

Potato

Spacing

Rows 34 to 36 inches apart. Seed pieces 9 to 11 inches apart in row, depending on variety and intended use. Seed 16 to 18 100-pound bags per acre. Seed piece should be 1.5 to 2 ounces. Using B-size certified seed will save cutting labor and reduce tuber-borne diseases.

Fertilizing

Lime: To control common scab, soil pH should be within 5.0 to 5.2. However, low soil pH reduces phosphorus availability and increases availability of toxic elements such as manganese and aluminum. If the field has a history of scab, using scab-resistant varieties is recommended. Then, the soil pH can be 6.5 where phosphorus is most available.

Preplant: N: none — only a small amount such as 24 to 30 pounds with the starter fertilizer. P_2O_5 : none — apply 50 to 150 pounds as a starter depending on the soil test results. K_2O : 50 to 400 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state. For the most efficient phosphate application, apply the fertilizer at planting in a band 2 to 3 inches to the side and below each side of the tuber. Examples would be 500 pounds per acre of 6-24-24 or 8-16-16. Do not apply more than 200 pounds of K_2O per acre in the band at planting. On sandy soils, broadcast 30 pounds or band 15 pounds sulfur per acre.

Sidedress N: For irrigated sandy soils, two split N applications are recommended: half at emergence and half at hilling or tuber initiation. For the early maturing varieties, use 50 to 60 pounds of N per acre at each growth stage. The second application can be adjusted according to rainfall and a petiole nitrate-N analysis. For upland or finer textured soils, all of the required N can be applied preplant or shortly after emergence. For soils with more than 3 percent organic matter and following soybeans, alfalfa, or a grass-legume hay crop, apply 100 pounds N per acre. For soils with less than 3 percent organic matter and the above rotation, apply 135 pounds N per acre. For potatoes following corn, rye, oats, wheat, or a vegetable crop, apply 150 pounds N per acre. Refer to University of Minnesota recommendations for N rates adjusted for yield goal.

Vine Killing

Vine Killing Product	Treatment	Comments
Defol 750*	3.2 qts. per acre in 10-20 gals. water by ground or 5-10 gals. by air.	Apply 10 days before harvest. Do not apply in extreme heat during middle of the day.
paraquat	0.8-1.5 pts. per acre of 2.5L or 0.6-1.0 pt. per acre of 3L in 50-100 gals. of water plus 1 gal. COC or 1-2 pts. nonionic surfactant per 100 gals. spray solution. Not for potatoes to be stored or used for seed.	Begin applications when leaves begin to turn yellow. Immature potato foliage and drought-stressed potato foliage are tolerant to this product. Maximum 3 pts. of 2.5L or 2 pts. of 3L per acre per season. For split applications, use lower rate and wait 5 days between applications. Read label for complete instructions. 3L formulation not for use in Iowa or Missouri. 3-day PHI.
Reglone*	1-2 pts. in 20-100 gals. water plus 8-64 fl. oz. nonionic surfactant.	A second application can be made if necessary. Allow at least 5 days between applications. 7-day PHI.
Rely 280*	21 fl. oz. per acre. Not for potatoes to be used for seed.	Do not make more than 1 application. 9-day PHI.

Chemical Sprout Control

Use maleic hydrazide (MH-30) according to label directions one week after blossoms fall. For varieties and conditions where flowering does not occur, apply four to six weeks before potatoes are mature and ready for harvest. Make only one application. Apply when no rain is expected for 24 hours. Potatoes treated with MH cannot be used for seed because sprouting will be inhibited. Follow label directions.

Pesticide Use in Greenhouses

Before using any pesticide, always read the product label for mention of greenhouse restrictions. See Selected Information About Recommended Fungicides (page 79), Selected Information About Recommended Herbicides (page 69), and Selected Information About Recommended Insecticides (page 54).

Disease Control

Black Dot

Recommended Products

Bravo®, **Echo**®, and **Equus**® and are labeled for use at various rates. 7-day PHI.

Headline SC® at 6-9 fl. oz. per acre. 3-day PHI.

Luna Tranquility® at 11.2 fl. oz. per acre. 7-day PHI.

Quadris® at 6-15.5 fl. oz. per acre. 14-day PHI.

Revus Top 2.08SC® at 5.5-7.0 fl. oz. per acre. 14-day PHI.

Satori® at 6-15.5 fl. oz. per acre. 14-day PHI.

Tanos® at 6-8 oz per acre. *Disease suppression only.* 14 day PHI.

Zing 4.9SC® at 32-34 fl. oz per acre. 7 day PHI.

Black Leg

Plant cut seed tubers that have been stored under conditions for rapid healing of cut surfaces and treated with a labeled potato seed treatment. Plant whole seed tubers where possible.

Black and Silver Scurf

Always use a crop rotation of 2-3 years. Plant seed pieces certified to be free of disease. Harvest potatoes as soon after maturity as possible. Use a fungicide when appropriate.

Recommended Products

Evolve® at 0.75 lb. per cwt.

Moncut 75DF® at 0.7-1.1 lbs. per acre.

RR **Quadris F**® at 0.4-0.8 fl. oz. per 1,000 ft. of row in furrow.

Satori® at 0.4-0.8 fl. oz. per 1,000 ft. of row in furrow.

Tops MZ® at 0.75-1 lb. per cwt.

Early Blight

Choose a cultivar with partial resistance to early blight.

Avoid droughty, wet, or compacted soils, and other conditions (such as insufficient nitrogen) that might add undue stress to the crop and increase susceptibility to early blight. Rotate fields away from potato production for 2-3 years.

Group 11 Resistance

Strains of the fungus that cause early blight that are resistant to group 11 fungicides have been observed. Group 11 products labeled for potato and early blight include **Gem**®, **Headline**®, and **Quadris**®, and **Satori**®. See Selected Information About Recommended Fungicides (page 79) for more information.

Recommended Products

Bravo®, **Echo**®, and **Equus**® are labeled for use at various rates. 7-day PHI.

Dithane®, **Manzate**®, and **Penncozeb**® are labeled for use at various rates. 14-day PHI.

Endura 70WG® at 3.5-4.5 oz. per acre. 10-day PHI.

Gavel 75DF® at 1.5-2 lbs. per acre. 14-day PHI.

RR Gem 500SC® at 2.9-3.8 fl. oz. per acre. 7-day PHI.

Headline® at 6-9 oz. per acre. 3-day PHI.

Luna Tranquility® at 11.2 fl. oz. per acre. 7-day PHI.

RR Quadris 2.08SC® at 6.0-15.5 fl. oz. per acre. 14-day PHI.

Quadris Opti® at 1.6 pts. per acre. 14-day PHI.

Revus Top 2.08SC® at 5.5-7 fl. oz. per acre. 14-day PHI.

Rovral® at 1-2 pts. per acre 14-day PHI.

Satori® at 6-15.5 fl. oz. per acre. 14-day PHI.

RR Scala® at 7 fl. oz. per acre. 7-day PHI.

Tanos 50WDG® at 6 oz. per acre. 14-day PHI.

Velum Prime® at 6.5-6.84 fl. oz. per acre. Apply through overhead irrigation. 7-day PHI.

Zing 4.9SC® at 32-34 fl. oz per acre. 7 day PHI.

Fusarium Dry Rot

Avoid bruising at harvest. Cure potatoes in storage at 60°F before lowering temperature. Provide adequate ventilation.

Recommended Products

Manzate FL® at 1 qt. per 50 gals. water. Dip whole or cut potatoes in solution.

Mertect 340-F® at 0.42 oz. per 2,000 lbs. of tubers.

Late Blight

Destroy all potato cull piles.

The fungus that causes late blight does not overwinter in areas where hard freezes occur regularly. The fungus must be re-introduced on winds or plant material each year.

Recommended Products

Bravo®, **Echo**®, and **Equus**® are labeled for use at various rates. 7-day PHI.

Curzate 60DF® at 3.2 oz. per acre. 14-day PHI.

Gavel 75DF® at 1.5-2 lbs. per acre. 14-day PHI.

Dithane®, **Manzate**®, and **Penncozeb**® are labeled for use at various rates. 14-day PHI.

Orondis Opti®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 7-day PHI.

Orondis Ultra®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 14-day PHI.

Omega 500F® at 5.5 fl. oz. per acre. 14-day PHI.

Previcur Flex® at 0.7-1.2 pts. per acre. 14-day PHI.

RR Ranman 400SC® at 1.4-2.75 fl. oz. per acre. 7-day PHI.

Revus Top 2.08SC® at 5.5-7 fl. oz. per acre. 14-day PHI.

Tanos 50 WDG® at 6-8 oz per acre. 14-day PHI.

Zampro® at 11-14 fl. oz per acre. 4-day PHI.

Zing 4.9SC® at 32-34 fl. oz per acre. 7 day PHI.

Ring Rot

Use certified disease-free seed. When cutting seed stock, the cutter should be periodically cleaned and disinfected, especially when changing seed lots.

The ring rot bacterium is easily spread. Although this bacterium will not survive more than 1 year in the soil (and thus can be controlled by crop rotation), a farm with ring rot must conduct a thorough clean-up before bringing in seed for the next year's crop. The organism can easily survive the winter in crop debris or soil on storage walls; seed cutters, bin pilers, graders, and other handling equipment; tractors, fork lifts and other vehicles; and on burlap sacks, wooden boxes, or other containers. If clean seed potatoes contact any of these contamination sources, the problem can recur.

The first step is to clean all contaminated surfaces with hot soapy water to remove all soil and debris. Use steam or water under pressure. However, this alone will not eliminate the bacterium. The surfaces then must be treated with a disinfectant.

For more information about sanitation, see *Commercial Greenhouse and Nursery Production: Sanitation for Disease and Pest Management* (Purdue Extension publication HO-250-W), available from the Education Store, www.edustore.purdue.edu.

Root-knot and Lesion Nematodes

Sample fields during growing season for parasitic nematodes before planting. Avoid fields with high numbers of root-knot and/or lesion nematodes.

Recommended Product

Nimitz® at 3.5-7 pts. per acre at planting.

Telone II® or **Telone C-35**®. See label for rates. *RUP*.

Vapam®. See label for rates.

Velum Prime® at 6.5-6.84 fl. oz. per acre. Apply through overhead irrigation. 7-day PHI.

Velum Prime® at 6.5-6.84 fl. oz. per acre. Apply through overhead irrigation. 7-day PHI.

Vydate L® at 1-2 gals. per acre in 20 gals. of water broadcast. Incorporate 2-4 inches. *RUP*.

Scab

Plant resistant varieties. Maintain high moisture levels (near field capacity) during tuber set and enlargement. Do not apply manure or other organic matter immediately before planting. Avoid excessive liming, and maintain acid soil pH. Follow 3-4 year rotation schedule.

Verticillium Wilt

Employ at least a 2-year rotation with small grains to manage fungus populations in the soil.

Good weed control also is important in reducing pathogen populations. Choose potato varieties that have partial resistance to Verticillium wilt.


Virus Diseases and Purple-Top Wilt (aster yellows)

Plant only certified seed tubers. Practice clean cultivation. Rogue first infected plants, including tubers. Control aphids and leafhoppers with insecticides.

White Mold

Avoid excess nitrogen. Reduce overhead irrigation if disease is present.

Recommended Products

 **Contans WG**® at 1-4 lbs. per acre. Apply immediately after harvest or 3-4 months before planting.

Endura® at 5.5-10 oz. per acre. 10-day PHI.

Luna Tranquility® at 11.2 fl. oz. per acre. 7-day PHI.

Omega 500F® at 5.5-8 fl. oz. per acre. 14-day PHI.

Rovral® at 2 pts. per acre. 14-day PHI.

Topsin FL® at 20-30 fl. oz. per acre. 21-day PHI.

Velum Prime® at 6.5-6.84 fl. oz. per acre. Apply through overhead irrigation. 7-day PHI.

Weed Control

Potato cultural practices offer several good opportunities to control weeds, beginning with the period between planting and emergence (when early-emerging weeds can be killed with an herbicide or flaming), and continuing through the hilling process (when weeds can be buried or cultivated out). Some organic farmers also use flaming after potatoes emerge because some injury to the potato foliage early in the season can be tolerated. A relatively large number of herbicides are labeled for use on potatoes.


For specific weeds controlled by each herbicide, check Relative Effectiveness of Herbicides for Vegetable Crops (page 68).

Rates provided in the recommendations below are given for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

Burndown or Directed/Shielded Applications Broadleaves and Grasses

Recommended Products

Gramoxone SL 2.0® at 1-2 pts. per acre. Use 1 qt. of COC, or 4-8 fl. oz. of NIS per 25 gals. of spray solution. Apply before planting, or after planting but before ground cracks. *RUP*.

 **Glyphosate** products at 0.75-2.75 lbs. acid equivalent (ae) per acre. Use formulations containing 3 lbs. ae per gal. (4 lbs. isopropylamine salt per gal.) at 1-5 qts. per acre, or formulations containing 4.5 lbs. ae per gal. (5 lbs. potassium salt per gal.) at 0.66-3.3 qts. per acre. Broadcast before planting, after planting before ground cracks, or apply between crop rows with wipers or hooded or shielded sprayers. Use low rate for annuals and higher rates for perennials. See label for suggested application volume and adjuvants. 14-day PHI.

Burndown or Directed/Shielded Applications Broadleaves

Recommended Products

Aim EC® at 0.5-2 fl. oz. per acre. Apply prior to or within 24 hours of planting, or apply between crop rows with hooded sprayer. Do not allow spray to contact crop. Use COC or NIS. Weeds must be actively growing and less than 4 inches tall. Do not exceed 6.1 fl. oz. per acre per season. 7-day PHI.

Preemergence Broadleaves and Grasses

Recommended Products

Dual Magnum® or **Dual II Magnum**® at 1-2 pts. per acre. Use lower rates on coarse soils. Apply and incorporate before planting, or apply after planting before weeds emerge. May also be applied at 1.67 pts. per acre after hilling. Dual Magnum® might delay maturity and/or reduce yield of Superior and other early maturing varieties if cold, wet soil conditions occur after treatment. Dual Magnum® can be tank-mixed with Lorox®, Sencor®, Prowl® or Eptam®. See labels. Do not exceed 3.6 pts. per acre. 60-day PHI if applied before drag-off. 40-day PHI if applied at lay-by.

Eptam 7E® at 3.5-7 pts. per acre, or **Eptam 20G**® at 15-20 lbs. per acre. Apply before planting, after drag-off, or as directed spray at lay-by. Incorporate immediately. On muck soils, supplement with

 This is a reduced-risk pesticide. See page 37 for details.

linuron or metribuzin products applied before crop emerges and after drag-off. The Superior variety may be sensitive. Suppresses nutsedge. 45-day PHI.

Linuron® 50DF products at 1.5-3 lbs. per acre, or 4L products at 1.5-4 pts. per acre. Also controls small, emerged weeds. Apply after planting but before crop emergence, when weeds are less than 2 inches tall. Seed pieces must be planted at least 2 inches deep. Do not use on sand, loamy sand, or soils with less than 1 percent organic matter.

Matrix 25DF® at 1-1.5 oz. per acre. Typically combined with full-labeled rates of metribuzin to improve spectrum of broadleaf control. Use 0.5 pt. of NIS per 25 gals. of spray solution if emerged weeds are present. Apply after planting before crop emerges, at hilling, drag-off, or reservoir tillage, to a clean, newly prepared seedbed. Apply post when weeds are less than 1 inch tall. Avoid using adjuvants when potatoes are under heat stress. Do not exceed 2.5 oz. per acre per year. 60-day PHI.

Metribuzin® 4F products at 0.5-2 pts. per acre, or 75DF products at 0.33-1.32 lbs. per acre. *Not for early-maturing or red-skinned varieties.* Apply after planting before crop emerges, or apply up to 1 pt. of metribuzin 4F (1.32 lbs. of 75DF formulations) after emergence. Check label for sensitive varieties. Avoid spraying when potatoes are 12-15 inches tall. Do not apply within 3 days of cool, wet, or cloudy weather, or crop injury may occur. Do not apply within 1 day of other pesticide applications. Do not exceed 2 pts. of 4F formulations or 1.32 lbs. of 75DF formulations per acre per year. 60-day PHI.

Outlook® at 12-21 fl. oz. per acre. Apply after planting or drag-off and before weeds emerge. In cold and wet conditions potatoes may emerge slowly or be stunted. May be tank-mixed with a number of other potato herbicides. 40-day PHI.

Pendimethalin products at the following rates:

3.3EC formulations at 1.2-3.6 pts. per acre.

Prowl H2O® at 1.5-3 pts. per acre.

Use low rates on coarse soils. Broadcast after planting but before emergence or drag-off, or after potatoes have fully emerged before potatoes are 6 inches tall. May be incorporated. Not effective on muck soils. Do not apply postemergence to stressed potatoes.

Trifluralin products at 0.5-1 lb. a.i. per acre. Use 4EC formulations at 1-2 pts. per acre, or 60DF formulations at 0.8-1.7 lbs. per acre. Use low rate

on soils with less than 2% organic matter. Broadcast and incorporate after planting but before emergence, immediately after drag-off, or after potatoes have fully emerged. Not effective on muck or high organic matter soils.

Preemergence Broadleaves

Recommended Products

Chateau 51WDG® at 1.5 oz. per acre to soil covered potato. *Minnesota only.* Apply to potatoes after hilling. A minimum of 2 inches of soil must cover vegetative plant parts when applied to avoid injury. Provides suppression of lambsquarters, nightshades, pigweeds, wild mustard, and wild radish. Tank-mixes recommended to improve efficacy. No PHI listed.

League® at 4-6.4 oz. per acre. Apply after planting crop and before crop emerges, or immediately after hilling. Or use 3.2 oz. per acre and after at least 21 days make a second application of 3.2 oz. per acre to control emerged weeds less than 3 inches tall. Or use 3.2-4 oz. per acre after crop emerges and before weeds are 3 inches tall; combine this with other measures to achieve satisfactory control. When emerged weeds are present use a Valent-recommended surfactant. Use the high rate in fields with a known history of nutsedge. Do not exceed two applications and 6.4 oz. per acre per year. 45-day PHI.

Reflex® at 1 pt. per acre. Broadcast after planting and before potatoes emerge. When using on any variety for the first time, first determine whether the variety is tolerant to this herbicide. May be tank-mixed with other preemergence herbicides. May not be used on the same land the following year. Alfalfa and most vegetables should not be planted for 18 months. 70-day PHI.

Postemergence Broadleaves and Grasses

Recommended Products

Linuron products. See details above for Preemergence Broadleaves and Grasses.

Matrix 25DF®. See details above for Preemergence Broadleaves and Grasses.

Postemergence Broadleaves

Recommended Products

Aim EC® See details above for Burndown or Directed/Shielded Applications Broadleaves.

League®. See details above for Preemergence Broadleaves.

Metribuzin products. See details above for Preemergence Broadleaves and Grasses.

Postemergence Grasses

Recommended Products

Clethodim products at the following rates:

Select Max® at 9-32 fl. oz. per acre.

2EC formulations of clethodim products at 6-16 fl. oz. per acre.

Use 1 qt. of COC per 25 gals. of spray solution (1% v/v). Spray on actively growing grass. Wait at least 14 days between applications. 30-day PHI.

Poast 1.5E® at 1-2.5 pts. per acre. Use 1 qt. of COC per acre. Spray on actively growing grass. Use high rate on quackgrass. Do not exceed 5 pts. per acre per season. 30-day PHI.

Herbicides for Potatoes¹

Product (REI/PHI)	Common Name	Timing and Application Location Relative to Crop ²						Timing Relative to Weeds		Weed Groups Controlled			Comments
		Before planting	After planting before grounds cracks	At/after Drag-off	At/after hilling	Between rows, directed/shielded	Postemergence over potato crop	Preemergence	Postemergence	Annual grasses	Small-seeded broadleaves	Broadleaves	
Aim® (12h/-)	carfentrazone	X				X		X		X	X		
Chateau® (12h/-)	flumioxazin				X			X		X	X	Minnesota only.	
Dual (II) Magnum® (12h/40d to 60d)	s-metolachlor	X	X	X	X			X		X	X		
Eptam® (12h/45d)	EPTC	X		X		X		X		X		Incorporate.	
Gramoxone® (12h to 24h/-)	paraquat	X	X						X	X	X	X	
League® (12h/45d)	imazosulfuron		X		X		X	X	X		X	X	
Linuron products (12h/-)	linuron		X					X	X	X	X	X	
Matrix® (4h/60d)	rimsulfuron		X	X	X			X	X	X	X	X	
Metribuzin products (12h/60d)	metribuzin		X				X	X		X	X	X	Not for sensitive varieties.
Outlook® (12h/40d)	dimethenamid-P		X	X				X		X	X		
Pendimethalin products (12h/ -)	pendimethalin		X				X	X		X	X		
Poast® (12h/30d)	sethoxydim	X	X	X	X		X		X	X			
Reflex® (12h/70d)	fomesafen		X					X			X	X	
Roundup®, others (12h/14d)	glyphosate	X	X			X			X	X	X	X	
Select Max®, others (12h/30d)	clethodim	X	X	X	X		X		X	X			
Treflan®, others (12h/-)	trifluralin		X	X				X		X	X		Incorporate.

¹For effectiveness against specific weeds, see Relative Effectiveness of Herbicides for Vegetable Crops (page 68), and read label. This table does not include all label information. Be sure to read and follow all instructions and precautions on the herbicide label. Herbicides can cause serious crop injury and yield loss if not used properly.

²X=permitted on label.

Insect Control

Aphids (green peach aphid, melon aphid, potato aphid, and others)

Conserve natural enemies. Limiting insecticide use will conserve predators and parasites that help control aphid populations.

Recommended Products

Soil-applied or seed piece treatment materials:

Admire Pro® (4.6F) at 5.7-8.7 fl. oz. per acre. Apply directly to seed piece or below seed piece at planting. Can expect 70-90 days of control. Do not exceed 8.7 fl. oz. per acre per season. See pollinator precautions.

Belay® at 0.4-0.6 fl. oz. per 100 lbs. of seed, or 9-12 fl. oz. per acre at planting. See label for application methods. Do not exceed 0.2 lb. of clothianidin per acre per year. 14-day PHI.

Cruiser 5FS® or **Cruiser Maxx**®. Rates vary according to seeding rate and row spacing. See labels. For best results plant potatoes immediately after treatment.

Movento HL® at 2-2.5 fl. oz. per acre. Do not exceed 5 fl. oz. per acre per season. 7-day PHI.

RR **Platinum 2SC**® at 5-8 fl. oz. per acre (do not exceed 8 fl. oz. per acre per season), or **Platinum Ridomil Gold**® at 2.2 fl. oz. per 1,000 linear ft. of row (do not exceed 38 fl. oz. per acre per season). Apply directly to seed piece in sufficient water to cover entire seed piece. Can expect 90-100 days control. See pollinator precautions.

Sivanto® at 7-10.5 fl. oz. per acre, or **Sivanto Prime**® at 7.0-14.0 fl. oz. per acre. 7-day PHI.

Thimet 20G® at the following rates:

Light or sandy soils: 8.5-11.3 oz. per 1,000 linear ft. of row for any spacing (minimum 32-inch spacing).

Heavy or clay soils: 13.0-17.3 oz. per 1,000 linear ft. of row.

Apply as a band application on each side of row and beneath the soil surface, or in the seed furrow. 90-day PHI. *RUP*.

Foliar-applied materials:

RR **Actara**® (25WDG) at 3 oz. per acre. Do not exceed 6 oz. per acre per season. See pollinator precautions. 14-day PHI.

Admire Pro® (4.6F) at 1.3 fl. oz. per acre. Do not exceed 5.6 fl. oz. per acre per season. See pollinator precautions. 7-day PHI.

Ambush® at 3.2-12.8 oz. per acre. 14-day PHI. Do not exceed 102.4 fl. oz. per acre per season. *RUP*.

Asana XL® at 5.8-9.6 fl. oz. per acre. 7-day PHI. *RUP*.

RR **Assail 30SG**® at 2.5-4 oz. per acre. Do not exceed 4 applications per year. 7-day PHI.

Athena® at 7-17 fl. oz. per acre. 21-day PHI. *RUP*.

Belay® (2.13SC) at 2-3 fl. oz. per acre. See pollinator precautions. 14-day PHI.

Beleaf 50SG® at 2-2.8 oz. per acre. 7-day PHI.

Dimethoate 400® or **Dimethoate 4E**® at 0.5-1 pt. per acre, or **Dimethoate 2.67EC**® at 0.75-1.5 pts per acre. 48-hour REI. 0-day PHI.

RR **Fulfill**® (50WDG) at 2.75-5.5 oz. per acre. Do not exceed 11 oz. per acre per season. 14-day PHI.

Lannate LV® (2.4WSL) at 1.5-3 pts. per acre. Do not exceed 15 pts. per acre per season. 6-day PHI. *RUP*.

M-Pede® at 1-2% by volume. Must contact aphids to be effective. 0-day PHI.

RR **Movento**® (2SC) at 4-5 fl. oz. per acre. Do not exceed 10 fl. oz. per acre per season. 7-day PHI.

Pyrenone® at 1-12 fl. oz. per acre. 0-day PHI.

Sivanto® (200SL) at 7-10.5 fl. oz. per acre, or **Sivanto Prime**® at 7.0-14.0 fl. oz. per acre. 7-day PHI.

Torac® (1.29EC) at 17-21 fl. oz. per acre. Do not exceed 2 applications per season. See pollinator precautions. 14-day PHI.

Transform WG® at 0.75-1.5 oz. per acre. Do not apply more 8.5 oz. per acre per year. Do not make applications less than 14 days apart. 7-day PHI.

Voliam Flexi® at 4 oz. per acre. 14-day PHI.

Vydate C-LV® at 17-34 fl. oz. per acre. Do not exceed 198 fl. oz. per acre per season. 7-day PHI. *RUP*.

Warrior II® (with Zeon Technology) at 1.28-1.92 fl. oz. per acre.

Colorado Potato Beetles

Allowable Defoliation From Colorado Potato Beetles

Preflowering: 20-30%.

Flowering: 5-10%.

Tuber Formation: 30%.

Manage resistance. See Colorado Potato Beetle Resistance Management on page 202.

Practice crop rotation. Planting fields as far as possible from last year's potato fields will reduce potato beetle damage.

Regular (weekly) field scouting will allow you to determine the necessity for, and improve the timing of, insecticide treatments.

RR This is a reduced-risk pesticide. See page 37 for details.

M May be acceptable for use in certified organic production. Check with your certifier before use.

Colorado Potato Beetle Resistance Management

In some areas of the Midwest, Colorado potato beetle populations are resistant to many insecticides. If a previously effective insecticide is no longer effective, consider switching to another chemical class. If insecticides are still effective, alternating between classes will help prolong their effective lives. If planting time applications of neonicotinoids (Admire Pro®, Gaucho®, Genesis®, Platinum®) are used, foliar neonicotinoids (Actara®, Leverage®) should not be used.

The following table shows the active ingredients and chemical classes of Colorado potato beetle insecticides, and should be used to make resistant management decisions. To avoid promoting insect resistance, make sure to rotate between products that have different Insecticide Resistance Action Committee (IRAC) Group Numbers.

Insecticide	Active Ingredient	Chemical Class	IRAC Group Number
Actara®	thiamethoxam	neonicotinoid	4A
Platinum®	thiamethoxam	neonicotinoid	4A
Admire Pro®	imidacloprid	neonicotinoid	4A
Assail®	acetamiprid	neonicotinoid	4A
Belay®	clothianidin	neonicotinoid	4A
Genesis®	imidacloprid	neonicotinoid	4A
Gaucho®	imidacloprid	neonicotinoid	4A
Leverage®	imidacloprid + cyfluthrin	neonicotinoid + pyrethroid	4A + 3
Endigo ZC®	thiamethoxam = lambda cyhalothrin	neonicotinoid + pyrethroid	4A + 3
Baythroid XL®	cyfluthrin	pyrethroid	3
Ambush®	permethrin	pyrethroid	3
Pounce®	permethrin	pyrethroid	3
Warrior II®	lambda cyhalothrin	pyrethroid	3
Agri-Mek®	abamectin	GABA agonist	6
Epi-Mek®	abamectin	GABA agonist	6
Monitor®	methomidaphos	organophosphate	1B
Kryocide®, Cryolite®	sodium aluminofluoride	mineral	9A
M-Trak®, Novodor®, Raven®	<i>Bacillus thuringiensis</i>	bacterium	11C
Entrust®	spinosad	spinosyn	5
Radiant®	spinetoram	spinosyn	5
Rimon®	novaluron	chitin biosynthesis inhibitor	15
Torac®	tolfenpyrad	mitochondrial complex I electron transport inhibitors	21A
Coragen®	chlorantraniliprole	anthanilic diamide	28
Voliam Flexi®	chlorantraniliprole + thiamethoxam	anthanilic diamide + neonicotinoid	28 + 4A
Voliam Xpress®	chlorantraniliprole + lambda cyhalothrin	anthanilic diamide = pyrethroid	28 + 3

Recommended Products

Soil-applied or seed piece treatments:

Admire Pro® (4.6F) at 0.17-0.35 fl. oz. per 100 lbs. of seed, or 5.7-8.7 fl. oz. per acre. Apply directly to seed piece or below seed piece at planting. Can expect good control of first generation potato beetle and 70-90 days of aphid control. Do not exceed 8.7 fl. oz. per acre per season. See pollinator precautions.

Belay® at 0.4-0.6 fl. oz. per 100 lbs. of seed, or 9-12 fl. oz. per acre at planting. See label for application methods. 14-day PHI.

Cruiser 5FS® or **Cruiser Maxx**®. Rates vary according to seeding rate and row spacing. See labels. For best results plant potatoes immediately after treatment.

RR **Platinum**® (2SC) at 5-8 fl. oz. per acre, or **Platinum Ridomil Gold**® at 2.2 fl. oz. per 1,000 linear ft. of row. Apply directly to seed piece in sufficient water to cover entire seed piece. Provides seasonlong control of potato beetles and aphids at higher label rates. Do not exceed 8.0 fl. oz. of Platinum 2SC®, or 38 fl. oz. of Platinum Ridomil Gold® per acre per season. See pollinator precautions.

Scorpion 35SL® at 11.5-13.25 fl. oz. per acre.

Sivanto® at 10.5-14 fl. oz. per acre.

Thimet 20G® at the following rates:

Light or sandy soils, early season only: 8.5-11.3 oz. per 1,000 linear ft. of row for any spacing (minimum 32-inch spacing).

Heavy or clay soils: 13.0-17.3 oz. per 1,000 linear ft. of row.

Apply as a band application on each side of row and beneath the soil surface or in the seed furrow. 90-day PHI. *RUP.*

Vydate C-LV® at 8.5-34 fl. oz. per acre. Do not exceed 198 fl. oz. per acre per season. 7-day PHI. *RUP.*

Foliar-applied products:

RR **Actara**® (25WDG) at 1.5-3 oz. per acre. Do not exceed 6 oz. per acre per season. See pollinator precautions. 14-day PHI.

Admire Pro® (4.6F) at 3.7 fl. oz. per acre. Do not exceed 5.6 fl. oz. per acre per season. See pollinator precautions. 7-day PHI.

Agri-Mek 0.15EC® at 8-16 fl. oz. per acre. Do not exceed 32 fl. oz. per acre per season. 14-day PHI. *RUP.*

Ambush® (2EC) at 3.2-12.8 fl. oz. per acre. Do not exceed 102.4 fl. oz. per acre per season. 14-day PHI. *RUP.*

Asana XL® (0.66 EC) at 5.8-9.6 fl. oz. per acre. Do not exceed 67.2 fl. oz. per acre per season. 7-day PHI. *RUP.*

RR **Assail 30SG**® at 1.5-4 oz. per acre. Do not exceed 4 applications per year. 7-day PHI.

Athena® at 7-17 fl. oz. per acre. 21-day PHI. *RUP.*

RR **Avaunt 30WDG**® at 3.5-6.0 oz. per acre. Do not exceed 24 oz. per acre per season. 7-day PHI.

Baythroid XL® (1EC) at 1.6-2.8 fl. oz. per acre. Do not exceed 16.8 fl. oz. per acre per season. 0-day PHI. *RUP.*

Belay® (2.13SC) at 2-3 fl. oz. per acre. See pollinator precautions. 14-day PHI.

Blackhawk® at 1.7-3.3 oz. per acre. 7-day PHI.

RR **Coragen**® (1.67SC) at 3.5-7.5 fl. oz. per acre. Do not exceed 15.4 fl. oz. per acre per season. 14-day PHI.

Endigo ZC® at 3.5-4.5 fl. oz. per acre. 14-day PHI. *RUP.*

Entrust® (2SC) at 3-10 fl. oz. per acre. Do not exceed 21 fl. oz. per acre per season. Observe resistance management restrictions. 7-day PHI.

Kryocide® (96D) at 10-12 lbs. per acre. Apply by air in 5-15 gals. of water per acre, or by ground in 25-100 gals. of water per acre at a minimum of 7-day intervals. Do not exceed 96 lbs. per acre per season. 0-day PHI.

Mustang Maxx® (0.8EC) at 3.2-4 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP.*

BP **Novodor**® at 1-3 qts. per acre. *Small Colorado potato beetle larvae only. Bacillus thuringiensis*-based insecticide. 0-day PHI.

Pounce 25WP® at 6.4-12.8 oz. per acre. Do not exceed 6.4 lbs. per acre per season. 14-day PHI. *RUP.*

Prokil Cryolite 50D® at 19-23 lbs. per acre. Do not exceed 184 lbs. per acre per season. 0-day PHI.

RR **Radiant SC**® (1SC) at 4.5-8 fl. oz. per acre. Do not exceed 32 fl. oz. per acre per season. 7-day PHI.

Rimon 0.83EC® at 6-12 fl. oz. per acre. Do not exceed 24 fl. oz. per acre. 14-day PHI.

Scorpion 35SL® at 2-2.75 fl. oz. per acre.

RR This is a reduced-risk pesticide. See page 37 for details.

BP This is a biopesticide. See page 37 for details.

 May be acceptable for use in certified organic production. Check with your certifier before use.

Sivanto® at 10.5-14 fl. oz. per acre.

Torac® (1.29EC) at 14-21 fl. oz. per acre. Do not exceed 2 applications per season. 7-day PHI.

Voliam Flexi® at 4 oz. per acre. 14-day PHI.

Warrior II® (2.08EC) at 1.28-1.92 fl. oz. per acre. Do not exceed 2 applications per season. 14-day PHI. *RUP.*

Cutworms

Recommended Products

Ambush® (2EC) at 3.2-12.8 oz. per acre. Do not exceed 102.4 fl. oz. per acre per season. 14-day PHI. *RUP.*

Asana XL® (0.66 EC) at 5.8-9.6 fl. oz. per acre. Do not exceed 67.2 fl. oz. per acre per season. 7-day PHI. *RUP.*

Bacillus thuringiensis products (Biobit HP®, DiPel DF®, XenTari®, etc.) at 0.5-1 lb. per acre. 0-day PHI.

Baythroid XL® (1EC) at 0.8-1.6 fl. oz. per acre. Do not exceed 16.8 fl. oz. per acre per season. 0-day PHI. *RUP.*

Endigo ZC® at 3.5-4.5 fl. oz. per acre. 14-day PHI. *RUP.*

Lannate VL® (2.4WSL) at 1.5 pts. per acre. Do not exceed 15 pts. per acre per season. 6-day PHI. *RUP.*

Mustang Maxx® (0.8EC) at 1.28-4 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP.*

Pounce 25WP® at 6.4-12.8 fl. oz. per acre. 14-day PHI. *RUP.*

Sevin XLR PLUS® (4F) at 1-2 qts. per acre. Do not exceed 6 qts. per acre per crop. 7-day PHI.

Warrior II® (2.08EC) at 0.96-1.6 fl. oz. per acre. Do not exceed 7.68 fl. oz. per acre per season. 7-day PHI. *RUP.*

European Corn Borers

European Corn Borer Threshold

1 egg mass per 25 leaves

Recommended Products

Ambush® (2EC) at 3.2-12.8 oz. per acre. Do not exceed 102.4 fl. oz. per acre per season. 14-day PHI. *RUP.*

Asana XL® (0.66 EC) at 5.8-9.6 fl. oz. per acre. Do not exceed 67.2 fl. oz. per acre per season. 7-day PHI. *RUP.*

RR **Assail**® at 2.5-4 oz. per acre. Do not exceed 4 applications per year. 7-day PHI.

Athena® at 7-17 fl. oz. per acre. 21-day PHI. *RUP.*

RR **Avaunt 30WDG**® at 3.5-6.0 oz. per acre. Do not exceed 24 oz. per acre per season. 7-day PHI.

Baythroid XL® (1EC) at 1.6-2.8 fl. oz. per acre. Do not exceed 6 applications or 16.8 fl. oz. per acre per season. 0-day PHI. *RUP.*

Blackhawk® at 1.7-3.3 oz. per acre. 7-day PHI.

RR **Coragen**® (1.67SC) at 3.5-7.5 fl. oz. per acre. Do not exceed 15.4 fl. oz. per acre per season. 14-day PHI.

Endigo ZC® at 4-4.5 fl. oz. per acre. 14-day PHI. *RUP.*

EM **Entrust**® (2SC) at 3-10 fl. oz. per acre. Do not exceed 21 fl. oz. per acre per season. Observe resistance management restrictions. 7-day PHI.

Mustang Maxx® (0.8EC) at 1.76-4 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP.*

Pounce 25WP® at 6.4-12.8 per acre. Do not exceed 6.4 lbs. per acre per season. 14-day PHI. *RUP.*

Pyrenone® at 1-12 fl. oz. per acre. 0-day PHI.

RR **Radiant SC**® (1SC) at 6-8 fl. oz. per acre. Do not exceed 32 fl. oz. per acre per season. 7-day PHI.

Rimon 0.83EC® at 6-12 fl. oz. per acre. Do not exceed 24 fl. oz. per acre. 14-day PHI.

Sevin XLR PLUS® (4F) at 1-2 qts. per acre. Do not exceed 6 qts. per acre per crop. 7-day PHI.

Voliam Flexi® at 4 oz. per acre. 14-day PHI.

Warrior II® (2.08EC) at 1.28-1.92 fl. oz. per acre. Do not exceed 7.68 fl. oz. per acre per season. 7-day PHI. *RUP.*

Flea Beetles

Flea Beetle Threshold

2 per sweep

Recommended Products

RR **Actara**®, **Admire Pro**®, **Asana**®, **Ambush**®, **Asana**®, **Assail**®, **Athena**®, **Baythroid XL**®, **Belay**®, **Kryocide**®, **Mustang Max**®, **Platinum**®, **Pounce**®, or **Vydate**® can be applied as described for Colorado potato beetles. *Reduced-risk pesticide. Be sure to check PHI on product labels.

Cruiser 5FS® or **Cruiser Maxx**®. Rates vary according to seeding rate and row spacing. See labels. For best results, plant potatoes immediately after treatment.

Endigo ZC® at 3.5-4.5 fl. oz. per acre. 14-day PHI. *RUP.*

Lannate LV® (2.4WSL) at 1.5 pts. per acre. Do not exceed 15 pts. per acre per season. 6-day PHI. *RUP.*

RR This is a reduced-risk pesticide. See page 37 for details.

EM May be acceptable for use in certified organic production. Check with your certifier before use.

Pyrenone® at 1-12 fl. oz. per acre. 0-day PHI.

Scorpion 35SL® at the following rates:

Soil application: 11.5-13.25 fl. oz. per acre.

Foliar application: 2-2.75 fl. oz. per acre.

Sevin XLR PLUS® (4F) at 0.5-1 qts. per acre. Do not exceed 6 qts. per acre per crop. 7-day PHI.

Thimet 20G® at the following rates:

Light or sandy soils: 8.5-11.3 oz. per 1,000 linear ft. of row for any spacing (minimum 32-inch spacing).

Heavy or clay soils: 13.0-17.3 oz. per 1,000 linear ft. of row.

Apply as a band application on each side of row and beneath the soil surface or in the seed furrow. 90-day PHI. RUP.

Voliam Flexi® at 4 oz. per acre. 14-day PHI.

Warrior II® (2.08EC) at 1.28-1.92 fl. oz. per acre. Do not exceed 7.68 fl. oz. per acre per season. 7-day PHI. RUP.

Potato Leafhoppers

Recommended Products

Soil-applied or seed piece treatment materials:

Admire Pro® (4.6F) at 0.17-0.35 fl. oz. per 100 lbs of seed, or 5.7-8.7 fl. oz. per acre. Apply directly to seed piece or below seed piece at planting. Can expect 40-50 days of control. Do not exceed 8.7 fl. oz. per acre per season. See pollinator precautions.

Belay® at 0.4-0.6 fl. oz. per 100 lbs. of seed, or 9-12 fl. oz. per acre at planting. See label for application methods. 14-day PHI.

Cruiser 5FS® or **Cruiser Maxx**®. Rates vary according to seeding rate and row spacing. See labels. For best results, plant potatoes immediately after treatment. RUP.

RR **Platinum 2SC*** at 5-8 fl. oz. per acre, or **Platinum Ridomil Gold**® at 2.2 fl. oz. per 1,000 linear ft. of row. **Reduced-risk pesticide*. Apply directly to seed piece in sufficient water to cover entire seed piece. Do not exceed 8 fl. oz. of Platinum 2SC®, or 38 fl. oz. of Platinum Ridomil Gold® per acre per season. Can expect 90-100 days control. See pollinator precautions.

Sivanto® at 7-10.5 fl. oz. per acre.

Scorpion 35SL® at 11.5-13.25 fl. oz. per acre as a soil application.

Thimet 20G® at the following rates:

Light or sandy soils: 8.5-11.3 oz. per 1,000 linear ft. of row for any spacing (minimum 32-inch spacing).

Heavy or clay soils: 13.0-17.3 oz. per 1,000 linear ft. of row.

Apply as a band application on each side of row and beneath the soil surface or in the seed furrow. 90-day PHI. RUP.

Foliar-applied materials:

RR **Actara**® (25WDG) at 1.5-3 oz. per acre. Do not exceed 6 oz. per acre per season. Control may require 2 applications at a 7-10 day interval. See pollinator precautions. 14-day PHI.

Admire Pro® (4.6F) at 1.3 fl. oz. per acre. Do not exceed 5.6 fl. oz. per acre per season. See pollinator precautions. 7-day PHI.

Ambush® (2EC) at 3.2-12.8 oz. per acre. Do not exceed 102.4 fl. oz. per acre per season. 14-day PHI. RUP.

Asana XL® (0.66 EC) at 2.9-9.6 fl. oz. per acre. Do not exceed 67.2 fl. oz. per acre per season. 7-day PHI. RUP.

RR **Assail 30SG**® at 1.5-4 oz. per acre. Do not exceed 4 applications per year. 7-day PHI.

Athena® at 7-17 fl. oz. per acre. 21-day PHI. RUP.

Baythroid XL® (1EC) at 0.8-1.6 fl. oz. per acre. Do not exceed 16.8 fl. oz. per acre per season. 0-day PHI. RUP.

Belay® (2.13SC) at 2-3 fl. oz. per acre. See pollinator precautions. 14-day PHI.

Dimethoate 400® or **Dimethoate 4E**® at 0.5-1 pt. per acre, or **Dimethoate 2.67EC**® at 0.75-1.5 pts per acre.. 0-day PHI for Dimethoate 400® or Dimethoate 2.67EC®. 2-day PHI for Dimethoate 4E®.

Endigo ZC® at 3.5-4.5 fl. oz. per acre. 14-day PHI. RUP.

Lannate LV® (2.4WSL) at 1.5-3 pts. per acre. Do not exceed 15 pts. per acre per season. 6-day PHI. RUP.

RR This is a reduced-risk pesticide. See page 37 for details.

Malathion[®] products at the following rates:

5: 1 pt. per acre.

5EC: 2 pts. per acre.

57EC: 1-1.5 pts. per acre.

0-day PHI.

Mustang Maxx[®] (0.8EC) at 1.76-4 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP.*

Pounce 25WP[®] at 6.4-12.8 oz. per acre. Do not exceed 6.4 lbs. per acre per season. 14-day PHI. *RUP.*

Pyrenone[®] at 1-12 fl. oz. per acre. 0-day PHI.

Scorpion 35SL[®] at 2-2.75 fl. oz. per acre as a foliar application. 7-day PHI.

Sevin XLR PLUS[®] (4F) at 0.5-1 qt. per acre. Do not exceed 6 qts. per acre per crop. 7-day PHI.

Sivanto[®] (200SL) at 7-10.5 fl. oz. per acre, or **Sivanto Prime**[®] at 7.0-14.0 fl. oz. per acre. 7-day PHI.

Torac[®] (1.29EC) at 14-21 fl. oz. per acre. Do not exceed 2 applications per season. 14-day PHI.

Transform WG[®] at 1.5-2.25 oz. per acre. Do not apply more 8.5 oz. per acre per year. See label for other restrictions. 7-day PHI.

Voliam Flexi[®] at 4 oz. per acre. 14-day PHI.

Vydate C-LV[®] at 17-34 fl. oz. per acre (do not exceed 198 fl. oz. per acre per season), or **Vydate L**[®] (2WSL) at 2-4 pts. per acre (do not exceed 24 pts. per acre per season). 7-day PHI. *RUP.*

Warrior II[®] (2.08EC) at 0.96-1.6 fl. oz. per acre. Do not exceed 7.68 fl. oz. per acre per season. 7-day PHI. *RUP.*

Wireworms

Site selection: wireworms are most likely to be a problem in fields recently planted to sod or pasture, or in fields that have had a grassy weed problem.

Sampling: check for the presence of wireworms by burying a potato 6 inches deep in 5 locations per field prior to planting. Mark the spots with flags. Dig up the potatoes and inspect for wireworms 7 days later.

Recommended Products

Admire Pro[®] (4.6F) at 0.17-0.35 fl. oz. per 100 lbs of seed, or 5.7-8.7 fl. oz. per acre. Apply directly to seed piece or below seed piece at planting.

Brigade[®] (2EC) at 9.6-19.2 fl. oz. per acre at planting. 21-day PHI. *RUP.*

Capture LFR[®] at 12.75-25.5 fl. oz. per acre at planting. *RUP.*

Cruiser 5FS[®] at 0.11-0.16 fl. oz. per 100 lbs of seed pieces. Rates vary according to seeding rate and row spacing. See labels.

Diazinon[®]. *Ohio only.* Ohio has 24c special local needs for this product on potato for wireworm suppression.

Platinum[®] (2SC) at 5-8 fl. oz. per acre. Apply to seed pieces. See pollinator precautions.

Regent 4SC[®] at 0.184-0.220 fl. oz. per 1000 row feet, applied in-furrow at-planting.

Thimet 20G[®] before or at time of planting at the following rates:

Light or sandy soils: 8.5-11.3 oz. per 1,000 linear ft. of row for any spacing (minimum 32-inch spacing).

Heavy or clay soils: 13.0-17.3 oz. per 1,000 linear ft. of row.

No effective treatment after planting. Treatment at planting may only provide 65% control. Apply as a band application on each side of row and beneath the soil surface, or in the seed furrow. 90-day PHI. *RUP.*