Potato - Horticulture

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Crop Description

Potatoes (*Solanum tuberosum*) are a staple food grown from small tubers of a mother plant that is grown by specialized seed-potato producers. The Midwest produces potatoes primarily for table stock and processing into potato chips. Varieties used for chipping are usually brown skinned, white-fleshed, and globe-shaped to facilitate slicing from any direction. Table stock potatoes include 'starchy' (high dry matter) baking varieties and 'waxy' (low dry matter) boiling varieties in numerous skin and flesh color combinations with widely variable sizes and shapes. Starchy varieties include the Russets. Waxy varieties include Norland Reds. Some varieties are intermediate between those two types, for example Yukon Gold.

Scab is an important disease that affects the marketability of table stock potatoes. One way to manage scab is to maintain a soil pH of 5.0 to 5.2. However, low soil pH reduces phosphorus availability, and most rotational crops will not perform well at the low pH. In fields with a history of scab, using scab-resistant varieties is the best option to avoid having to adjust pH to the detriment of rotational crops.

Planting and Spacing

Tuber production: 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 1-1/2 to 2 ounces. Using B-size certified seed will save cutting labor and reduce tuber-borne diseases.

Seed stock production: Select seed stock from high-yielding hills that are smooth, well-shaped, and free of diseases and insect injury. When possible, obtain certified G1 or G2 (generation) seed stock. Store seed stock in new crates to avoid disease contamination. Seed potatoes should be at least 1-1/2 to 2 ounces in weight. If cutting larger seed potatoes, warm to 45 F before cutting, then sort to remove blind, slab, sliver, ripped, and undersized pieces after cutting. Cure cut stock at 38 F to 40 F, with 85% to 95% humidity in piles less than 6 feet deep, with good air circulation for 6 to 10 days. To supply one acre of seed potatoes, you need roughly 14,000 to 26,000 seed pieces.

Fertilizing

pH: Maintain a soil pH of 5.5 to 6.5.

Before planting, do not fertilize with N or P, but apply 50 to 400 pounds K_2O per acre based on soil test results and recommendations from your state. The most efficient way to spread the remaining fertilizer is with a banded application at planting at least 2 inches below and 2 inches to both sides of the tuber. As a banded starter fertilizer, apply 0 to 30 pounds N per acre, 0 to 150 pounds P_2O_5 per acre, and 0 to 200 pounds K_2O per acre. The rate of K_2O should not exceed 200 pounds per acre when banded.

Manganese may be needed when the soil pH is above 6.5 on mineral soils and above 5.8 on organic soils. Use a soil test to determine the amount of manganese needed. Include the required amount of manganese in the starter fertilizer, or spray the foliage with 1 to 2 pounds of manganese per acre at least twice during active growth. On sandy soils, broadcast 30 pounds or band 15 pounds sulfur per acre.

Sidedress once at emergence and once at hilling or tuber initiation with 50-75 pounds N per acre each time. The second application can be adjusted according to rainfall and a petiole nitrate-N analysis. Use lower end of range for early-maturing varieties. Reduce the amount of fertilizer N applied by the value of N credits from green manures, legume crops grown in the previous year, compost and animal manures, and soils with more than 3% organic matter. The total amount of N from fertilizer and other credits should be 100 to 150 pounds per acre.

Harvesting

"New" potatoes can be dug by hand from the sides of hills for continual harvest for fresh market sale, but they do not keep as well as a mature tuber. New potatoes can also be once-over harvested in sections at a time, but the chain conveyors can blemish the soft skins of these immature tubers.

Storage potato market life can be lengthened by preventing sprouting of potatoes in storage; use maleic hydrazide (Royal 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 maleic hydrazide cannot be used for seed because sprouting will be inhibited. Follow label directions.

Storage potatoes benefit from uniform maturation for mechanical harvest. This can be accomplished by killing the vines with a labeled herbicide. Once vines are down and dried, mechanical harvest can begin with chain-conveyor diggers. The labeled vine-killing herbicides are listed below, along with instructions.

Vine Kill Herbicides

Defol 5 (5L) (sodium chlorate) 4.8 qts. per acre with 10-20 gals. per acre water by ground or 5-10 gals. per acre water by air. Apply 10 days before harvest. Do not apply in extreme heat during the middle of the day. REI: 12-hour. HRAC NC.

paraquat formulations (paraquat) 0.8-1.5 pts. per acre of 2.5L or 0.6-1.3 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 2.6 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*. REI: 24-hour. PHI: 3-day. HRAC 22. *RUP*.

Reglone (2L) (diquat) 1-2 pts. per acre 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. REI: 24-hour. PHI: 7-day. HRAC 22.

Rely 280 (2.34L) (glufosinate) 21 fl. oz. per acre. **Not for potatoes to be used for seed.** Do not make more than 1 application. REI: 12-hour. PHI: 9-day. HRAC 10.

Scythe (4.2L) (pelargonic acid) 5% to 10% solution in 75 to 200 gals. spray solution per acre. REI: 12-hour. PHI: 24-hour. HRAC NC.

Potato - Diseases

Aster Yellows (Purple-Top Wilt) of Multiple Crops - Phytoplasma Mollicutes

This pathogen is transmitted by leafhoppers. Infection rates can jump when adjacent crops are harvested mid-season, such as alfalfa or wheat.

Non-Pesticide

Plant only certified seed tubers. Practice clean cultivation. Rogue first infected plants, including tubers.

Pesticide

Insecticides | Use an insecticide to control leafhoppers that transmit the disease. Leafhoppers must be controlled before they feed. See Insect section.

Black Dot of Potatoes - Colletotrichum Fungus

Pesticide

azoxystrobin products (azoxystrobin) | Several formulations are labeled at various rates (Acadia LFC, AZteroid FC 3.3, Heritage, Quadris). Use 3.3 lb. a.i. per gallon formulations at 3.9-12.8 fl. oz. per acre. Use 2 lb. a.i. per gallon formulations at 6.0-15.5 fl. oz. per acre. Use 1.65 lb. a.i. per gallon formulations at 7.6-25.6 fl. oz. per acre. REI: 4-hour. PHI: 14-day. FRAC 11.

chlorothalonil products (chlorothalonil) | Several formulations are labeled at various rates (Bravo, Echo, Equus, Initiate). Use 38.5% (Zn) formulations at 1.1-2.25 pt. per acre. Use 54% (720) formulations at 0.75-1.5 pt. per acre. Use 82.5% (WDG) formulations at 0.7-1.4 lb. per acre. Use 90% (DF) formulations at 0.6-1.25 lb. per acre. *Michigan and Minnesota only* can apply up to 16 lbs. a.i. per acre per year with 24c labels. All other states do not exceed 11.25 lbs. a.i. per acre per year. REI: 12-hour. PHI: 7-day. FRAC M05.

Headline (pyraclostrobin) | 6-9 fl. oz. per acre. REI: 12-hour. PHI: 3-day. FRAC 11.

Luna Tranquility (fluopyram, pyrimethanil) | 8-11.2 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 07, FRAC 09.

Miravis Prime (pydiflumetofen, fludioxonil) | 9.2-11.4 fl. oz. per acre. Black dot suppression only. Use high rate for white mold. REI: 12-hour. PHI: 14-day. FRAC 07, FRAC 12.

Quadris Opti (azoxystrobin, chlorothalonil) | 1.6 pts. per acre. REI: 12-hour. PHI: 14-day. FRAC 11, FRAC M05.

Revus Top (mandipropamid, difenoconazole) | 5.5-7.0 fl. oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 40, FRAC 03.

Tanos (famoxadone, cymoxanil) | 6-8 oz. per acre. Black dot Disease suppression only. REI: 12-hour. PHI: 14-day. FRAC 11, FRAC 27.

Zing! (zoxamide, chlorothalonil) | 24-34 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 22, FRAC M05.

Black Leg of Potatoes - Pectobacterium or Dickeya Bacteria

Non-Pesticide

Use seed pieces certified to be free of disease. Plant in well-drained soil and avoid over-irrigation. Sanitize equipment at planting and at harvest to limit spread.

Pesticide

copper products (copper hydroxide, copper octanoate, copper oxychloride, copper sulfate, copper diammonium diacetate complex, cuprous oxide) | Several formulations of copper (e.g., Badge) products are labelled for use and may slow the spread of bacterial blight. See label for directions. REI: 4 to 48-hour. PHI: 0-day. FRAC M01. *OMRI-listed.*

Double Nickel 55 (Bacillus amyloliquefaciens strain D-747) | 0.125-1 lbs. per acre as a soil drench or 0.25-3 lbs. per acre as a foliar application, according to disease management considerations. REI: 4-hour. PHI: 0-day. FRAC 44. *OMRI-listed.*

streptomycin products (Streptomycin sulfate) | Use 17% products at 8 oz. per 100 gals of water, or 50% products at 2.7 oz. per 100 gals. of water to maintain a concentration of 100 ppm. Soak seed pieces in solution for several minutes. REI: 12-hour. FRAC 25.

Black Scurf of Potatoes - Rhizoctonia Fungus

Use a fungicide when appropriate.

Non-Pesticide

Plant seed pieces certified to be free of disease. Harvest potatoes as soon after maturity as possible. Rotation to a non-host crop 2-3 years.

Pesticide

azoxystrobin products (azoxystrobin) | Several formulations are labeled at various rates (Acadia LFC, AZteroid FC 3.3, Dynasty, Quadris). Use 3.3 lb. a.i. per gallon formulations at 0.24-0.48 fl. oz. per 1,000 row feet. Use 2 lb. a.i. per gallon formulations at 0.4-0.8 fl. oz. per 1,000 row feet. Use 1.65 lb. a.i. per gallon formulations at 0.5-1.0 fl. oz. per 1000 row feet. Use

0.83 lb. a.i. per gallon formulations (Dynasty) for seed treatment at 0.10-3.75 fl. oz. per 100 lbs. of seed. REI: 4-hour. FRAC 11.

Moncut (flutolanil) | 0.7-1.1 lbs. per acre of the DF formulation or 16-25 fl. oz. per acre of the SC formulation. REI: 12-hour. FRAC 07.

Dry Rot of Potatoes - Fusarium Fungus

Non-Pesticide

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

Pesticide

mancozeb products (mancozeb) | Seed treatment; dip whole or cut potatoes in solution. Several formulations are labeled at various rates (Dithane, Koverall, Manzate, Penncozeb). Always check the label. Use 37% formulations at 1.6-2.5 qt. per acre. Use 75% and 80% formulations at 1.25 lb. per 50 gal. REI: 24-hour. PHI: 3-day in Michigan and Ohio; 14-day in all other states. FRAC M03.

Maxim 4FS (fludioxonil) | 0.08 fl. oz. per 100 lbs. of seed. Seed treatment. Use specific application equipment according to label. REI: 12-hour. FRAC 12.

Maxim MZ (mancozeb, fludioxonil) | 0.5 lbs. per 100 lbs. of seed. Seed treatment. REI: 24-hour. FRAC M03, FRAC 12.

Mertect 340-F (thiabendazole) | 0.42 oz. per 2,000 lbs. of tubers. 0.42 fl. oz. per 2,000 lbs. of tubers. Do not treat seed potatoes after cutting. *Fungicide resistance known* REI: 12-hour. FRAC 01.

Seed treatments for diseases (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments Cruiser Maxx Vibrance Potato (thiamethoxam, difenconazole, sedaxane, fludioxonil); Cruiser Maxx Potato Extreme (thiamethoxam, difenoconazole, fludioxonil); Emesto Silver (penflufen, prothioconazole).

Stadium (azoxystrobin, difenoconazole, fludioxonil) | 1 fl. oz. per 2,000 lbs. of tubers. Postharvest application only; no more than one application to tubers. FRAC 11, FRAC 03, FRAC 12.

Early Blight of Potatoes - Alternaria Fungus

This disease initially causes lesions on lower leaves of the potato plant. After field planting, begin protective fungicide applications on a 7-14 day schedule.

Group 11 Resistance: Strains of the fungus that causes early blight that are resistant to group 11 fungicides have been observed in Indiana and Ohio. Group 11 products labeled for potato and early blight include Cabrio and Quadris. Tank-mix group 11 fungicides with products that have a different mode of action, or alternate group 11 fungicides with fungicides that have a different group number.

Non-Pesticide

Avoid fields with a history of nematodes, Fusarium or Verticillium wilts, 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. Varieties with partial resistance are available. Rotate to non-host crops for 2-3 years.

Pesticide

azoxystrobin products (azoxystrobin) | Several formulations are labeled at various rates (Acadia LFC, AZteroid FC 3.3, Heritage, Quadris). Use 3.3 lb. a.i. per gallon formulations at 3.9-12.8 fl. oz. per acre. Use 2 lb. a.i. per gallon formulations at 6.0-15.5 fl. oz. per acre. Use 1.65 lb. a.i. per gallon formulations at 7.6-25.6 fl. oz. per acre. REI: 4-hour. PHI: 14-day. FRAC 11.

chlorothalonil products (chlorothalonil) | Several formulations are labeled at various rates (Bravo, Echo, Equus, Initiate). Use 38.5% (Zn) formulations at 1.1-2.25 pt. per acre. Use 54% (720) formulations at 0.75-1.5 pt. per acre. Use 82.5% (WDG) formulations at 0.7-1.4 lb. per acre. Use 90% (DF) formulations at 0.6-1.25 lb. per acre. *Michigan and Minnesota only* can apply up to 16 lbs. a.i. per acre per year with 24c labels. All other states do not exceed 11.25 lbs. a.i. per acre per year. REI: 12-hour. PHI: 7-day. FRAC M05.

Endura (boscalid) | 3.5-4.5 oz. per acre. REI: 12-hour. PHI: 10-day. FRAC 07.

Gavel 75DF (zoxamide, mancozeb) | 1.5-2 lbs. per acre. REI: 48-hour. PHI: 3-day in Michigan and Ohio; 14-day in all other states. FRAC 22, FRAC M03.

Headline (pyraclostrobin) | 6-9 fl. oz. per acre. REI: 12-hour. PHI: 3-day. FRAC 11.

iprodione products (iprodione) | 1-2 pts. per acre. Formulations of iprodione include Nevado and Rovral. REI: 24-hour. PHI: 14-day. FRAC 02.

Luna Tranquility (fluopyram, pyrimethanil) | 8-11.2 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 07, FRAC 09.

mancozeb products (mancozeb) | Several formulations are labeled at various rates (Dithane, Koverall, Manzate, Penncozeb). Always check the label. Use 37% formulations at 0.4-1.6 qt. per acre. Use 75% and 80% at 0.5-2.0 lb. per acre. REI: 24-hour. PHI: 14-day. FRAC M03.

Miravis Prime (pydiflumetofen, fludioxonil) | 9.2-11.4 fl. oz. per acre. Black dot suppression only. Use high rate for white mold. REI: 12-hour. PHI: 14-day. FRAC 07, FRAC 12.

Quadris Opti (azoxystrobin, chlorothalonil) | 1.6 pts. per acre. REI: 12-hour. PHI: 14-day. FRAC 11, FRAC M05.

Revus Top (mandipropamid, difenoconazole) | 5.5-7.0 fl. oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 40, FRAC 03.

Scala (pyrimethanil) | 7 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 09.

Tanos (famoxadone, cymoxanil) | 6 oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 11, FRAC 27.

Velum Prime (fluopyram) | 6.5-6.84 fl .oz. per acre. Apply through overhead chemigation. Do not exceed 13.7 fl. oz. per acre per season. Allow 5 days between applications. REI: 12-hour. PHI: 7-day. FRAC 07.

Zing! (zoxamide, chlorothalonil) | 24-34 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 22, FRAC M05.

Late Blight of Potatoes/Tomatoes - Phytophthora Oomycete

This destructive pathogen causes quick plant death and can be identified by large spreading brown stem lesions, velvety white growth on plant surfaces, and large brown leathery spots on green fruits. It is favored by prolonged cool and damp conditions.

The pathogen overwinters on plant residue, including volunteer potatoes and potato cull piles. When it is reported in your region, begin weekly preventive sprays with chlorothalonil and mancozeb for as long as favorable conditions persist. Pay attention to which pathogen strain is identified. If infections start in a field, the strain US-23 is sensitive to mefenoxam (Ridomil).

Non-Pesticide

The first step to manage this disease is monitoring and destroying cull and volunteer potato emergence in the spring.

Pesticide

chlorothalonil products (chlorothalonil) | Several formulations are labeled at various rates (Bravo, Echo, Equus, Initiate). Use 38.5% (Zn) formulations at 1.1-2.25 pt. per acre. Use 54% (720) formulations at 0.75-1.5 pt. per acre. Use 82.5% (WDG) formulations at 0.7-1.4 lb. per acre. Use 90% (DF) formulations at 0.6-1.25 lb. per acre. *Michigan and Minnesota only* can apply up to 16 lbs. a.i. per acre per year with 24c labels. All other states do not exceed 11.25 lbs. a.i. per acre per year. REI: 12-hour. PHI: 7-day. FRAC M05.

Curzate 60DF (cymoxanil) | 3.2 oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 27.

Gavel 75DF (zoxamide, mancozeb) | 1.5-2 lbs. per acre. REI: 48-hour. PHI: 3-day in Michigan and Ohio; 14-day in all other states. FRAC 22, FRAC M03.

mancozeb products (mancozeb) | Several formulations are labeled at various rates (Dithane, Koverall, Manzate, Penncozeb). Always check the label. Use 37% formulations at 0.4-1.6 qt. per acre. Use 75% and 80% at 0.5-2.0 lb. per acre. REI: 24-hour. PHI: 14-day. FRAC M03.

Omega 500F (fluazinam) | 5.5 fl. oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 29.

Orondis Opti (oxathiapiprolin, chlorothalonil) | 1.75-2.5 pts. per acre. REI: 12-hour. PHI: 7-day. FRAC 49, FRAC M05.

Orondis Ultra (oxathiapiprolin, mandipropamid) | 5.5-8 fl. oz. per acre. REI: 4-hour. PHI: 14-day. FRAC 49, FRAC 40.

Previcur Flex (propamocarb) | 0.7-1.2 pts. per acre. REI: 12-hour. PHI: 14-day. FRAC 28.

Ranman 400SC (cyazofamid) | 1.4-2.75 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 21.

Revus Top (mandipropamid, difenoconazole) | 5.5-7.0 fl. oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 40, FRAC 03.

Tanos (famoxadone, cymoxanil) | 6-8 oz. per acre. Black dot Disease suppression only. REI: 12-hour. PHI: 14-day. FRAC 11, FRAC 27.

Zampro (ametoctradin, dimethomorph) | 11-14 fl. oz. per acre. REI: 12-hour. PHI: 4-day. FRAC 45, FRAC 40.

Zing! (zoxamide, chlorothalonil) | 30-34 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 22, FRAC M05.

Nematodes

Potato cyst nematodes are serious pathogens that reduce stands, yield and tuber quality. As sedentary endoparasites, the female body hardens into a cyst that protects its eggs for a decade or so in absence of a host.

Root lesion nematodes form a destructive disease complex with Verticillium, called Potato Early-Die. Both root lesion nematodes and Verticillium can be supported by multiple crops, which makes it difficult to control through rotation.

Non-Pesticide

Collect soil samples for nematodes in the fall and avoid fields with high numbers. Rotate to a non-broadleaf crop, such as grass grains or sweet corn for >3 years. Prompt destruction of the finished crop with tillage to rapidly breakdown tissue and displace nematodes is an important

method to prevent nematode build-up. Anaerobic soil disinfestation (ASD) is an effective sterilization method for greenhouse and high tunnel soils that contain nematodes.

Pesticide

K-PAM HL (metam potassium) | 30-60 gals. per acre for K-PAM HL or 30-63.9 gals. per acre for Sectagon K54. Use high rates on muck and lower rates on sands. In the fall, when soil at 6 inches are above 50 F and moist, place K-PAM HL or Sectagon K54 about 8 inches beneath the surface through shank-injectors, or broadcast sprayers directly in front of tillage tools to bury it. Seal with soil packing or irrigation. Or, in the spring, it can be applied through drip irrigation under unperforated plastic beds. Before planting, allow product to dissipate for 1 week for every 10 gals. per acre plus 1 more week. REI: 5-day. IRAC 08F, FRAC M03, HRAC NC. *RUP.*

Nimitz (fluensulfone) | 3.5-7.0 pts. per acre. May be broadcast, banded, or drip-applied in the spring up to 7 days before planting at a depth of 8 inches. Effectiveness is reduced on muck and clay soils REI: 12-hour. IRAC UN.

Telone C-17 (1,3-dichloropropene, chloropicrin) | *Muck soils*: 30 gals. per acre for C-17 formulation and 36 gals. per acre for C-35 formulation. *Mineral soils*: 18-27.5 gals. per acre for C-17 formulation and 21.4-33 gals. per acre for C-35 formulation. In the fall, when soil temperatures at 6 inches are above 50 F and soil is moist, place product about 8 inches beneath the surface through shank-injectors, or broadcast sprayers directly in front of tillage tools to bury it. Seal with soil packing, irrigation, or plastic. Or, in the spring, InLine may be applied through drip irrigation under unperforated plastic beds at 13-20.5 gals. per acre (on mineral soils only). Before planting, allow product to dissipate for 1 week for every 10 gals. per acre plus 1 more week. REI: 3-5-day. IRAC UN, FRAC NC, IRAC 08B. *RUP.*

Telone II (1,3-dichloropropene) | *Muck soils*: Use at 25 gals. per acre. *Mineral soils*: Use at 9-12 gals. per acre. In the fall, when soil at 6 inches is above 50 F and moist, place Telone II about 8 inches beneath the surface through shank-injectors, or broadcast sprayers directly in front of tillage tools to bury it. Seal with soil packing or irrigation. Or, in the spring, Telone EC may be applied through drip irrigation under unperforated plastic beds at 9-18 gals. per acre on mineral soils only. Before planting, allow product to dissipate for 1 week for every 10 gals. per acre plus 1 more week. REI: 5-day. IRAC UN, FRAC NC. *RUP.*

VAPAM HL (metam sodium) | 37.5-75 gals. per acre for VAPAM HL, or 30-75 gals. per acre of Sectagon K42. Use high rates on muck, and lower rates on sands. In the fall, when soil at 6 inches is above 50 F and moist, place VAPAM HL or Sectagon K42 about 8 inches beneath the surface through shank-injectors, or broadcast sprayers directly in front of tillage tools to bury it. Seal with soil packing or irrigation. Or, in the spring, it can be applied through drip irrigation under unperforated plastic beds. Before planting, allow product to dissipate for 1 week for every 10 gals. per acre plus 1 more week. REI: 5-day. IRAC 08F, FRAC M03, HRAC NC. *RUP.*

Velum Prime (fluopyram) | 6.5-6.84 fl .oz. per acre. Apply through overhead chemigation. Do not exceed 13.7 fl. oz. per acre per season. Allow 5 days between applications. REI: 12-hour. PHI: 7-day. FRAC 07.

Vydate C-LV (oxamyl) | 34-68 fl. oz. per acre. Apply as a banded or shank-injected at-plant in-furrow soil treatment incorporated 2-4 inches deep with at least 20 gals. water per acre, or overhead chemigate to deliver rate in 0.5 inch of irrigation water. Do not exceed 8 applications or 306 fl. oz. per acre per season. *In Kansas*, allow 14 days between applications and do not exceed 4 applications or 204 fl. oz. per acre per season. REI: 48-hour. PHI: 7-day. IRAC 01A. *RUP.*

Ring Rot of Potatoes - Clavibacter Bacteria

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 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.

Non-Pesticide

Use certified disease-free seed. When cutting seed stock, the cutter should be periodically cleaned and disinfected, especially when changing seed lots. The first step is to clean all contaminated surfaces with hot soapy water under pressure or steam to remove all soil and debris. Then apply a disinfectant sanitizer. 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.

Scab of Potatoes - Streptomyces Bacteria

Scab is more common on potatoes grown in soils with pH over 5.2.

Non-Pesticide

Avoid fields with a history of nematodes, Fusarium or Verticillium wilts, droughty, wet, or compacted soils, and other conditions (such as insufficient nitrogen) that might add undue stress to the crop and increase susceptibility scab. Acidify soil to a pH between 5.0 and 5.2 with elemental sulfur in the fall prior to planting.

Silver Scurf of Potatoes - Helminthosporium Fungus

Use a fungicide when appropriate.

Non-Pesticide

Plant seed pieces certified to be free of disease. Harvest potatoes as soon after maturity as possible. Rotation to a non-host crop 2-3 years.

Pesticide

azoxystrobin products (azoxystrobin) | Several formulations are labeled at various rates (Acadia LFC, AZteroid FC 3.3, Dynasty, Quadris). Use 3.3 lb. a.i. per gallon formulations at 0.24-0.48 fl. oz. per 1,000 row feet. Use 2 lb. a.i. per gallon formulations at 0.4-0.8 fl. oz. per 1,000 row feet. Use 1.65 lb. a.i. per gallon formulations at 0.5-1.0 fl. oz. per 1000 row feet. Use 0.83 lb. a.i. per gallon formulations (Dynasty) for seed treatment at 0.10-3.75 fl. oz. per 100 lbs. of seed. REI: 4-hour. FRAC 11.

White Mold (Timber Rot, Drop, Stem Rot) of Multiple Crops - Sclerotinia Fungus

This soil pathogen is long-lived in the soil, and has a wide host range on broadleaved crops and weeds, including beans, vine crops, lettuce, tomatoes, peppers, and cole crops. It goes by other names in other crops, such as Drop, White Mold, Stem Rot, and Timber Rot.

It is more commonly where humidity and temperatures are high. The fungus often infects flowers, which then drop off and infect the stems that they land on. But, the pathogen can also infect stem tissue around the root crown. The stems take on a woody appearance and can split open, revealing small black pellets that are the overwintering body of the pathogen.

Non-Pesticide

Avoid fields with a history of the problem. Rotate to a non-broadleaf crop, such as grass grains or sweet corn for >6 years. Avoid excess nitrogen. Reduce overhead irrigation if disease is present. Prompt destruction of the finished crop with tillage to rapidly breakdown tissue is an important method to prevent disease build-up.

Pesticide

Contans WG (Coniothyrium minitans strain CON/M/91-08) | 1-6 lbs. per acre. Apply immediately after harvest or 3-4 months before planting. REI: 4-hour. FRAC NC. *OMRI-listed.*

Endura (boscalid) | 5.5-10 oz. per acre. REI: 12-hour. PHI: 10-day. FRAC 07.

iprodione products (iprodione) | 2 pts. per acre. Formulations of iprodione include Nevado and Rovral. REI: 24-hour. PHI: 14-day. FRAC 02.

Luna Tranquility (fluopyram, pyrimethanil) | 11.2 fl. oz. per acre. REI: 12-hour. PHI: 7-day. FRAC 07, FRAC 09.

Miravis Prime (pydiflumetofen, fludioxonil) | 9.2-11.4 fl. oz. per acre. Black dot suppression only. Use high rate for white mold. REI: 12-hour. PHI: 14-day. FRAC 07, FRAC 12.

Omega 500F (fluazinam) | 5.5-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. FRAC 29.

Topsin M WSB (thiophanate-methyl) | 20-30 fl. oz. per acre. 20-30 fl. oz. per acre for Topsin 4.5FL, 21.8-32.7 fl. oz. per acre for Cercobin, or 1-1.5 lbs. per acre for Topsin M WSB. REI: 24-hour to 3-day. PHI: 21-day PHI. FRAC 01.

Velum Prime (fluopyram) | 6.5-6.84 fl .oz. per acre. Apply through overhead chemigation. Do not exceed 13.7 fl. oz. per acre per season. Allow 5 days between applications. REI: 12-hour. PHI: 7-day. FRAC 07.

Wilt of Multiple Crops - Verticillium Fungus

This pathogen can interact with root lesion nematodes to create a destructive condition known as Potato Early-Die.

Non-Pesticide

Choose potato varieties that have partial resistance to Verticillium wilt. Good weed control also is important in reducing pathogen populations. Employ at least a 2-year rotation with small grains to manage fungus populations in the soil.

Potato - Insects

Aphids

Pesticide

Actara (thiamethoxam) | 3.0 oz. per acre. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Admire Pro (imidacloprid) | *Seed treatment*: 0.17-0.35 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 5.7-8.7 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 1.3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day for foliar applications. IRAC 04A.

Asana XL (esfenvalerate) | 5.8-9.6 fl. oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 03A. *RUP.*

Assail 30SG (acetamiprid) | Use 30SG formulations at 2.5-4.0 oz. per acre. Use 70WP formulations at 1.0-1.7 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 04A.

Athena (bifenthrin, abamectin) | 7-17 fl. oz. per acre. REI: 12-hour. PHI: 21-day. IRAC 03A, IRAC 06. *RUP.*

Belay (clothianidin) | *Seed treatment*: 0.4-0.6 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 9-12 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 2-3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Beleaf (flonicamid) | 2.0-2.8 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 29.

Brigadier (bifenthrin, imidacloprid) | Apply 16.0-25.6 fl. oz. per acre at plant as an in-furrow spray on to the seed pieces or seed potatoes. Apply 3.8-6.14 fl. oz. per acre as a foliar application. REI: 12-hour. PHI: 21-days. IRAC 03A, IRAC 04A. *RUP.*

Dimethoate 4EC (dimethoate) | Use 2.67EC formulations at 0.75-1.5 pt. per acre. Use 4EC, LV-4, and 400 formulations at 0.5-1 pt. per acre. REI: 48-hour. PHI: 0-day. IRAC 01B.

Fulfill (pymetrozine) | 2.75-5.5 oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 09B.

Lannate LV (methomyl) | 1.5-3.0 pts. per acre. REI: 48-hour. PHI: 6-day. IRAC 01A. *RUP.*

M-Pede (potassium salts of fatty acids) | 1-2% by volume. Must contact aphids to be effective. Combine with another labeled product for best results. REI: 12-hour. PHI: 0-day. IRAC UN, FRAC NC. *OMRI-listed.*

Movento (spirotetramat) | 4-5 fl. oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 23.

Mustang Maxx (zeta-cypermethrin) | 3.2-4.0 fl. oz. per acre. REI: 12-hour. PHI: 1-day. IRAC 03A. *RUP.*

Perm-Up 25DF (permethrin) | Use 25W, 25WP or 25DF formulations at 6.4-12.8 oz. per acre. Use 3.2EC formulations at 4-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 03A. *RUP.*

Platinum 2SC (thiamethoxam) | Use 2SC formulations at 5-8 fl. oz. per acre or 75SG formulations at 1.66-2.67 oz. per acre as a preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. IRAC 04A.

Seed treatments for insects (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments with an insecticide ingredient, such as thiamethoxam (Cruiser 5FS, Cruiser Maxx Vibrance Potato; Cruiser Maxx Potato Extreme).

Sivanto 200 (flupyradifurone) | 7.0-10.5 fl. oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 04D.

Thimet 20G (phorate) | *Light or sandy soils*: 8.5-11.3 oz. per 1,000 ft. of row for any row spacing larger than 32-inches at planting or postemergence. *Heavy or clay soils*: 13.0-17.3 oz. per 1,000 ft. of row at planting but do not use post emergence. Apply as a band application on each side of row and beneath soil surfaces, or in the seed furrow. REI: 48-hour. PHI: 90-day. IRAC 01B. *RUP.*

Torac (tolfenpyrad) | 17-21 fl. oz. per acre. See pollination precautions. REI: 12-hour. PHI: 14-day. IRAC 21A, FRAC 39.

Transform WG (sulfoxaflor) | 0.75-1.5 oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 04C.

Voliam Flexi (thiamethoxam, chlorantraniliprole) | 4 oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 04A, IRAC 28.

Vydate C-LV (oxamyl) | 17-34 fl. oz. per acre. REI: 48-hour. PHI: 7-day. IRAC 01A. *RUP.*

Warrior II (lambda-cyhalothrin) | 1.28-1.92 fl. oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 03A. *RUP.*

Caterpillars

Pesticide

Asana XL (esfenvalerate) | 5.8-9.6 fl. oz. per acre. For corn borers, and cutworms. REI: 12-hour. PHI: 7-day. IRAC 03A. *RUP.*

Assail 30SG (acetamiprid) | For corn borers as an ovicide. Use 30SG formulations at 2.5-4.0 oz. per acre. Use 70WP formulations at 1.1-1.7 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 04A.

Athena (bifenthrin, abamectin) | 7-17 fl. oz. per acre. For corn borers, and cutworms. REI: 12-hour. PHI: 21-day. IRAC 03A, IRAC 06. *RUP.*

Avaunt (indoxacarb) | 3.5-6.0 oz. per acre. For corn borers. REI: 12-hour. PHI: 7-day. IRAC 22.

Baythroid XL (beta-cyfluthrin) | 0.8-2.8 fl. oz. per acre. For corn borers, and cutworms. REI: 12-hour. PHI: 0-day. IRAC 03A. *RUP.*

Blackhawk (spinosad) | 2.25-3.5 oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 05.

Coragen (chlorantraniliprole) | 3.5-7.5 fl. oz. per acre. For corn borers. REI: 4-hour. PHI: 14-day. IRAC 28.

Diazinon AG500 (diazinon) | 3-4 qts. per acre. For cutworms in *Ohio 24c label only.* Use as a pre-plant incorporation and do not exceed 1 application per season. REI: 2 to 4-day. IRAC 01B. *RUP.*

Endigo ZCX (thiamethoxam, lambda-cyhalothrin) | 3.0-3.5 fl. oz. per acre. For corn borers, and cutworms. REI: 24-hour. PHI: 14-day. IRAC 04A, IRAC 03A. *RUP.*

Entrust SC (spinosad) | For corn borers. Use 2SC formulations at 3.0-10.0 fl. oz. per acre. Use 80WP formulations at 1.0-3.0 oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 05. *OMRI-listed.*

Lannate LV (methomyl) | 1.5 pts. per acre. For cutworms. REI: 48-hour. PHI: 6-day. IRAC 01A. *RUP.*

Mustang Maxx (zeta-cypermethrin) | 1.28-4.0 fl. oz per acre. For corn borers, and cutworms. REI: 12-hour. PHI: 1-day. IRAC 03A. *RUP.*

Perm-Up 25DF (permethrin) | For corn borers, and cutworms. Use 25W, 25WP or 25DF formulations at 6.4-12.8 oz. per acre. Use 3.2EC formulations at 4-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 03A. *RUP.*

Radiant 1SC (spinetoram) | 6-8 fl. oz. per acre. For corn borers. REI: 4-hour. PHI: 7-day. IRAC 05.

Rimon 0.83EC (novaluron) | 6-12 fl. oz. per acre. For corn borers. REI: 12-hour. PHI: 14-day. IRAC 15.

Sevin XLR Plus (carbaryl) | 1-2 qts. per acre. For corn borers, and cutworms. REI: 12-hour. PHI: 7-day. IRAC 01A.

Tombstone (cyfluthrin) | 0.8-2.8 fl. oz. per acre. For cutworms and loopers. REI: 12-hour. PHI: 12-hour. IRAC 03A. *RUP.*

Voliam Flexi (thiamethoxam, chlorantraniliprole) | 4 oz. per acre. For corn borers. REI: 12-hour. PHI: 14-day. IRAC 04A, IRAC 28.

Warrior II (lambda-cyhalothrin) | 0.96-1.92 For corn borers, and cutworms. REI: 24-hour. PHI: 7-day. IRAC 03A. *RUP.*

Colorado Potato Beetle

Pesticide

Actara (thiamethoxam) | 3.0 oz. per acre. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Admire Pro (imidacloprid) | *Seed treatment*: 0.17-0.35 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 5.7-8.7 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 1.3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day for foliar applications. IRAC 04A.

Agri-Mek SC (abamectin) | Use 0.7SC formulations at 1.75-3.5 fl. oz. per acre. Use 0.15SC formulations at 8-16 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 06. *RUP.*

Asana XL (esfenvalerate) | 5.8-9.6 fl. oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 03A. *RUP.*

Assail 30SG (acetamiprid) | Use 30SG formulations at 1.5-4.0 oz. per acre. Use 70WP formulations at 0.6-1.7 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 04A.

Athena (bifenthrin, abamectin) | 7-17 fl. oz. per acre. REI: 12-hour. PHI: 21-day. IRAC 03A, IRAC 06. *RUP.*

Avaunt (indoxacarb) | 3.5-6.0 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 22.

Baythroid XL (beta-cyfluthrin) | 1.6-2.8 fl. oz. per acre. REI: 12-hour. PHI: 0-day. IRAC 03A. *RUP.*

Belay (clothianidin) | *Seed treatment*: 0.4-0.6 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 9-12 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 2-3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Blackhawk (spinosad) | 2.25-3.5 oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 05.

Brigadier (bifenthrin, imidacloprid) | Apply 16.0-25.6 fl. oz. per acre at plant as an in-furrow spray on to the seed pieces or seed potatoes. Apply 3.8-6.14 fl. oz. per acre as a foliar application. REI: 12-hour. PHI: 21-days. IRAC 03A, IRAC 04A. *RUP.*

Coragen (chlorantraniliprole) | 3.5-7.5 fl. oz. per acre. REI: 4-hour. PHI: 14-day. IRAC 28.

Endigo ZCX (thiamethoxam, lambda-cyhalothrin) | 3.0-3.5 fl. oz. per acre. REI: 24-hour. PHI: 14-day. IRAC 04A, IRAC 03A. *RUP.*

Entrust SC (spinosad) | Use 2SC formulations at 3.0-10.0 fl. oz. per acre. Use 80WP formulations at 1.0-2.0 oz. per acre. Tolerance/resistance has been observed in Minnesota. Observe resistance management restrictions. REI: 4-hour. PHI: 7-day. IRAC 05. *OMRI-listed.*

Exirel (cyantraniliprole) | 5.0-13.5 fl. oz. per acre. Do not apply more than twice per generation. REI: 12-hour. PHI: 7-day. IRAC 28.

Mustang Maxx (zeta-cypermethrin) | 3.2-4.0 fl. oz. per acre. REI: 12-hour. PHI: 1-day. IRAC 03A. *RUP.*

Neemix (azadirachtin) | 4-16 fl. oz. per acre. Use on larvae. REI: 4-hour. PHI: 0-day. IRAC UN. *OMRI-listed.*

Novodor FC (Bacillus thuringiensis tenebrionis strain NB-176) | 1-3 qts. per acre. Effective on small (up to 1/4 inch) larvae only. Use higher rate for mixed sizes or heavier infestations. REI: 4-hour. PHI: 0-day. IRAC 11A.

Perm-Up 25DF (permethrin) | Use 25W, 25WP or 25DF formulations at 6.4-12.8 oz. per acre. Use 3.2EC formulations at 4-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 03A. *RUP.*

Platinum 2SC (thiamethoxam) | Use 2SC formulations at 5-8 fl. oz. per acre or 75SG formulations at 1.66-2.67 oz. per acre as a preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. IRAC 04A.

Radiant 1SC (spinetoram) | 4.5-8 fl. oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 05.

Rimon 0.83EC (novaluron) | 6-12 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 15.

Scorpion 35SL (dinotefuran) | *Soil application*: Use Scorpion 35SL at 11.5-13.25 fl. oz. per acre, or Venom 70SG at 6.5-7.5 fl. oz. per acre applied in-furrow at planting, or side-dressed to both sides of the row at ground crack. *Foliar application*: Use Scorpion 35SL at 2.0-2.75 fl. oz. per acre, or Venom 70SG at 1.0-1.5 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day. IRAC 04A.

Seed treatments for insects (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments with an insecticide ingredient, such as thiamethoxam (Cruiser 5FS, Cruiser Maxx Vibrance Potato; Cruiser Maxx Potato Extreme).

Sevin XLR Plus (carbaryl) | 1.0-2.0 qts. per acre. Some Colorado Potato Beetle populations are resistant to carbaryl, so results may vary. REI: 12-hour. PHI: 7-day. IRAC 01A.

Sivanto 200 (flupyradifurone) | 10.5-14.0 fl. oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 04D.

Thimet 20G (phorate) | *Light or sandy soils*: 8.5-11.3 oz. per 1,000 ft. of row for any row spacing larger than 32-inches at planting or postemergence. *Heavy or clay soils*: 13.0-17.3 oz. per 1,000 ft. of row at planting but do not use post emergence. Apply as a band application on each side of row and beneath soil surfaces, or in the seed furrow. REI: 48-hour. PHI: 90-day. IRAC 01B. *RUP.*

Tombstone (cyfluthrin) | 1.6-2.8 fl. oz. per acre. REI: 12-hour. PHI: 12-hour. IRAC 03A. *RUP.*

Torac (tolfenpyrad) | 14-21 fl. oz. per acre. See pollination precautions. REI: 12-hour. PHI: 14-day. IRAC 21A, FRAC 39.

Trident (Bacillus thuringiensis tenebrionis strain SA-10) | 3-6 qts. per acre.p Effective on small (up to 1/4 inch) larvae only. Use higher rate for mixed sizes or heavier infestations. REI: 4-hour. PHI: 0-day. IRAC 11A. *OMRI-listed.*

Trigard (cyromazine) | 2.66-5.32 oz. per acre. REI: 12-hour. PHI: 17-day. IRAC 17.

Voliam Flexi (thiamethoxam, chlorantraniliprole) | 4 oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 04A, IRAC 28.

Warrior II (lambda-cyhalothrin) | 1.28-1.92 fl. oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 03A. *RUP.*

Flea Beetles

Pesticide

Actara (thiamethoxam) | 3.0 oz. per acre. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Admire Pro (imidacloprid) | *Seed treatment*: 0.17-0.35 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 5.7-8.7 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 1.3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day for foliar applications. IRAC 04A.

Asana XL (esfenvalerate) | 5.8-9.6 fl. oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 03A. *RUP.*

Assail 30SG (acetamiprid) | Use 30SG formulations at 1.5-2.5 oz. per acre. Use 70WP formulations at 0.6-1.1 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 04A.

Athena (bifenthrin, abamectin) | 7-17 fl. oz. per acre. REI: 12-hour. PHI: 21-day. IRAC 03A, IRAC 06. *RUP.*

Baythroid XL (beta-cyfluthrin) | 1.6-2.8 fl. oz. per acre. REI: 12-hour. PHI: 0-day. IRAC 03A. *RUP.*

Belay (clothianidin) | *Seed treatment*: 0.4-0.6 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 9-12 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 2-3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Brigadier (bifenthrin, imidacloprid) | Apply 16.0-25.6 fl. oz. per acre at plant as an in-furrow spray on to the seed pieces or seed potatoes. Apply 3.8-6.14 fl. oz. per acre as a foliar application. REI: 12-hour. PHI: 21-days. IRAC 03A, IRAC 04A. *RUP.*

Endigo ZCX (thiamethoxam, lambda-cyhalothrin) | 3.0-3.5 fl. oz. per acre. REI: 24-hour. PHI: 14-day. IRAC 04A, IRAC 03A. *RUP.*

Lannate LV (methomyl) | 1.5 pts. per acre. REI: 48-hour. PHI: 6-day. IRAC 01A. *RUP.*

Perm-Up 25DF (permethrin) | Use 25W, 25WP or 25DF formulations at 6.4-12.8 oz. per acre. Use 3.2EC formulations at 4-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 03A. *RUP.*

Platinum 2SC (thiamethoxam) | Use 2SC formulations at 5-8 fl. oz. per acre or 75SG formulations at 1.66-2.67 oz. per acre as a preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. IRAC 04A.

Scorpion 35SL (dinotefuran) | *Soil application*: Use Scorpion 35SL at 11.5-13.25 fl. oz. per acre, or Venom 70SG at 6.5-7.5 fl. oz. per acre applied in-furrow at planting, or side-dressed to both sides of the row at ground crack. *Foliar application*: Use Scorpion 35SL at 2.0-2.75 fl. oz. per acre, or Venom 70SG at 1.0-1.5 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day. IRAC 04A.

Seed treatments for insects (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments with an insecticide ingredient, such as thiamethoxam (Cruiser 5FS, Cruiser Maxx Vibrance Potato; Cruiser Maxx Potato Extreme).

Sevin XLR Plus (carbaryl) | 0.5-1.0 qts. per acre. REI: 12-hour. PHI: 7-day. IRAC 01A.

Thimet 20G (phorate) | *Light or sandy soils*: 8.5-11.3 oz. per 1,000 ft. of row for any row spacing larger than 32-inches at planting or postemergence. *Heavy or clay soils*: 13.0-17.3 oz. per 1,000 ft. of row at planting but do not use post emergence. Apply as a band application on each side of row and beneath soil surfaces, or in the seed furrow. REI: 48-hour. PHI: 90-day. IRAC 01B. *RUP.*

Tombstone (cyfluthrin) | 1.6-2.8 fl. oz. per acre. REI: 12-hour. PHI: 12-hour. IRAC 03A. *RUP.*

Voliam Flexi (thiamethoxam, chlorantraniliprole) | 4 oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 04A, IRAC 28.

Warrior II (lambda-cyhalothrin) | 1.28-1.92 fl. oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 03A. *RUP.*

Leafhoppers

Pesticide

Actara (thiamethoxam) | 3.0 oz. per acre. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Admire Pro (imidacloprid) | *Seed treatment*: 0.17-0.35 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 5.7-8.7 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece at planting. *Foliar application*: 1.3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day for foliar applications. IRAC 04A.

Asana XL (esfenvalerate) | 5.8-9.6 fl. oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 03A. *RUP.*

Assail 30SG (acetamiprid) | Use 30SG formulations at 1.5-4.0 oz. per acre. Use 70WP formulations at 0.6-1.7 oz. per acre. REI: 12-hour. PHI: 7-day. IRAC 04A.

Athena (bifenthrin, abamectin) | 7-17 fl. oz. per acre. REI: 12-hour. PHI: 21-day. IRAC 03A, IRAC 06. *RUP.*

Baythroid XL (beta-cyfluthrin) | 0.8-1.6 fl. oz. per acre. REI: 12-hour. PHI: 0-day. IRAC 03A. *RUP.*

Belay (clothianidin) | *Seed treatment*: 0.4-0.6 fl. oz. per 100 lbs of seed applied directly to seed pieces. *Soil application*: 9-12 fl. oz. per acre applied in-furrow, side-dressed, or below seed piece

at planting. *Foliar application*: 2-3 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 14-day. IRAC 04A.

Brigadier (bifenthrin, imidacloprid) | Apply 16.0-25.6 fl. oz. per acre at plant as an in-furrow spray on to the seed pieces or seed potatoes. Apply 3.8-6.14 fl. oz. per acre as a foliar application. REI: 12-hour. PHI: 21-days. IRAC 03A, IRAC 04A. *RUP*.

Dimethoate 4EC (dimethoate) | Use 2.67EC formulations at 0.75-1.5 pt. per acre. Use 4EC, LV-4, and 400 formulations at 0.5-1 pt. per acre. REI: 48-hour. PHI: 0-day. IRAC 01B.

Endigo ZCX (thiamethoxam, lambda-cyhalothrin) | 3.0-3.5 fl. oz. per acre. REI: 24-hour. PHI: 14-day. IRAC 04A, IRAC 03A. *RUP*.

Lannate LV (methomyl) | 1.5-3.0 pts. per acre. REI: 48-hour. PHI: 6-day. IRAC 01A. *RUP*.

Malathion 5EC (malathion) | Use 5EC formulations at 2.0 pts. per acre. Use 57EC formulations at 1.0-1.5 pts. per acre. REI: 12-hour. PHI: 0-day. IRAC 01B.

Mustang Maxx (zeta-cypermethrin) | 3.2-4.0 fl. oz. per acre. REI: 12-hour. PHI: 1-day. IRAC 03A. *RUP*.

Perm-Up 25DF (permethrin) | Use 25W, 25WP or 25DF formulations at 6.4-12.8 oz. per acre. Use 3.2EC formulations at 4-8 fl. oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 03A. *RUP*.

Platinum 2SC (thiamethoxam) | Use 2SC formulations at 5-8 fl. oz. per acre or 75SG formulations at 1.66-2.67 oz. per acre as a preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. IRAC 04A.

Scorpion 35SL (dinotefuran) | *Soil application*: Use Scorpion 35SL at 11.5-13.25 fl. oz. per acre, or Venom 70SG at 6.5-7.5 fl. oz. per acre applied in-furrow at planting, or side-dressed to both sides of the row at ground crack. *Foliar application*: Use Scorpion 35SL at 2.0-2.75 fl. oz. per acre, or Venom 70SG at 1.0-1.5 fl. oz. per acre applied to foliage. See pollinator precautions. REI: 12-hour. PHI: 7-day. IRAC 04A.

Seed treatments for insects (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments with an insecticide ingredient, such as thiamethoxam (Cruiser 5FS, Cruiser Maxx Vibrance Potato; Cruiser Maxx Potato Extreme).

Sevin XLR Plus (carbaryl) | 0.5-1.0 qts. per acre. REI: 12-hour. PHI: 7-day. IRAC 01A.

Sivanto 200 (flupyradifurone) | 7.0-10.5 fl. oz. per acre. REI: 4-hour. PHI: 7-day. IRAC 04D.

Thimet 20G (phorate) | *Light or sandy soils*: 8.5-11.3 oz. per 1,000 ft. of row for any row spacing larger than 32-inches at planting or postemergence. *Heavy or clay soils*: 13.0-17.3 oz.

per 1,000 ft. of row at planting but do not use post emergence. Apply as a band application on each side of row and beneath soil surfaces, or in the seed furrow. REI: 48-hour. PHI: 90-day. IRAC 01B. *RUP.*

Torac (tolfenpyrad) | 14-21 fl. oz. per acre. See pollination precautions. REI: 12-hour. PHI: 14-day. IRAC 21A, FRAC 39.

Transform WG (sulfoxaflor) | 1.5-2.25 oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 04C.

Voliam Flexi (thiamethoxam, chlorantraniliprole) | 4 oz. per acre. REI: 12-hour. PHI: 14-day. IRAC 04A, IRAC 28.

Vydate C-LV (oxamyl) | 17-34 fl. oz. per acre. REI: 48-hour. PHI: 7-day. IRAC 01A. *RUP.*

Warrior II (lambda-cyhalothrin) | 0.96-1.60 fl. oz. per acre. REI: 24-hour. PHI: 7-day. IRAC 03A. *RUP.*

Wireworms

Pesticide

Admire Pro (imidacloprid) | 0.17-0.35 fl. oz. per 100 lbs of seed Apply directly to seed pieces. See pollinator precautions. REI: 12-hour. IRAC 04A.

Brigade 2EC (bifenthrin) | 9.6-19.2 fl. oz. per acre. Use 2EC formulations at 9.6-19.2 fl. oz. per acre as preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. Do not use 10DF, 10WP, or 10WSB formulations as they are not labeled for potatoes. REI: 12-hour. PHI: 21-day. IRAC 03A. *RUP.*

Brigadier (bifenthrin, imidacloprid) | Apply 16.0-25.6 fl. oz. per acre at plant as an in-furrow spray on to the seed pieces or seed potatoes. Apply 3.8-6.14 fl. oz. per acre as a foliar application. REI: 12-hour. PHI: 21-days. IRAC 03A, IRAC 04A. *RUP.*

Capture LFR (bifenthrin) | 12.75-25.5 fl. oz. per acre. Apply as preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. PHI: 21-day. IRAC 03A. *RUP.*

Platinum 2SC (thiamethoxam) | Use 2SC formulations at 5-8 fl. oz. per acre or 75SG formulations at 1.66-2.67 oz. per acre as a preplant broadcast and incorporate, at planting as a banded spray into furrow, or at lay-by as a soil-directed and incorporated spray through cultivation. REI: 12-hour. IRAC 04A.

Regent 4SC (fipronil) | 0.184-0.220 fl. oz. per 1,000 ft. of row. Make one in-furrow application at planting time only. Do not apply in row spacing less than 30 inches. On any row spacing greater than 36 inches, apply no more than 0.220 fl. oz. Do not apply if potato is planted by hand. REI: 0-hour. PHI: 90-day. IRAC 02B. *RUP.*

Seed treatments for insects (various ingredients) | Rates of other options otherwise not listed here vary by product, and are often multiple premixed ingredients. Select seed treatments with an insecticide ingredient, such as thiamethoxam (Cruiser 5FS, Cruiser Maxx Vibrance Potato; Cruiser Maxx Potato Extreme).

Thimet 20G (phorate) | *Light or sandy soils*: 8.5-11.3 oz. per 1,000 ft. of row for any row spacing larger than 32-inches at planting or postemergence. *Heavy or clay soils*: 13.0-17.3 oz. per 1,000 ft. of row at planting but do not use post emergence. Apply as a band application on each side of row and beneath soil surfaces, or in the seed furrow. REI: 48-hour. PHI: 90-day. IRAC 01B. *RUP.*

Potato - Weeds

All Weeds

A relatively large number of herbicides are labeled for use on potatoes, and there are many opportunities to apply them because the hilling process recreates a preemergent crop situation by burying crop leaves and protecting them from soil surface sprays.

For specific weeds controlled by each herbicide, check the Relative Effectiveness of Herbicides for Vegetable Crops table.

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

Non-Pesticide

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 by 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. Rolling cultivators on wide tool-bars offer effective high-speed cultivation between rows and can also hill.

Pesticide

Aim EC (carfentrazone) POST | 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. REI: 12-hour. PHI: 7-day. HRAC 14.

Anthem Flex (carfentrazone, pyroxasulfone) POST PRE | 3.5-6.0 fl. oz. per acre. Apply as a broadcast spray to the soil surface after planting, drag-off, or hilling. Ensure that a

minimum of 2 inches of soil cover the vegetative portion of the potato plants. Use lower rates on coarse soils. Do not apply more than 6 fl. oz. per acre in a single application or more than 9.12 fl. oz. per acre per year. Do not apply to soil with less than 1% organic matter. REI: 12-hour. PHI: 0-day. HRAC 14, HRAC 15.

Chateau SW (flumioxazin) PRE | 1.5 oz. per acre of Chateau SW or 1.5 fl. oz. per acre of Chateau EZ. *Minnesota only -- supplemental label.* 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. REI: 12-hour. HRAC 14.

clethodim products (clethodim) POST | Use 2EC formulations at 6-16 fl. oz. per acre with 1 qt. of COC per 25 gals. of spray solution (1% v/v). Use Select Max at 9-32 fl. oz. per acre with 8 fl. oz. of NIS per 25 gals. of spray solution (0.25% v/v). Use low rates for annual grasses, the high rates for perennial grasses. Spray on actively growing grass. Wait at least 14 days between applications. Do not exceed 32 fl. oz. of 2EC formulations or 64 fl. oz. of Select Max per acre per season. REI: 24-hour. PHI: 30-day. HRAC 01.

Dual Magnum (s-metolachlor) PRE | 1-2 pts. per acre. 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. REI: 24-hour. PHI: 60-day if applied before drag-off, or 40-day if applied at lay-by. HRAC 15.

Eptam 7E (EPTC) PRE | 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 linuron or metribuzin products applied before crop emerges and after drag-off. The Superior variety may be sensitive. Suppresses nutsedge. REI: 12-hour. PHI: 45-day. HRAC 15.

glyphosate products (glyphosate) POST | 0.75-3.75 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. REI: 4-hour to 12-hour. PHI: 14-day. HRAC 9.

League (imazosulfuron) POST | PRE | 4.0-6.4 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 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. REI: 12-hour. PHI: 45-day. HRAC 02.

Lorox DF (linuron) POST | PRE | Use 50DF formulations at 1.5-3 lbs. per acre. Use 4L formulations 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% organic matter. REI: 24-hour to 8-day. HRAC 05.

Matrix SG (rimsulfuron) POST | PRE | 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. REI: 4-hour. PHI: 30-day. HRAC 02.

metribuzin products (metribuzin) POST | PRE | Use 4F formulations at 0.5-2 pts. per acre, or 75DF formulations 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. REI: 12-hour. PHI: 60-day. HRAC 05.

Outlook (dimethenamid-p) PRE | 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. REI: 12-hour. PHI: 40-day. HRAC 15.

paraquat products (paraquat) POST | 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. REI: 12 to 24-hour. HRAC 22. *RUP.*

pendimethalin products (pendimethalin) PRE | Use 3.8 formulations at 1.5-3 pts. per acre. Use 3.3EC formulations at 1.2-3.6 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. REI: 24-hour. HRAC 03.

Poast (sethoxydim) POST | 1.0-2.5 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. REI: 12-hour. PHI: 30-day. HRAC 01.

Reflex (fomesafen) PRE | 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. REI: 24-hour. PHI: 70-day. HRAC 14.

trifluralin products (trifluralin) PRE | 0.5-1 lb. a.i. per acre. Use 4EC formulations at 1-2 pts. per acre. Use 10G formulations at 5-10 lbs. per acre. Broadcast and incorporate 1-2 inches after planting but before emergence, immediately after drag-off, or after potatoes have fully emerged. Use low rate on coarse soils with less than 2% organic matter. Not effective on muck or high organic matter soils. REI: 12-hour. HRAC 03.

Tripzin ZC (pendimethalin, metribuzin) POST PRE | 31-62 fl. oz. per acre. before potatoes are 6 inches tall. May be incorporated. Not effective on muck soils. Do not apply postemergence to red-skinned varieties or to stressed plants. REI: 24-hour. HRAC 03, HRAC 05.

Zidua SC (pyroxasulfone) PRE | 2.5-3.25 fl. oz. per acre. Apply after planting and before potatoes emerge. Use with another herbicide. Some varieties may be sensitive to Zidua. REI: 12-hour. HRAC 15.