual II Magnum		Make preemergence applications after drag-off or after hilling but before weeds emerge. Use rates vary with soil organic matter and formulation. PHI varies with type of application, so read the label carefully. Do not use on peat or muck soils. If cool wet soil conditions occur after treatment, Dual may delay maturity or reduce yield of early-maturing varieties.
	trifluralin	several manufacturers		Treat after planting but before emergence, following dragoff or after potatoes have fully emerged. May also be applied through chemigation. Controls annual grasses and some broadleaf weeds, but is weak on wild mustard, smartweed, common ragweed, velvetleaf, and black nightshade. Rate varies with soil texture and organic matter. Follow recommended soil preparation, application, and incorporation procedures. May injure potatoes if improperly incorporated. Must be incorporated within 24 hours. See label for plantback restrictions. Ineffective on peat and muck soils.
<b>Annual broadleaves and some grasses</b>	linuron	Linex 4L ( <i>use and rate vary by soil type—see label</i> )		Use included on a Wisconsin Special Local Needs 24c label that addresses restricted soil types, organic matter, and depth to groundwater. See label for details. Apply delayed preemergence after planting but just before potatoes emerge. Linuron can be applied in a hill-spray operation. Apply before grasses are 2 inches tall and broadleaf weeds are 6 inches tall, preferably just before or when weed seedlings emerge. If weeds are present, add 1 pt surfactant/25 gal spray mixture. In irrigated areas, apply linuron to moist soil and follow with sprinkler irrigation or rainfall within 2 weeks. Do not incorporate. More effective on annual broadleaf weeds than grasses.

\*Restricted-use pesticide.

(continued)

Pea

Pepper

Potato

Pumpkin & squash

Sweet corn

Table beet

Tomato

## Weed control in potato *(continued)*

Weed	Rate/a of active ingredient	Rate/a of commercial product	Days to harvest	Remarks and suggestions
<b>Annual broadleaves and some grasses</b> <i>(cont.)</i>	metribuzin	See label—rate and use instructions vary.	60	Apply delayed preemergence after drag-off or hilling. Do not incorporate. Early postemergence applications are labeled for russet-type or white-skinned varieties that are not early maturing. Can be applied with sprinkler irrigation systems. Do not apply within 3 days after periods of cool, wet, or cloudy weather, or to weeds taller than 1 inch. Postemergence metribuzin treatment is not recommended for red-skinned varieties or Atlantic, Shepody, Chip Bell, Bellchip, or Centennial. Preemergence application to these varieties may also cause injury. Split applications (preemergence and early postemergence) at reduced rates are often effective and reduce potential for leaching. See label for rotation restrictions.
<b>Annual weeds and some perennial weeds</b>	0.0156–0.02 lb rimsulfuron	1.0–1.5 oz Matrix or Solida	30	Apply 1.0–1.5 oz/a immediately after hilling or dragoff, or postemergence to young, actively growing weeds. Depending on soil type, rainfall or irrigation of 1/3 to 1 inch is needed within 5 days after application for activation. For postemergence applications, allow at least 4 hours drying time after application. Sequential applications are allowed up to a total of 2.5 oz/a. Check the label for crop rotation guidelines.
<b>Emerged weeds</b>	glyphosate	several manufacturers and formulations		See manufacturer's label to assure that the formulation is labeled for this crop and for specific instructions. Glyphosate may be applied any time before crop emerges. Apply before crop germination in coarse sandy soils. If weeds have been mowed or tilled, wait until they resume active growth and reach the recommended stage on the label. Unless otherwise stated, allow 7 or more days before tilling treated fields. Do not tank mix with soil-residual herbicides unless otherwise specified.
	*paraquat <i>(rate varies by label)</i>	several manufacturers and formulations, not all are registered for this use		Make application up to cracking. Always add crop oil concentrate or non-ionic surfactant to spray mixture. Follow precautions on label. In preplant and preemergence (to the crop) uses, do not apply to soils lacking clay minerals (i.e., muck, pure sand).
<b>Emerged grasses</b>	0.068–0.24 lb clethodim	9.0–32.0 oz Select Max	30	Apply to actively growing grasses. Repeat treatments may be made at 14-day intervals up to the maximum annual use rate. Do not cultivate grasses within 7 days before or after application. Include appropriate surfactant as required by product label. Do not apply if rain is expected within 1 hour.
	0.094–0.25 lb clethodim	6.0–16.0 oz Select 2EC	30	
	0.19–0.48 lb sethoxydim	1.0–2.5 pt Poast	30	

\*Restricted-use pesticide.